

WHITE PLAINS CITY SCHOOL DISTRICT
RENOVATIONS AT ROCHAMBEAU ALTERNATIVE HIGH SCHOOL
SED Control Number: 66-22-00-01-0-015-020

CONTRACT G – GENERAL CONSTRUCTION WORK
CONTRACT W- WINDOW REPLACEMENT
CONTRACT P – PLUMBING WORK
CONTRACT M – HEATING, VENTILATION, AND AIR CONDITIONING
CONTRACT E – ELECTRICAL WORK

WESTCHESTER COUNTY, NEW YORK

NOTE: *This clarification forms a part of the contract documents for the above project and must be acknowledged in the plans and specifications. Attach it to the inside front cover of each of the specifications.*

RFI questions are represented in italics, our responses are represented in bold text.

CLARIFICATION TO PROJECT:

1. *"There is no milestone schedule in the spec. Please advise."* **See Special Provisions issued in Addendum 1.**
2. *Please advise what the required bid bond percentage is. The invitation to bidders shows 10% and the instruction to bidders shows 5%. Bid Bond should be 5% This was addressed with Addendum 2.*
3. *There are two sets of bid forms labeled Contract G – General Construction and Abatement Work. Please advise which form is to be used for the General Construction and Abatement Work. New bid forms were issued as part of Addendum 2.*
4. *Drawing E601 is missing from the bid set. Please advise. The bid documents call for the bidder to provide a list of subcontractors and values, there is only a subcontractor form for Plumbing & Gas Fitting, HVAC, and Electrical. Please advise. Drawing E601 removed from drawing list, this was issued as part of Addendum 1. List of subcontractors were removed from specifications issued in Addendum 2.*
5. *Please advise if we are to include a flash drive when submitting bids. Section 02113 Instructions to Bidders was revised to include a flash drive, this was issued as part of Addendum 2.*
6. *Please confirm bidders are to use three separate envelopes. (bid proposal, qualifications, and subcontractor list). Section 02113 Instructions to Bidders was revised to state 2 envelopes, this was issued as part of Addendum 2.*
7. *"The contractor certification form shows DRAFT embedded in the document. Is there finalized form? Please advise." Revised form with DRAFT watermark removed included in attachment.*
8. *During the bid walkthrough it was mentioned that the abatement scope was greatly reduced. Please advise. Abatement scope was issued as part of Addendum 2.*
9. *"The finish schedule lists LVT in both the floor and base columns in the rooms which get it. Please clarify actual base to be used." LVT shall remain as the floor. Vinyl cove base to be used as the material. Drawings are revised.*
10. *The LVT Spec section refers to spec section 090561.13 regarding Vapor Reduction Membrane, but we cannot find this spec section. Referenced spec section 090561.13 Vapor Reduction Membrane to be omitted.*
11. *"Dwg A-501 calls out our Pinnacle 900 polycarbonate glazed 9 inch rafter system. The basis of design in the spec*

is our Pinnacle 600 6 inch glass system. Meanwhile, since these are only 11'-ish wide, VELUX can easily provide our Pinnacle 350 3.5 inch system for either/or. Please see typical details for all three models in the insulating glass option attached, since glass is being specified". 6" glass system will be the Basis of Design. Drawings Sheet A501 has been updated. Substitutions must follow the process outlined in the project manual.

12. *PB-W-1 Bid Paper is incorrectly labeled Contract G-general Construction and Abatement work. Please reissue Bid Sheet. This has been addressed and issued in Addendum 2*
13. *Please clarify the following discrepancy: Specification 085113-7 2.03- B indicates Insulated Glazing and all window details show insulated glazing. Specification 085113-7 2.04 indicates dual glazing/integral blinds. Integral blinds can only be used with dual glazing. Please clarify if job intent is for insulated glazing as per glazing legend and glazing specifications, or if integral blinds utilizing dual glazing is required. Integral blinds to be removed from specification. Insulated glazing required as per legend and specifications. Integral blinds are not part of the project.*
14. *Please clarify the following discrepancy: Specification 085113-7 2.03- B indicates insulated glazing with Viracon Coatings. Specification 088000-9 2.13 indicates various insulated glass makeups with Starphire Glass and various Guardian coatings. These two glazing specs do not match each other. Further, the Tags noted on page 088000-9 2.13 (E1G-1, E1G-2 etc) do not match any tags on window schedule drawing page A600.00 where the legend indicates "Window Tint Type 1, Window Tint Type 2, Opaque Tint, Spandrel" Please clarify glazing requirements. Specification Section 088000 and drawings have been revised to reflect the tint colors.*
15. *Specification 085113 7 and 8 2.05 D indicates both cam action handles and roto operators Both cannot be used on project out windows, it has to be on or the other. Please clarify. Specification Section 085113 2.07 has been updated to indicate the correct hardware.*
16. *Specification does not mention the muntins. Please verify that muntins are exterior applied only, and there are no muntins internal to the IGU or on the interior side of the glass. Muntins to be exterior applied only. Revised specification section 085113 attached.*
17. *Louver specification indicates 6-inch louver by Airolite with a 1-inch insulated blank off panel and bird screen. Window detail A1 page A 601 shows a 2-inch louver with no insulated blank off panel. Please clarify louver specification for glazed in window louver. Specification Section 085113 now includes a section for glazed in louver.*
18. *"Page A104.00 Indicates Alternate W-2 (ADD) to provide labor and materials associated with the removal and replacement of the windows at the upper gym. Please clarify if Storage Room 401A, Exer Eq Room 405 and Office 404 are also to be included in this alternate." Yes, those rooms will also be included in the alternate.*
19. *"General window notes A 600 indicate a meeting rail on casement window to align with double hung windows. Please verify that this is a note from previous project, and we should ignore." There are casement style windows where a rescue window is required. See elevations and window types. There is no double hung windows included in the project. The note will be revised to state casement rail instead of double hung windows.*
20. *"Page A-600:"*
 - a. *"Window type V and type W are listed twice. Please clarify." Duplicate window types removed from drawing sheet.*
21. *"Floor plan A-100 Room Office B2- Missing the U1 Window tag. This window is shown on elevation 2/A202. Please clarify". Window tag U1 provided on A100.00 floor plan.*
22. *"Floor plan A103 Classroom 303 is missing the G1 tag. Please clarify." The window tag 'G' has been added to the plans.*

23. "Floor plan A101/A102 only shows (1) type "O" in stair 2, however elevation A200 indicates (2) type O in this staircase. Please clarify." **There will be 2 type 'O' windows as per the elevations. One occurs at intermediate stair landing below window type 'JJ'.**
24. "Floor plan A101/A102 only shows (1) type "O" in stair 2, however elevation A200 indicates (2) type O in this staircase. Please clarify." **There will be 2 type 'O' windows as per the elevations.**
25. "Floor plan A102/A103 does not show any type "O" in stair 3, however elevation 2 A201 indicates there is (1) type O in this staircase. Please clarify." **Type 'O' window occurs at intermediate stair landing below window type 'JJ'.**
26. "Floor plan A101 shows a window type P in stair 4. This should be a door as per elevation 2 A201, so this P should be removed from the floor plan". **The door is shown on the basement floor plan. There are 2 Type 'P' windows which is represented on the floor plans and elevations.**
27. Please clarify whose contract the following work is in:
- a. Skylights. **Contract W**
 - b. Exterior Doors RF1 (cupola) and B15 (boiler room). **Contract G**
 - c. All Interior doors. **Contract G**
 - d. General Window Notes page A600.00 indicates that all louvers will be provided by Contract M and installed by Contract G.
 - i. Addendum indicates shall furnish and install a louver in the window frame assemble for use in providing fresh air for the mechanical system. The louver shall be as indicted kin the Contract Documents. There shall be an insulated metal panel installed at the exterior side of the louver and the Window Contract shall cut an opening in the panel and coordinate size of opening with the Mechanical Contract. The Mechanical Contract shall provide template for each opening to the Window Contract for the Window Contractors use in cutting the opening in each panel. **Contract W shall purchase and install all louvers with insulated blank off panel. Contract M is to provide template of duct size to Contract W. Contract W shall cut blank off panel to template size provided. Contract M shall connect ductwork to louver.**
 - ii. Please clarify scope for windows in louvers. **Contract W shall purchase and install louvers. Louvers shall be glazed into window system.**
28. Page A100 General Work Note 11, window details A500 and window schedule A601 indicates provide new window shades, please clarify which contract this is under.
- a. If under window contract, please clarify attachment/installation detail shown at new ceiling on 1/A500 and BA601. **Window shades shall be Contract G.**
 - b. General Notes A200/201/202
 - i. Note 9: All Power washing of exterior masonry. **Contract W**
 - ii. Note 11: Rake out existing joints between stone coping, fascia sill base, pediment & brick to a min depth of 1 inch. Furnish and install new mortar joint to match existing stone. All stone surfaces to be sealed at completion of repointing skyward facing joints with sealant. **Contract W**
29. A 603.00 is showing 123A and 123B keep the existing floors and wall coverings but receive new base tile. **Drawing A603.00 Finish Schedule was updated to reflect the correct flooring and base.**
30. A 401.00 detail 1 has demolition note 3, showing existing remains, yet detail 2 construction note 3 shows new flooring and all elevations show new wall tile. **The existing terrazzo floor is to remain in the bathroom. Prep existing flooring to receive new floor tile.**
31. Finish Schedule A 603 , Shows Terrazzo legend but the room finish schedule does not list terrazzo. There is a spec 090160 which calls out for Terrazzo Floor Restoration. **There is terrazzo flooring outside the second floor bathrooms (ADA Restroom 317A and 317B). The specification is in the project manual in the event there is damage or over demolition done near the existing terrazzo flooring.**

32. *What is the species for the wood doors? Specs just say "oak". Is it white oak or red oak? **Provide Red Oak.***
33. *On G-102 the stage is labeled 211A. Auditorium is not labeled. On A602 addendum 2 finish schedule "Auditorium 211" is "EX" and "SS" (existing floor sanded and sealed). There is no stage 211A. Do you mean 211A in the finish schedule and sand and seal the stage? Do not believe there is wood floor in the auditorium but need clarification. **There is no scope of work in the Auditorium and Stage. Drawings and schedule have been revised accordingly.***
34. *Drawing ED101/ED102/ED103: During the Walkthrough it was noted that the classrooms have a media panel surface mounted to the existing ceiling, please advise if this is to be relocated by the Contract E Prime into the new ceiling or if this is existing to remain or will be relocated by others. Please note we do not know for certain if the existing cables from the Wiremold are long enough to reach the new ceiling. **Media Panels are to remain above new drop ceiling.***
35. *Drawing E100: During the Walkthrough it was noted that the only access to the Pipe Tunnel, where a portion of the new electrical equipment would be is through an approximately 3ftx3ft wide door. Please advise if this equipment can be relocated into Storage B20 in lieu of the Pipe Tunnel. This would provide easier access for Facilities, ConEdison and Emergency Services. **New electric service equipment moved to Storage Room.***
36. *Drawing E110: Please confirm, there is no property line box shown from the existing Pole "W6". Assuming a case has been filed with ConEd for this work, have they reviewed and approved running directly from the public pole to the transformer? As typically we are required to install a Property-Line demarcation point i.e. a Pole or Box. **See revised electric service routing on drawing.***
37. *Drawing E110*
- General Notes: #8 advises us to drill UNDER the roadway. Will trenching across be an acceptable method for installing the conduit as referenced in General Notes #3? **See revised notes on drawing.***
 - Please advise if any WP PD fees will be exempt or if fees for WP PD standby shall be included for the road work? **Any fees for WP PD will be paid by the contractor.***
 - Please advise if a case has been filed with the utility company or if the expectation is for the successful contractor to file the case? **Contractor to File Case/Application for new electric service to Con-ed.***
38. *Drawing E500*
- Has various notes to provide complete installation "AS REQUIRED PER UTILITY CO. (PSE&G)". Please confirm this is a typo and should read Con Edison in lieu of PSE&G. This may impact the overall utility design if designed around PSE&G spec. **All references to PSE&G have been changed to Con-ed.***
 - The Primary and Secondary Conduits listed call for 4" PVC. Please advise if this should instead call for HDPE as typical ConEd spec on the Primary and Secondary conduit before the meter is HDPE not PVC. **Conduit type is changed from PVC to HDPE.***
 - The cable from the Trans S cabinet to the meter is noted to be provided by the utility PSE&G. With this being corrected to "ConEd". ConEd does not typically provide the 10point meter cable. Please confirm if we should price this as cable provided by utility. **Contractor to provide metering cable.***
39. *Drawings E121/E122/E123*
- Based on the two (2) sets of switches at each door it is assumed that there are two (2) switching zones in the typical classroom. If changed to where all the classroom lights come on together. We could change the quantity of switches from two (2)/Four (4) per room to one (1)/two (2) per room, depending on whether the room requires 3way switching. **Two new LV switches shown in each classroom, one for each row of light fixtures.***
 - Are there any requirements for daylight sensors to be installed for fixtures near exterior windows as currently none are shown. **No.***
 - The drawings reference a Wattstopper lighting controls system as basis of design. The spec also allows for Hubbell and Sensor Switch. Please advise if Lutron would be an acceptable brand as well. **Luton is and acceptable Manufacturer.***

- d. *Please confirm, there does not appear to be any EM fixtures or EM Battery Pack fixtures in the various classrooms. **No EM fixtures or EM battery packs are required in the classrooms with windows.***

CLARIFICATION TO SPECIFICATIONS:

1. Revised Contractor Certification Form without the DRAFT watermark attached.
2. Revised Specification Section 085113 Aluminum Windows attached.
3. Revised Specification Section 088000 Glazing attached.
4. Revised Specification Section 260505 Selective Demolition for Electrical attached.
5. Revised Specification Section 260583 Wiring Connections attached.
6. Revised Specification Section 262100 Low Voltage Electrical Service Entrance attached.
7. Revised Specification Section 262400 Panelboards attached.
8. Revised Specification Section 26816.16 Enclosed Switches attached.
9. Revised Specification Section 264300 Surge Protection Devices attached.
10. Revised Specification Section 265100 Interior Lighting attached.
11. Revised Specification Section 284600 Fire Detection and Alarm attached.
12. Specifications 260574:
 - a. Being that a short circuit study is required by our chosen panelboard manufacturer. This may result in changes to breaker KAIC ratings. Please advise if all panelboard breakers should be priced at 65KAIC for pricing purposes or if breakers should be priced as shown on the panel schedules and any increases to breaker KAIC ratings will be addressed during construction. **Correct.**
 - b. Please advise if the Utility company has provided the proposed inrush current for the study as that will be needed as part of the study. **Contractor to receive when the service application is filed.**
 - c. Please confirm only the New distribution equipment will be a part of the study and not the existing service distribution equipment and associated branch loads. **Correct.**
 - d. Please advise up to what size branch load shall be covered in the study if any or if ALL branch loads are to be covered in the study. **No branch loads to be included in the study.**
 - e. SquareD is noted as the only approved manufacturer. Please confirm, Eaton, ABB, Siemens are approved manufacturers as well. **Other equipment manufacturers have been added to the specifications.**

CLARIFICATION TO DRAWINGS:

1. Remove A100.00 PROPOSED BASEMENT FLOOR PLAN and replace with A100.00 PROPOSED BASEMENT FLOOR PLAN. Window type 'U1' has been added to Office B2.
2. Remove A103.00 PROPOSED SECOND FLOOR PLAN and replace with A103.00 PROPOSED SECOND FLOOR PLAN. Window tag 'G' has been added to Classroom 303.

3. Remove A501.00 SKYLIGHT AND MISCELLANEOUS DETAILS and replace with A501.00 SKYLIGHT AND MISCELLANEOUS DETAILS. Pinnacle 900 Ridge Member has been revised to Pinnacle 600 Ridge Member. Roof penetration details have been added to the sheet.
4. Remove A600.00 WINDOW TYPES and replace with A600.00 WINDOW TYPES. Duplicate 'V' and 'W' window types removed. General Window note 1 revised. Legend revised to reflect tints as stated in the specifications. Duplicate window types removed from drawing.
5. Remove A603.00 CASEWORK, FURNITURE, AND FINISH SCHEDULE and replace with A603.00 CASEWORK, FURNITURE, AND FINISH SCHEDULE. Revisions to Finish Schedule and Furniture Schedule
6. Remove P001.00 PLUMBING GENERAL NOTES, LEGEND, ABBREVIATIONS, SCHEDULES, AND DETAILS and replace with P001.01 PLUMBING GENERAL NOTES, LEGEND, ABBREVIATIONS, SCHEDULES, AND DETAILS. Revisions to plumbing fixture schedule.
7. Remove P100.00 PLUMBING ENLARGEMENT PLANS AND RISERS and replace with P100.01 PLUMBING ENLARGEMENT PLANS AND RISERS. Revisions to enlarged plan of room 322, sanitary and vent enlargement plan of room 317A and 317B, keyed plumbing notes, and domestic water enlargement plan of room 317A and 317B.
8. Remove M500.00 MECHANICAL DETAILS and replace with M500.01 MECHANICAL DETAILS. Details updated to reflect delineation of Contract 'M', 'G', and 'W' scope for roof work and penetrations.
9. Remove M501.00 MECHANICAL DETAILS and replace with M501.01 MECHANICAL DETAILS. Details updated to reflect delineation of Contract 'M', 'G', and 'W' scope for roof work and penetrations.
10. Remove M600.00 MECHANICAL SCHEDULE (1 OF 2) and replace with M600.01 MECHANICAL SCHEDULE (1 OF 2). Note #4 "SCHEDULE FOR REFERENCE ONLY. LOUVER PROVIDED AND INSTALLED BY CONTRACT 'W'. CONTRACT 'M' TO COORDINATE WITH CONTRACT 'W'" added to Louver Schedule.
11. Remove E001.00 GENERAL NOTES AND LEGENDS and replace with E001.00 GENERAL NOTES AND LEGENDS: Light Fixture Schedule, Types C, C1 and D.
12. Remove E100.00 BASEMENT FLOOR PLAN and replace with E100.00 BASEMENT FLOOR PLAN: New electric service equipment moved from Pipe Tunnel to Storage Room.
13. Remove E110.00 ELECTRICAL SITE PLAN and replace with E110.00 ELECTRICAL SITE PLAN :
 - a. Changed all references from PSE&G to Con-Ed
 - b. Updated routing of new electric service.
 - c. Updated Primary Cable/Conduit Specification
 - d. Updated General Notes.
14. Remove E500.00 ELECTRICAL ONE LINE DIAGRAM and replace with E500.00 ELECTRICAL ONE LINE DIAGRAM:
 - a. Changed all references from PSE&G to Con-Ed
 - b. Moved new electric service equipment from Pipe Tunnel to Storage Room.
15. Remove E600.00 ELECTRICAL SCHEDULES and replace with E600.00 ELECTRICAL SCHEDULES
 - a. Added SPD to Panel HDP.

Labor Law 220-i Certification Form

-Sign and Submit with Bid-

By submission of this bid, the person authorized to sign on behalf of the Bidder hereby certifies, under penalty of perjury, that: (i) the Bidder is registered with the New York State Department of Labor pursuant to Section 220-i of the New York Labor Law and (ii) each of the subcontractors engaged by the Bidder for this Project are also registered.

Bidder further represents that it has included with this certification, a copy of the Certificate(s) of Registration issued by the Commissioner of the Department of Labor for the Bidder and each of its subcontractor(s).

Project: _____

Bidder Name (Corporate): _____

Bidder Address: _____

Signature of Corporate Officer: _____

Print Name and Title: _____

Date: _____

Sworn to before me this _____
day of _____, 20____

Notary Public

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes fixed and/or operable aluminum-framed windows for exterior locations.
- B. Related Sections include the following:
 - 1. Division 088000 Section "Glazing" for additional glazing requirements for aluminum windows.

1.03 DESCRIPTION OF WORK

- A. Provide all plant, labor, materials, accessories, equipment, incidentals, scaffolds and supervision necessary to complete window installations with hardware, exterior trim, components and related work shown and/or specified including but not necessarily limited to the following:
 - 1. Projected Windows: 60" x 144" (F/PO/F/PI)
 - 2. Casement Windows: 36" x 60"
 - 3. Fixed/Transom Windows.
 - 4. Miscellaneous trim, closures, brake metals, receptors, panning, sills, mullions, mullion covers, and flashing.
 - 5. Glazed-in louver
- B. Related Work Specified Elsewhere:
 - 1. Joint Sealants: Division 07
 - 2. Aluminum Entrances and Storefronts: Division 08
 - 3. Glazing for additional requirements: Division 08

1.04 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA/CSA 101/I.S.2/A440-08:
 - 1. AW: Architectural.
- B. Performance grade number according to AAMA/WDMA/CSA 101/I.S.2/A440-08:
 - 1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.
- C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.
- D. Minimum test size is smallest size permitted for performance class (gateway test size) or as specified elsewhere in this section, whichever is more stringent. Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class. Downsized test reports will not be considered acceptable.

1.05 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:
 - 1. Projected Windows: 60" x 144" (F/PO/F/PI).

2. Casement Windows: 36" x 60"
- B. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing , Uniform Load Structural Test, at AAMA/WDMA/CSA 101/I.S.2/A440 basic wind speed indicated:
 1. Deflection: Based on passing , Uniform Load Deflection Test. AAMA/WDMA/CSA 101/I.S.2/A440
 - a. 100 psf (positive and negative) Projected Windows.
 - b. 160 psf (positive and negative) - Fixed Windows.
 - c. 140 psf (positive and negative) - Outswing Casement
 2. Uniform Load Structural Test:
 - a. 150 psf (positive and negative) Projected Windows.
 - b. 240 psf (positive and negative) - Fixed Windows.
 - c. 210 psf (positive and negative) - Outswing Casement
 3. Basic Wind Speed: As indicated in miles per hour at 33 feet above grade. Determine wind loads (30 lbf/sq. ft. minimum) and resulting design pressures applicable to Project according to the following, based on mean roof heights above grade as indicated on Drawings:
 - a. ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 6.4.2, "Analytic Procedure."
 - b. Appendix B in AAMA/WDMA/CSA 101/I.S.2/A440.
- C. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA/CSA 101/I.S.2/A440, Air Infiltration Test.
 1. Maximum Rate: (Tested at an inward test pressure of 6.24 lbf/sq. ft)
 - a. 0.10 cfm/sq. ft. of area for Projected Windows
 - b. 0.01 cfm/sq. ft. of area for Fixed Windows
- D. Water Resistance: No water leakage as defined in AAMA/WDMA/CSA 101/I.S.2/A440 referenced test methods at a water test pressure equaling that indicated, when tested according to, Water Resistance Test.
 1. Test Pressure: 20 percent of positive design pressure, but not less than 25 lbf/sq. ft.
- E. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F588.
- F. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a minimum CRF of 62.
- G. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested in a dual glazed version (reports based on windows glazed with insulating glass will not be acceptable) according to AAMA 1503.
 1. U-Value (Btu/sq. ft. x h x deg F):
 - a. Maximum 0.33 (0.24 Glass / Warm Edge) for Projected Windows
 - b. Maximum 0.33 (0.24 Glass / Warm Edge) for Fixed Windows
 2. SHGC: 0.33
- H. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections.
- I. Projected Windows: Must be flush vent type (overlapping vents will not be acceptable) and must comply with AAMA/WDMA/CSA 101/I.S.2/A440 for the following tests, in addition to Gateway Performance Requirements:
 1. Hardware Load Test.

2. Sash Torsion Test.
 3. Torsion Test.
 4. Horizontal Concentrated Load Test on Latch Rail.
 5. Vertical Concentrated Load Test on Latch Rail.
 6. Torsion Load Test on Intermediate Frame Rails.
 7. Vertical Concentrated Load Test on Intermediate Frame Rails.
 8. Balance Arm Load Test.
 9. Life Cycle Testing: When tested in accordance with AAMA 910.
- J. Sliding Windows: In addition to Gateway Performance Requirements, comply with for the following tests: AAMA/WDMA/CSA 101/I.S.2/A440
1. Operating Force.
 2. Deglazing: When tested in accordance to ASTM E987.
 3. Life Cycle Testing: When tested in accordance with AAMA 910.
- K. Fixed Windows: Comply with the Gateway Performance Requirements of AAMA/WDMA/CSA 101/I.S.2/A440.

1.06 SUBMITTALS

- A. Product Data: Submit manufacturer's complete specifications, construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, subframes, trims, closures, etc., hardware, finishes, and operating instructions for each type of aluminum window indicated.
- B. Shop Drawings: Before proceeding with the manufacture of windows, Contractor shall prepare and submit verified and complete dimensioned plans, elevations, sections, large-scale details including interface and method of anchoring to adjacent construction, trims, metal thickness, hardware, attachments to other work, operational clearances, and including, but not limited to, the following:
1. Mullion details, including reinforcement and stiffeners.
 2. Joinery details.
 3. Weather-stripping details.
 4. Thermal-break details.
 5. Glazing details.
 6. For products indicated to comply with design loads, include structural analysis data signed and sealed by the licensed professional engineer registered in the state having jurisdiction responsible for their preparation and used to determine the structural test pressures and design pressures from basic wind speeds indicated.
 7. Submit any other components as required for Architect's approval. No fabrication shall be started until such approval is received. Contractor will verify all opening dimensions in the field and be responsible to provide proper size window units to fit all existing openings and note same on Shop Drawings.
- C. Submit Certified Test Reports from an AAMA accredited laboratory certifying the performance of each type of window specified. Test reports shall be no more than 4 years old and accompanied by AAMA Notice of Certification stating that the tested window meets or exceeds the specified performance criteria for the current appropriate window types. AAMA/WDMA/CSA 101/I.S.2/A440. Manufacturer shall also certify that Certified Test Reports are for window sample submitted, and for windows to be used on this Project.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
1. Include similar samples of hardware and accessories involving color selection.
- E. Maintenance Data: For operable window sash, operating hardware, and finishes to include in maintenance manuals.

- F. Warranty: Special warranty specified in this Section.

1.07 QUALITY ASSURANCE

- A. Product Qualifications: In order to confirm that the proposed product(s) conform to the material and performance requirements contained in these specifications, bidders shall include the following with their bid. Failure to comply with these requirements shall cause the bid to automatically be rejected.
1. Bidder's Acknowledgement: Bidders shall include a letter in their bid stating the manufacturer and series (model) number of the product upon which its bid has been based. Changes in product (manufacturer or series) will not be permitted after the bid.
 2. Product Data: Bidders submitting bids based on products other than the Basis of Design product listed in Paragraph 2.1 must also include the following with their bid:
 - a. Comprehensive test reports not more than four years old prepared by a qualified testing agency for each product type being used on the project demonstrating compliance with the air, water and structural requirements outlined herein. Test reports based on the use of downsized test units will not be accepted.
 - b. Thermal simulations prepared by a qualified independent testing agency for each product type being used on the project demonstrating compliance with the thermal transmittance requirements outlined in Paragraph 2.3.
 - c. Full size product details showing all frame and sash details, dimensions, thermal break construction, wall thicknesses and joinery. Details must accurately reflect all glazing and hardware options specified herein.
- B. Product Requirements: For maximum performance, windows for this project must meet both the testing requirements as contained herein and the minimum material requirements specified. Windows that carry the applicable AAMA rating but do not meet the material thicknesses, depths, etc. shall not be acceptable for use on this project.
- C. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E548.
- E. Single Source Responsibility: Provide all window types listed by a single manufacturer. All components of windows including sub-frames, trims, framing, etc. shall be by the same manufacturer. Splitting of types of windows such as sliding, fixed windows by different manufacturers is not acceptable.
- F. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Do not modify size and dimensional requirements.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- G. Fenestration Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-08, "Standard/Specification for Windows, Doors, and Unit Skylights" for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
- H. Product Criteria: Information on Drawings and in Specifications establish requirements for aluminum window design and performance characteristics. Design characteristics are indicated

by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including pre-construction testing, field testing, and in-service performance.

- I. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.
- J. Preinstallation Conference: If requested, conduct conference at project site to review methods and procedures related to aluminum windows including, but not limited to, the following:
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components.
 - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.08 PROJECT CONDITIONS

- A. Field Measurements: For retrofit installations, verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.09 WARRANTY

- A. Special Warranty: Submit a written warranty signed by aluminum window manufacturer agreeing to repair or replace window that fail in materials or workmanship within the specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection.
 - c. Water leakage, air infiltration, or condensation.
 - d. Faulty operation of movable sash and hardware.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - f. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Windows: Two years after date of Substantial Completion for the total window system.
 - b. Insulated Glazing: Ten years after date of Substantial Completion.
 - c. Painted Metal Finishes:
 - 1) Five years from date of Substantial Completion for AAMA 2603 Baked Enamel Finishes.
 - 2) Fifteen years from date of Substantial Completion for AAMA 2605 Superior Performance Finishes.
- B. Deficiencies due to such elements not meeting the specifications shall be corrected at no expense to the Owner during the warranty period.

1.10 WORK SCHEDULE

- A. Two weeks before actually starting window replacement work at the site Contractor will meet with the Architect and Owner to establish a work schedule acceptable the Owner. Contractor will not change approved schedule without prior approval.
- B. No windows will be removed unless Contractor can replace them with new units prior to end of day's work.

1.11 SAMPLE WINDOW INSTALLATION

- A. Prior to the actual starting of the project, Contractor will install a sample replacement unit in the opening selected by the Owner for the architect's and Owner's approval. The Sample will be typical of completed window installations showing all elements including but not limited to: frames, sash, mullions, trim, casings, weeps, sills, caulking, etc. for a complete installation.

PART 2 PRODUCTS

2.01 MANUFACTURER:

- A. A. Basis-of-Design Product: The basis of design for these specifications is the Series 3042i Projected/Fixed and Series 3042i Casement Windows as manufactured by Architectural Window Manufacturing Corporation, Rutherford, New Jersey.
- B. B. Equivalents: Subject to compliance with all material and performance requirements outlined in these specifications, "or equal" products by other manufacturers will be considered for use subject to review by the Architect. The Architect's decision regarding equivalency is final.

2.02 MATERIALS:

- A. A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than 0.080-inch thickness at any location for the main frame and sash members.
- B. Frame/Sash Depth:
 - 1. Frame/Sash Depth: 4 ¼" minimum frame depth; 3 ½" minimum sash depth.
- C. Brake Formed Aluminum: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, and not less than 0.062 inch thickness.
- D. Glazed in louver - Model number 2DB45-GF Drainable stationary Louver with 1" Glazing Frame as manufactured by Architectural Window or approved equivalent.
 - 1. Aluminum construction providing high resistance to corrosion
 - 2. 2" deep, 6063-T5 extruded aluminum. .063 nominal wall thickness.
 - 3. All welded construction for strength and durability.
 - 4. Published performance ratings data based on testing in accordance with AMCA Publication 511.
 - 5. Drainable head collects and channels water to drainable jamb to provide excellent water penetration performance.
 - 6. Drainable blade channels water to drainable jamb minimizing water cascade between the blades.
 - 7. Bird screen

- E. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
 - 1. All fasteners must be concealed except where unavoidable for application of hardware.
 - 2. For application of hardware, where required, use non-magnetic stainless steel phillips flat head machine screws.
- F. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- G. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.
 - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA/CSA 101/I.S.2/A440-08.
- H. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
 - 1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.
- I. Replaceable Weather Seals: Comply with AAMA 701/702.
- J. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.03 WINDOW

- A. Window Type: Outswing Casement
- B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440-08.
 - 1. Performance Class and Grade: AW-PG140 Outswing
- C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested with insulating glass for thermal performance according to AAMA 1503, showing a minimum CRF of 60.
- D. Thermal Transmittance: Provide aluminum windows with whole-window U-factor and SHGC maximums indicated when simulated in accordance with NFRC 100 and NFRC 200 at a model size of 36" x 60" and glazed with 1" Argon filled sputter coat Low-E (#2) insulated glass using a warm edge spacer.
 - 1. U-Factor: 0.40 Btu/sq. ft. x h x deg F or less.
 - 2. SHGC: 0.28.
- E. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-08, Air Infiltration Test.
 - 1. Maximum Rate: <0.01 Outswing cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa).
- F. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.

1. Test Pressure: The lesser of 20 percent of positive design pressure or 25 lbf/sq. ft. Outswing
- G. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 588.
- H. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA/CSA 101/I.S.2/A440-08.
- I. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-08 for operating window types indicated.

2.04

2.05 HARDWARE:

- A. Hardware in General: Provide manufacturer's standard hardware fabricate from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and of size and strength to accommodate sash or ventilator weight, dimensions and operation. Do not use aluminum in friction contact with other metals.
- B. Locks and Latches in General: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- C. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches above floor; 1 pole operator and pole hanger per room that has operable windows with a pole operated locking mechanism more than 72 inches above floor.
- D. Projected Windows: Provide the following operating hardware:
 1. Hinge: Concealed stainless steel four-bar friction hinge with adjustable-slide friction shoe; two per ventilator.
 2. Lock: Cam-action, white bronze locking handle and keeper (two per ventilator over 42" wide).
 3. Lock: Provide pole-operated automatic white bronze locks on inward acting ventilators, where the distance to the operating hardware exceeds six feet above the floor.
 4. Limit Device: Integral adjustable stainless steel, stop (two per ventilator). stainless steel limit arm, limit openings to 8".
- E. Outswing Casement Windows: Provide the following operating hardware:
 1. Hinge: Three aluminum butt hinges (painted to match the exterior of the windows) per ventilator (four per ventilator over 60" tall).
 2. Lock: One single or multi-point (as required by vent height) standard color painted Zamac locking handle with strike by Caldwell Mfg. Co. plus one aluminum pull handle finished to match windows.
 3. Stay Arm: One 90 degrees stainless steel stay arm.

2.06 INSECT SCREENS:

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Provide insect screens on all operable sash. Locate insect screens on outside of window except mount insect screens on the inside of the window for project-out units and include hinged wickets at each operating latch.

- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
- C. Extruded-Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.062-inch wall thickness.
 - 1. 1. Finish: Match aluminum window members.
- D. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch diameter, coated aluminum wire.
 - 1. Wire-Fabric Finish: Charcoal Gray

2.07 ACCESSORIES

- A. Rescue Window Labels: One window per classroom or teaching area shall be deemed a "rescue window", for egress in case of emergency. All rescue windows shall comply with SED regulations and applicable codes and shall include a conforming label. At a minimum, provide the following:
 - 1. Letters: bright yellow background with black letters
 - 2. Label size: 3 inches high by 5 inches wide
 - 3. Text: the words "RESCUE WINDOW" must be visible from Interior and Exterior sides of each rescue window.
 - 4. Any window treatment/coverings at each of these locations must also have labels.
 - 5. Visible window operating instructions shall be provided if operation is not readily apparent.

2.08 FABRICATION:

- A. Windows must be flush vent design (overlapping vents will not be acceptable).
- B. Vents and fixed lites must have an integral exterior bevel.
- C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- D. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- E. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed (products with exposed thermal barriers will not be acceptable), low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 - 1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
 - 2. No thermal short circuits shall occur between the exterior and interior.
 - 3. The thermal barrier shall be INSULBAR® or equal and shall consist of two glass reinforced polyamide nylon 6/6 struts mechanically crimped in raceways extruded in the exterior and interior extrusions.
 - 4. Poured and debridged urethane thermal barriers shall not be permitted.
- F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- G. Weep Holes: Provide weep holes with hinged covers and internal passages to conduct infiltrating water to exterior.

- H. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- I. Subframes: Provide drainable subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093-inch thick extruded aluminum. Finish to match window units. Provide subframes capable of withstanding design loads of window units. .
- J. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.
- K. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system as indicated. Provide glazing stops to match sash and ventilator frames.
- L. Muntins: Where shown on drawings, muntins shall be 3/8" deep profiled extruded aluminum applied to the exterior of 1" deep insulating glass. Roll formed muntins shall not be acceptable. Exterior applied muntins, where applicable, must be pinned to an integral bevel on the frame or sash. Products using applied bevels will not be accepted.

2.09 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Exterior of window:
 - 1. Superior-Performance Organic Finish: AA-C12C42R1x Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: (as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Fluoropolymer Two-Coat XL System: Manufacturer's standard Two-Coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color and clear topcoat containing Mica Flakes not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605
 - b. Color: As Selected by the Architect from the manufacturer's full color offering..
- D. Interior of window:
 - 1. Baked-Enamel Finish: AA-C12C42R1x Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: (as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - a. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603. Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603.
 - b. Color: As Selected by the Architect from the manufacturer's full color offering..

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances and other conditions affecting performance of work.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
 - 3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Field measure all openings and verify all conditions. Note locations of existing mechanical equipment, guards, wires, etc. are required to be removed or removed, salvaged and reinstalled and incorporate such information into the shop drawings.
- C. Unacceptable conditions shall be reported in writing to the Architect prior to the start of work. Do not proceed with installation until unsatisfactory conditions have been corrected. Starting of work will be construed as Contractor's acceptance of existing conditions and the Contractor will be responsible to correct and repair defects not reported to the Architect in writing at no additional cost.

3.02 PREPARATION

- A. Remove existing window assemblies and other associated work as indicated and required for the proper installation of new windows.

3.03 INSTALLATION

- A. Do not remove existing windows that are to be replaced until new replacement windows are available for installation. Do not leave any openings uncovered at end of working day.
- B. Remove all necessary portions of frame, sash members, or other existing materials that are required to be removed to permit the proper erection of new windows, trim, etc. Remove and replace deteriorated or damaged sills, blocking, etc. prior to covering or installing new windows, etc.
- C. Remove hardware, window shades, blinds, drapes, window air conditioners, exhaust vents, louvers, etc. as may be required to allow window replacement. Salvage or dispose of window treatments as directed by Owner.
- D. Install and/or reinstall window air conditioners, exhaust vents and louvers in insulated aluminum panels where indicated.
- E. Windows shall be installed and adjusted by experienced and qualified window erectors, and using only skilled window mechanics. Install windows in accordance with manufacturer's written instructions for installing windows, complete with all hardware, accessories, and other components Contract Drawings and approved shop drawings, at the proper elevation and location, plumb, level, and in alignment, rigidly secure and properly brace frames to prevent

distortion and misalignment. Protect windows and operating parts against accumulation of cement, lime, and other building materials. Keep windows tightly closed.

- F. Anchor component parts securely in place to comply with performance requirements and permit movement where intended or necessary. Install slip-joint linings wherever possible to ensure movement as intended or necessary. In no case, shall any attachments to existing structure or to components of the window system be through or affect the thermal barriers of the windows.
- G. Provide all anchors, brackets, bolts, fasteners, treated wood blocking, furring, fillers, nailers, shims and inserts as required for a plumb and secure installation.
- H. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- I. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- J. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- K. Set all metal to metal joints between members of windows, frames, in a mastic sealant of type in conformance with AAMA/WDMA/CSA 101/I.S.2/A440 requirements. Remove excess mastic before it hardens.
- L. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/WDMA/CSA 101/I.S.2/A440.
- M. Apply bituminous coating of approximately 30 mil dry film thickness, or other suitable permanent separator, on concealed contact surfaces of dissimilar metals or cementitious materials, before assembly or installation, wherever there is the possibility of corrosive or electrolytic action.
- N. Wedge fiberglass insulation between frames of new windows and construction to remain or between frames and new blocking as applicable.
- O. Seal entire perimeter of window frames in wall openings to accomplish a watertight seal. Include both exterior and interior caulking.
- P. Seal joints between metal and all masonry surfaces, in addition to other areas as shown. Caulking to be tooled properly without ripples or omissions.
- Q. Color as selected by Architect.

3.04 ADJUST

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Manufacturer shall clean all glass and aluminum prior to shipment.
- C. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system.

3.05 PROTECTION AND CLEANING

- A. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, labels, dirt and other substances. Lubricate hardware and moving parts.
- B. Clean glass of pre-glazed units promptly after installation of windows. Comply with manufacturer's written recommendations for final cleaning and maintenance.
- C. Screens shall be properly cleaned and free of any dirt, caulking, or other substances, etc.
- D. Contractor will clean premises of all refuse, debris, removed materials, etc., as soon as windows have been installed. Working areas to be left broom clean to Architect's satisfaction.
- E. Debris and/or removed materials shall not be allowed to accumulate.
- F. Initiate and maintain all protection and other precautions required to ensure that window units will be without damage or deterioration (other than normal weathering at time of acceptance).

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Door and Window glazing.

1.03 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. Interspace: Space between lites of an insulating-glass unit.
- D. Sealed Insulating Glass Unit Surface Designations:
 - 1. Surface #1 - Exterior surface of the outer glass lite
 - 2. Surface #2 - Interspace surface of the outer glass lite
 - 3. Surface #3 - Interspace surface of the inner glass lite
 - 4. Surface #4 - Interior surface of the second layer of laminated glass.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - b. Basic Wind Speed: 135 mph.
 - c. Risk Category: III.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.05 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type; 12 inches (300 mm) square.
 - 1. Insulating glass.
- C. Glazing Accessory Samples: For gaskets sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers manufacturers of insulating-glass units with sputter-coated, low-e coatings glass testing agency and sealant testing agency.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass coated glass insulating glass glazing sealants and glazing gaskets.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Warranties: Sample of special warranties.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain tinted float glass coated float glass laminated glass and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (232 deg C), and the fire-resistance rating in minutes. Fire resistance rated assemblies must be tested in accordance with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
- J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes enhanced-protection testing requirements in ASTM E1996 for Wind Zone 1 when tested according to ASTM E1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.
1. Large-Missile Test: For all glazing, regardless of height above grade.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.02 GLASS PRODUCTS

- A. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
- B. Pyrolytic-Coated, Self-Cleaning, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.
 - 1. Products <<http://www.specagent.com/LookUp/?ulid=166&mf=04&src=wd>>: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cardinal Glass Industries; LoE2 Plus
 - b. Pilkington North America; Activ
 - c. PPG Industries, Inc.; SunClean
- C. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Solargray by PPG Industries or comparable product by one of the following:
 - a. EFCO.
 - b. Guardian Industries.
 - 2. Tint Color: StarPhire.
 - 3. Visible Light Transmittance: 76 for Clear glazing and 54 for Gray Tinted glazing percent minimum.
- D. Spandrel Glass: ICD OPACI-COAT-300 Silicone Opacifier coating: ASTM C1048, Kind FT, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Vitro Architectural Glass or comparable product by one of the following:
 - 2. Guardian Glass Products.
 - 3. Pilkington North America.
 - 4. Spandrel Coating Color: As selected by the Architect.

2.03 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, with "Windborne-Debris-Impact Resistance" Paragraph in "Glass Products, General" Article, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with the following to comply with interlayer manufacturer's written recommendations:

- a. Polyvinyl butyral interlayer.
 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 3. Interlayer Color: Clear unless otherwise indicated.
- C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.04 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
 2. Spacer: Manufacturer's standard spacer material and construction.
 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- B. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.05 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies.
- B. Multi-laminate Fire-Rated (45 to 120 minutes), Impact Safety-Rated Fireglass multi-laminate glass with clear intumescent interlayers, interior and exterior use, meets CPSC 16 CFR 1201 (Cat. I and II) and ANSI Z97.1 and providing protection against radiant and conductive heat transfer as per ASTM E119 and UL 263, withstands thermal shock. 5-year limited warranty. .
1. Products : Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pilkington Pyrostop: 45-200: 45 min., 3/4 inch thick, STC 40, U-Value - .86
 - b. or approved equal

2.06 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C864.
 2. EPDM complying with ASTM C864.
 3. Silicone complying with ASTM C1115.
 4. Thermoplastic polyolefin rubber complying with ASTM C1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.
1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.07 GLAZING SEALANTS

- A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700
 - c. Pecora Corporation; 890
 - d. Sika Corporation, Construction Products Division; SikaSil-C990
 - e. Tremco Incorporated; Spectrem 1
- C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.08 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.09 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.11 INTERIOR LAMINATED-GLASS TYPES

- A. Glass Type ILG-1: Fire-rated laminated glass
 - 1. Thickness: 8.0 mm.
 - 2. Provide safety glazing label- CSPC 16 CFR 1201 Cat. I and II.
 - 3. Manufacturer: TGP Firelite Plus; McGrory Glass Pyran Platinum L or Architect approved equivalent.

2.12 EXTERIOR LAMINATED INSULATING GLASS TYPES

- A. Glass Type E-1: Low-e-coated, insulating glass.
 - 1. Overall Unit Thickness: 1 inch..
 - 2. Exterior Glass Lite: 1/4 inch tempered Solarban 60 Low-E (2) SolarBronze glass.
 - 3. Interspace Content: Air (5%) / Argon (95%).
 - 4. Interspace Gap Size: 1/2 inch
 - 5. Indoor Glass Lite: 1/4 inch heat strengthened StarPhire - glass____.
 - 6. Visible Light Transmittance: 42 percent minimum.
 - 7. Winter Nighttime U-Factor: 0.24 maximum.
 - 8. Solar Heat Gain Coefficient: 0.21 maximum.
- B. Glass Type E-2: Low-e-coated, insulating glass.
 - 1. Overall Unit Thickness: 1 inch..
 - 2. Exterior Glass Lite: 1/4 inch tempered SolarBronze + Solarban 90 Low-E (2) Clear glass.
 - 3. Interspace Content: Air (5%) / Argon (95%).
 - 4. Interspace Gap Size: 1/2 inch
 - 5. Indoor Glass Lite: 1/4 inch heat strengthened StarPhire - glass____.
 - 6. Visible Light Transmittance: 30 percent minimum.
 - 7. Winter Nighttime U-Factor: 0.24 maximum.
 - 8. Solar Heat Gain Coefficient: 0.21 maximum.

- C. Glass Type E-3: Low-e-coated, insulating glass.
 - 1. Overall Unit Thickness: 1 inch..
 - 2. Exterior Glass Lite: 1/4 inch tempered SolarBronze + Solarban 90 Low-E (2) Clear glass.
 - 3. Interspace Content: Air (5%) / Argon (95%).
 - 4. Interspace Gap Size: 1/2 inch
 - 5. Indoor Glass Lite: 1/4 inch heat strengthened StarPhire - Opaque(3).
 - 6. Winter Nighttime U-Factor: 0.24 maximum.
 - 7. Solar Heat Gain Coefficient: 0.21 maximum.
- D. Glass Type E-4: Spandrel Glass; ICD OPACI-COAT-300 Silicone Opacifier coating Low-E, insulating spandrel glass.
 - 1. Overall Unit Thickness: 1 inch..
 - 2. Thickness of Exterior Glass Lite: 1/4 inch fully tempered, Solarban 60 (2) and SolarBronze.
 - 3. Interspace Content: Air (5%) / Argon (95%).
 - 4. Interspace Gap Size: 1/2 inch
 - 5. Indoor Lite: 1/4 inch fully tempered Clear with ICD OPACI-COAT-300 Silicone Opacifier
 - 6. coating (4).
 - 7. Opacifier Color: Match Glazing configuration appearance or as selected by the Architect to match glazing system.
 - 8. Winter Nighttime U-Factor: 0.24 maximum.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.

- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Architect before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- C. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Notify local fire service.
 - 3. Make notifications at least 24 hours in advance.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

- F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- G. Repair adjacent construction and finishes damaged during demolition and extension work.
- H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

END OF SECTION 260505

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260533.13 - Conduit for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 262726 - Wiring Devices.
- E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 262726.
- D. Flexible Conduit: As specified in Section 260533.13.
- E. Wire and Cable: As specified in Section 260519.
- F. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 260583

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.
- B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260533.13 - Conduit for Electrical Systems.
- F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 262416 - Panelboards: Service entrance equipment.
- H. Section 264300 - Surge Protective Devices: Service entrance surge protective devices.
- I. Section 312316 - Excavation.
- J. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- K. Section 312323 - Fill: Bedding and backfilling.

1.03 DEFINITIONS

- A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.04 REFERENCE STANDARDS

- A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. IEEE C2 (National Electrical Safety Code).
 - 2. NFPA 70 (National Electrical Code).
 - 3. The requirements of the Utility Company.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics: As indicated on drawings.
- C. Electrical Service Characteristics:
 - 1. Service Type: Underground.
 - 2. Service Voltage: 480Y/277 V, 3 phase, 60 Hz.
 - 3. Service Size: 800 Amp.
- D. Utility Company: As indicated on drawings.
- E. Division of Responsibility:
 - 1. Pad-Mounted Utility Transformers:
 - a. Transformer Pads: Furnished and installed by Contractor per Utility Company requirements.
 - b. Transformers: Furnished and installed by Utility Company.
 - c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
 - d. Transformer Protective Bollards: Furnished and installed by Contractor per Utility Company requirements.
 - e. Primary:
 - 1) Trenching and Backfilling: Provided by Contractor.
 - 2) Conduits: Furnished and installed by Contractor.
 - 3) Conductors: Furnished and installed by Utility Company.
 - f. Secondary:
 - 1) Trenching and Backfilling: Provided by Contractor.
 - 2) Conduits: Furnished and installed by Contractor.
 - 3) Conductors: Furnished and installed by Contractor (Service Point at transformer).
 - 2. Terminations at Service Point: Provided by Utility Company.
 - 3. Metering Provisions:
 - a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
 - b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.
 - c. Metering Transformers: Furnished and installed by Utility Company.
 - d. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.
 - e. Wiring Between Metering Transformers and Meters: by Contractor.
 - f. Communications Conduits for Meters: Furnished and installed by Contractor per Utility Company requirements.
- F. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 312316.13.
- E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 033000.
- F. Provide required protective bollards in accordance with Utility Company requirements.
- G. Provide required support and attachment components in accordance with Section 260529.
- H. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.
- I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

END OF SECTION 262100

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Distribution panelboards.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electric Code.
- B. NECA Standard of Installation.
- C. NEMA AB1 - Molded Case Circuit Breakers.
- D. NEMA PB1 - Panelboards.
- E. NEMA PB1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- F. NEMA ICS2 - Industrial Control Devices, Controllers and Assemblies.
- G. NEMA KS1 - Enclosed Switches.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 013300.
- B. Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. New Panelboards
 - 1. Panelboards shall be manufactured by Square D, Eaton, ABB or Siemens.
 - 2. Or Approved equal.

2.02 PANELBOARD REQUIREMENTS

- A. Provide panelboards of circuit breaker, dead-front safety type, UL labeled, and meeting all applicable requirements of the National Electrical Manufacturers Association.
- B. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors.
- C. Provide electrically isolated neutral bars.
- D. Provide separate ground bars complete with lugs or connectors on bar.
- E. Provide key operated door and door lock. Door shall prevent access to operate circuit breakers.
- F. Provide panelboards with sequence phased bus bars or distributed phase bussing for voltage and phase as indicated on drawings.
- G. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.

- H. Provide typed circuit directory cards.
- I. Provide front filler plates for unused breaker knockouts.
- J. Refer to drawings for Ratings and Features.
- K. All bus bars, including ground bars shall be tin-plated copper.
- L. All circuit breakers shall be bolt-on type.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors under provisions of Section 260526.
- B. Install all circuits using a common neutral bus bay in accordance with the National Electric Code. Balance all circuits to achieve not greater than 7% unbalanced neutral current in panel feeders.
- C. Provide six circuit breaker handle lock-on devices for each lighting and miscellaneous power panelboard for installation by the contractor on circuits as directed by the Engineer to prevent unauthorized personnel from turning off circuits to controls, unit heaters, autodial alarm system, etc. Provide spare lock-on devices over to the Engineer.
- D. Install panelboards in accordance with NEMA PB 1.1.
- E. Install panelboards plumb.
- F. Height: 6 feet (2 m) to top of panel board.
- G. Provide typed circuit directory for each branch circuit panelboard. Handwritten circuit directory cards will not be accepted. Revise directory to reflect circuiting changes required to balance phase loads.
- H. Provide a typed circuit directory in accordance with NEC sections 110.22 and 408.4. Circuits shall be labeled with detailed information describing the switches function and equipment location.
- I. Revise directory to reflect circuiting changes required to balance phase loads.
- J. Provide engraved plastic nameplates under the provisions of Section 260553.
- K. Panelboards shall be factory installed in the motor control center by the manufacturer of Motor Control Center where indicated on drawings.

3.02 FIELD QUALITY CONTROL

- A. Maintain proper phasing for multi-wire branch circuits.

- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION 262400

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- E. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation; _____: www.eaton.com/#sle.
- B. Schneider Electric; Square D Products; _____: www.schneider-electric.us/#sle.
- C. Siemens Industry, Inc; _____: www.usa.siemens.com/#sle.
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Minimum Ratings:
 - a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
- L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed switches plumb.

SECTION 262816.16 - ENCLOSED SWITCHES **H2M**

- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.02 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262816.16

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surge protective devices for service entrance locations.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 262416 - Panelboards.

1.03 ABBREVIATIONS AND ACRONYMS

- A. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Field-Installed, Externally Mounted Surge Protective Devices:
 - 1. ABB: www.electrification.us.abb.com/#sle.
 - 2. Schneider Electric: www.se.com/#sle.
 - 3. Surge Suppression, LLC (SSI): www.surgesuppression.com/#sle.
- B. Factory-installed, Internally Mounted Surge Protective Devices:

1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
- B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.
- C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- D. Protected Modes:
 1. Wye Systems: L-N, L-G, N-G, L-L.
- E. UL 1449 Voltage Protection Ratings (VPRs):
 1. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
 1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

- A. Surge Protective Device:
 1. Protection Circuits: Field-replaceable modular or non-modular.
 2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
 3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
 4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
 5. Diagnostics:
 - a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
 - b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
 - c. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).

- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

END OF SECTION 264300

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Emergency power supply units.

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems.
- B. Section 260533.16 - Boxes for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

- A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources ; 2021.
- D. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- H. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 1. Ceiling Compatibility: Comply with NEMA LE 4.
- H. LED Luminaires:
 1. Components: UL 8750 recognized or listed as applicable.
 2. Tested in accordance with IES LM-79 and IES LM-80.
 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.
 2. Directional Arrows: As indicated or as required for installed location.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
1. Self-Powered Exit Signs:
 - a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
 - b. Provide low-voltage disconnect to prevent battery damage from deep discharge.
 - c. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.04 EMERGENCY POWER SUPPLY UNITS

- A. Description: Self-contained emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Compatibility:
- C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamps to emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- D. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status and field selectable audible alert.

END OF SECTION 265100

SECTION 284600 - FIRE DETECTION AND ALARM **H2M**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by Contractor that the system design will comply with Contract Documents.
 - 4. Proposed maintenance contract.
- C. Drawings must be prepared using AutoCAD Release 14.
- D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 - 4. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 - 5. Certification by Contractor that the system design complies with Contract Documents.
 - 6. Do not show existing components to be removed.
- E. Shop Drawings: Submit installation documentation required for plan review and permitting by AHJ, including floor plans showing locations of fire alarm system components, enlarged drawn to identified scale plan view, and riser diagrams.
 - 1. Show locations of components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 2. Include elevations and details of proposed equipment arrangements.
 - 3. Include system interconnection schematic riser diagram showing proposed and approved cable size and type; coordinated with floor plans and describing circuit class, survivability, and application specific information required by NFPA 72.

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4. Include typical wiring diagrams for devices, notification appliances, remote indicators, annunciators, remote test stations, and EoL and power supervisory devices.
 5. Include requirements and control diagrams for interfacing with other systems.
 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; standby and spare capacity calculations; notification appliance circuit loop resistance and voltage drop calculations, including spare capacity.
 7. List of devices and notification appliances on each SLC, with spare capacity indicated.
 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 10. Certification by either FACU manufacturer or manufacturer of related equipment.
 11. Certification by Contractor that system design complies with Contract Documents.
- F. Evidence of installer qualifications.
- G. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- H. Project Record Documents: See Section 017800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units and Accessories - Basis of Design: Edwards as Distributed by Alarm Specialists (914.946.1998).
- B. Initiating Devices and Notification Appliances:
1. Same manufacturer as control units.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:

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1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 2. Existing Fire Alarm Control Unit is an Edwards EST-3
 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the local authority having jurisdiction.
 - c. Applicable local codes.
 - d. Contract Documents (drawings and specifications).
 - e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
- B. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
 3. Notification Appliance Circuits (NAC): Class B, Style W.
- C. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
 2. Secondary: Storage batteries.
 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
 4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

- A. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
 2. Duct smoke detectors.
- B. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.05 COMPONENTS

- A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Addressable Fire Alarm Control Unit - Basis of Design: Edwards.

- D. Initiating Devices:
 - 1. Addressable Systems:
 - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
 - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
 - 2. Smoke Detectors: Edwards.
 - 3. Heat Detectors: Edwards.
- E. Notification Appliances:
 - 1. Strobes: Edwards Genesis Series.
- F. Circuit Conductors: Copper; provide 200 feet (60 m) extra; color code and label.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Raceways and Supports:
 - 1. Coordinate locations of outlet boxes as required for installation. Only install boxes and equipment at locations based on application standards indicated in NFPA 72.
 - 2. Secure and support raceways at intervals complying with NFPA 70. Provide supports where vertical rise exceeds permissible limits.
 - 3. Install firestopping to preserve fire resistance rating of partitions and other elements.
- C. Fire Alarm System Tests:
 - 1. Perform required tests of NFPA 72. Record measured values during operational checks.
 - 2. Confirm functional testing of fire alarm system is as indicated in Contract Documents.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 CLOSEOUT

END OF SECTION 284600

