



PROJECT MANUAL

ELMIRA CITY SCHOOL DISTRICT

BROADWAY 2026 RENOVATIONS

VOLUME II

BROADWAY SED # : 07-06-00-01-0-034-027

CAPITAL OUTLAY SED #: 07-06-00-01-0-034-028

The design of this project conforms to all applicable provisions of the New York State Uniform Fire Prevention and Building Code, the New York State Energy Conservation Code, and the building standards of the New York State Education Department

JULY 24, 2026

ISSUED FOR BIDS: OCTOBER 9, 2026

HUNT 2012-254

HUNT ENGINEERS | ARCHITECTS | SURVEYORS

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ASBESTOS ABATEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Laboratory reports with summary of bulk asbestos analysis results are available in the Architect/Certified Project Designer's office.
- B. The Contractor shall be responsible for investigating the site and verifying conditions and quantities prior to the submission of his bid. The Contractor shall not be permitted changes in the contract amount if specific variances are denied by New York State Department of Labor, Architect/Certified Project Designer, or any other agency.

1.2 REGULATORY REQUIREMENTS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).
- D. NYS DEC Title 6 NYCRR Part 360 - Solid Waste Management Facilities General Requirements; current edition.
- E. NYS DEC Title 6 NYCRR Part 364 - Waste Transporters; current edition.
- F. NYS DOH Title 10 NYCRR Part 73 - Asbestos Safety Program Requirements; current edition.
- G. USEPA Title 40 CFR Part 61 - National Emissions Standards for Hazardous Air Pollutants; current edition.
- H. USEPA Title 40 CFR Part 763, Subpart E - Asbestos Containing Materials in Schools; current edition.
- I. USEPA 530-SW-85-007 - Asbestos Waste Management Guidance; current edition.

1.3 SCOPE

- A. All work of this section shall be performed in does not fall under 12 NYCRR Part 56. However the contractor shall utilize the work practices identified in NYCRR 56 during disturbance or removal of asbestos materials less than 1%...
- B. Furnish all labor, materials, licenses, facilities, equipment, services, employee training and testing, permits and agreements necessary to perform the work required for asbestos removal, encapsulation and enclosure in accordance with these specifications, the latest regulations from the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Asbestos Hazard Emergency Response Act (AHERA), the State of New York, the recommendations of the National Institute of Occupational Safety and Health (NIOSH) and Standard 241 of the National Fire Protection Association (NFPA).
- C. All work shall be performed in accordance with the U.S. Environmental Protection Agency (EPA) 40 CFR Part 763, Subpart E, AHERA Regulations for Removal of Asbestos in Schools; (EPA) 40 CFR Part 61, and OSHA Title 29 CFR, Part 1910; sections 1001, 134, 1926.2 and 1926.1200. All work shall also be performed in accordance New York State Department of Health Title 10 NYCRR Part 73 and Department of Environmental Conservation Title 6 NYCRR Part 364

1.4 SUBMITTALS

- A. Pre-Work Submittals: The Contractor shall submit to the Architect/Certified Project Designer three copies of the documents listed below:
 - 1. Resume: Shall include the following:
 - a. Contractor license issued by New York State Dept. of Labor.
 - b. The number of years engaged in asbestos removal.
 - c. Provide a list of projects performed within the past two years and include the dollar value of all projects. Provide project references to include owner, consultant, and air-monitoring firms' name, contact person, address, and phone number.
 - d. An outline of the worker training course and medical surveillance program conducted by the Contractor.
 - e. Emergency plans, including proposed work area evacuation routes and fire extinguisher locations.
- B. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
 - 1. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the project and involved persons and agencies as well as the outcome of any actions.
 - 2. Any Stop Work Orders issued on projects within the past two years.
 - 3. Any litigation or arbitration proceedings arising out of performance on past projects.
 - 4. Any liquidated damages assessed within the last two years.
- C. Progress Schedule:
 - 1. Show the complete sequence of construction by activity and the sequencing of work within each building or section of the work.
 - 2. Show the dates for the beginning and completion of each major element of work including substantial completion dates for each work area, building, or phase.
 - 3. Show final inspection dates.
- D. Site Specific Variance: Submit all proposed site specific variances for this project to the Architect for review and approval.
- E. Schedule of Values: Prepare a schedule of values, as required by the General Conditions identifying the value of work, by work area, associated with each type of asbestos material included in the scope of work. Identify mobilization and administration costs separately.
- F. Notifications: Not notifications are required by federal, state, and local regulations..
- G. Permits: Submit copies of current valid permits required by state and local regulations, including arrangements for storage, transportation, and disposal of contaminated materials.
- H. Abatement Work Plan: Provide plans which clearly indicate all work areas (numbered sequentially) including the locations and types of all decontamination chambers, entrances and exits to the work area, type of abatement activity/technique, number and location of negative air units and exhaust including calculations, and the proposed location and construction of storage facilities and field office.
- I. Equipment: Submit manufacturer's information of vacuums, negative air pressure equipment, respirators, and air supply equipment, etc. Provide certification that all equipment meets applicable requirements of OSHA and EPA.
- J. Worker Training and Medical Surveillance: The Contractor shall submit a list of the persons who will be employed by him and his Subcontractors in the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
- K. (Sub)-Subcontractors List: The abatement (Sub)-Contractor shall submit a list of all sub-Subcontractors to be used on the project.

- L. Project Supervisor: Submit the resume of the proposed Project Supervisor. Identify work history and substantiate ability to supervise this project.
- M. Rental Notifications: Submit copies of notices sent to rental suppliers informing them of the nature of the work that the Contractor intends to use the equipment for.
- N. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of asbestos containing materials; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.
- O. Project Closeout Submissions:
 - 1. Submit copies of all waste disposal manifests, and disposal logs.
 - 2. Submit OSHA compliance air monitoring records conducted during the work.
 - 3. Submit copies of the daily progress log.
 - 4. Submit copies of the visitor's log.
 - 5. Submit Certificate of visual inspection obtained from the Project Monitor.
 - 6. Submit a list of all employees utilized on the project with social security and Asbestos Handler Certificate numbers.
 - 7. Submit copies of any required Employee Statements such as Medical Examination statement, Certificate of Worker's Release, or Employee Training Statement.
 - 8. Submit 3 copies of a description of work to be included in the Owner's AHERA Management Plan Building record. Indicate asbestos materials removed and quantities for each area(s) of abatement.

1.5 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall be on-site at all times work is in progress. If the Project Supervisor is not on-site, all work shall be stopped. The Project Supervisor must be able to read and write English fluently, as well as communicate with his workers. The Project Supervisor shall remain until the project is complete and cannot be removed without the written consent of the Owner and the Architect/Certified Project Designer.
- B. Prior to the commencement of work, the Contractor shall submit the proposed Project Supervisor's resume to the Owner and Architect/Certified Project Designer for approval. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.58 and shall have a minimum of one-year on-the-job training. This person shall hold certification as an Asbestos Project Supervisor.

1.6 ASBESTOS PROJECT MONITOR, AIR SAMPLING AND ANALYSIS FIRM

- A. An Asbestos Project Monitor, Air Sampling and Analysis firm shall be retained by the Owner to provide abatement project inspection and monitoring services and to conduct air sampling and provide laboratory analysis of air samples. This firm is responsible for ensuring that all abatement activities are in full compliance with all applicable federal, state, and local laws, rules, and regulations, and the contract documents. Air sampling and analysis required by OSHA regulations to be performed by the Contractor shall be the responsibility of the Contractor and will not be performed by the Air Sampling and Analysis Firm.
- B. The Asbestos Project Monitor shall have personnel on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any work, including mobilization and preparation, unless the Asbestos Project Monitor consultant is on-site.
- C. The Asbestos Project Monitor, and his on-site representative, shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the project documents and all regulations. The Asbestos Project Monitor shall have the authority to stop work when gross work practice deficiencies or unsafe practices are observed or ambient fiber concentrations outside the removal area exceed .01 f/cc or background level.

- D. The Asbestos Project Monitor shall provide the following functions:
1. Inspections of Contractor's work, practices, and procedures for compliance with all regulations and project specifications. Notify the Owner/Architect of Contractor non-compliance during the project.
 2. Maintain a daily log on-site of all activities undertaken by the Contractor, all visitors to the site, and any unusual events.
 3. The inspector shall turn over copies of all daily logs, air-monitoring results, and any other reports prepared in the field to the Architect/Certified Project Designer.
 4. Verify daily that all workers used in the performance of the project is certified by the appropriate regulatory agency.
 5. Monitor the progress of the Contractor's work and report any deviations from the schedule to the Architect/Certified Project Designer.
 6. Monitor, verify, and document all waste load-out operations. The Project Monitor shall maintain a disposal log indicating the time, date, quantity, and destination (including hauler information) of all waste removed from the site.
 7. The Project Monitor shall ensure that the waste disposal procedures are being followed, including the use of container seals and the Authority's waste manifest.
 8. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
 9. Verify that all materials and equipment delivered to the site are in conformance with the contract documents and approved submittals.
 10. Ensure that all warning signs and notices required of the owner and the Contractor are posted.
 11. Inspect each work area prior to abatement activities and document building damages prior to and after the abatement Contractor performs the work.
 12. Inspect each work area to verify total asbestos abatement in accordance with the contract documents prior to clearance air sampling.
 13. Attend regular meetings to discuss project related issues.
 14. Deliver a bound final report to the Owner within 30 days of the completion of monitoring services which contains all project monitoring and air sampling documentation, credentials, an executive summary of the activities included in the report, and a statement that confirms that all monitoring and air sampling has been completed in compliance with New York State Department of Labor and Environmental Protection Agency regulations.
 15. The selected monitoring company shall NOT be permitted to provide testing and/or consulting services to the selected asbestos abatement Contractor for any work on this project.
- E. The Project Monitoring services have been contracted for Monday through Friday, 8 hours per day. The time lines that have been established are based on the Owner's needs and the Contractor completing the work with sufficient manpower, supplies and organization within the scheduled time. If more hours are needed due to a lack of the Contractor's ability to meet the scheduled time lines, the cost for additional Project Monitoring and Air Sampling shall be the responsibility of the Contractor.

1.7 AIR SAMPLING REQUIREMENTS

- A. Air Sampling shall be conducted as required by New York State regulations.
- B. Unless otherwise required by applicable regulations, samples shall be analyzed by Phase Contrast Microscopy (PCM) and final clearance air samples by Transmission Electron Microscopy (TEM) as outlined by paragraphs below. Chain of Custody must be maintained for all samples.
- C. Analytical services shall be provided by a laboratory certified by the New York State Department of Health Environmental Laboratory Approval Program specifically for the analytical procedure being used.
- D. Air sampling shall be performed by an individual with at least six months experience in abatement project air sampling and shall hold certification as a New York State Asbestos Handler or Asbestos Project Air Sampling Technician as required by applicable New York State regulations.
- E. The Asbestos Project Air Sampling Technician shall maintain a log on-site of all air monitoring conducted and the results of such monitoring.

- F. The air sampling technician must have an adequate quantity of equipment required to conduct the necessary air monitoring, including a sufficient number of air sampling pumps as well as leaf blowers and fans required for aggressive clearance air monitoring.
- G. To help maintain scheduled time lines, the work is divided into work areas for air monitoring as grouped below. Each area shall have separate pre, during and post abatement monitoring.
- H. Pre-abatement air samples shall be collected before the Contractor arrives on site.
- I. During abatement samples shall be collected at locations selected by the PM/AST.
- J. Inside air samples shall be collected by the PM/AST. These samples shall not be used to satisfy the Contractor's responsibility for personal sampling.
- K. TEM and PCM final air samples shall be collected in the same locations as the pre-abatement air samples.
- L. Required Inspections - The following minimum inspections shall be conducted by the Asbestos Project Monitor. Additional inspections shall be conducted as required by project conditions. Progression from one phase of work to the next by the Contractor is only permitted with the written approval of the Project Monitor.
 - 1. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the work areas and to documents these conditions. It shall be conducted with the owner, Asbestos Project Monitor, Contractor, and the Architect/Certified Project Designer (as appropriate) prior to release of the building to the abatement Contractor.
 - 2. Pre-Commencement Inspection: The purpose of the inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the work area is fully prepped for removal.
 - 3. Work Inspections: The purpose of this inspection is to monitor the work practices and procedures employed on the project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the Asbestos Project Monitor during preparation and removal activities at least twice every work shift.
 - 4. Visual Clearance Inspection: The purpose of this inspection is to verify the Contractor's certification that all materials have been removed from the work area and the absence of all visible accumulations of debris in the work area. This inspection shall be conducted after encapsulation and removal of all surface plastic in the area, but before final air clearance testing. Critical barriers shall remain in place.
 - 5. Punch List Inspection: The purpose of this inspection is to verify the Contractors' certification that all work has been completed as contracted and the condition of the existing area prior to its release to the owner.

1.8 MINOR ASBESTOS ABATEMENT PROJECT (LESS THAN OR EQUAL TO 25 LINEAR FEET OR 10 SQUARE FEET)(TENT/MINI ENCLOSURES)

- A. Pre-abatement air sampling/during-abatement air sampling; In compliance with New York State Department of Labor approved specific variance.
- B. Final clearance air sampling; In compliance with New York State Department of Labor approved specific variance and New York State Education Department Final Clearance Air Sampling clarification dated August 2007:

1.9 SMALL ASBESTOS ABATEMENT PROJECT (LESS THAN 260 LINEAR FEET OR 160 SQUARE FEET, GREATER THAN 25 LINEAR FEET OR 10 SQUARE FEET)

- A. Pre-abatement sampling; Three (3) samples inside and three (3) samples outside the work area plus required blanks. Analysis by PCM

- B. During abatement; if required, during abatement air sampling shall be in compliance with New York State Department of Labor Applicable Variance and/or approved Specific Variance. Analysis by TEM. (Minimum requirement in compliance with New York State Department of Labor approved Specific Variance and New York State Education Department Final Clearance Air Sampling clarification, dated August 2007.
- C. Final clearance air samples;
 - 1. Five (5) aggressive air samples inside and three (3) standard samples outside the work area plus required blanks. Analysis by PCM. Minimum requirement in compliance with New York State Department of Labor approved Specific Variance and New York State Education Department Final Clearance Air Sampling clarification, dated August 2007.
 - 2. Five (5) aggressive air samples inside and three (3) standard samples outside the work area plus required blanks. Analysis by PCM. Minimum requirement in compliance with New York State Department of Labor approved Specific Variance.
 - 3. If one or both sets of samples do not meet the above stated final clearance air sample criteria, the Contractor shall re-clean the work area and a complete duplicate set of final clearance air samples shall be collected by the Project Monitor/Air sample Technician. The Contractor shall be responsible for all cost of the air sampling and subsequent analysis until all final clearance air sample criteria has been achieved.

1.10 LARGE ASBESTOS ABATEMENT PROJECT (260 LINEAR FEET OR 160 SQUARE FEET OR GREATER)

- A. Pre-abatement sampling; Five (5) samples inside and five (5) samples outside the work area plus required blanks. Analysis by PCM
- B. During abatement; Five (5) samples outside the work area plus required blanks. Analysis by PCM
- C. Final clearance air samples;
 - 1. Up to five (5) aggressive air samples inside and five (5) standard outside the work area plus required blanks. Analysis by TEM. Minimum requirement in compliance with New York State Department of Labor approved Specific Variance and New York State Education Department Final Clearance Air Sampling clarification, dated August 2007.
 - 2. Up to five (5) aggressive air samples inside and five (5) standard outside the work area plus required blanks. Analysis by PCM. Minimum requirement in compliance with New York State Department of Labor approved Specific Variance.
 - 3. If one or both sets of samples do not meet the above stated final clearance air sample criteria, the Contractor shall re-clean the work area and a complete duplicate set of final clearance air samples shall be collected by the Project Monitor/Air sample Technician. The Contractor shall be responsible for all cost of the air sampling and subsequent analysis until all final clearance air sample criteria has been achieved.

1.11 SCOPE OF WORK

- A. The quantities listed in the tables are for informational purposes ONLY. The Contractor shall be responsible for ALL asbestos containing materials within the work areas.
- B. Work areas are as follows:
 - 1. Work Area #1 – Involves the limited abatement of wall plaster located in the auditorim with asbestos content less than 1%..
- C. The work shall be completed in one phase within the following schedule:
 - 1. Work Area #1 Completed in 10 working days.
- D. WORK AREA #1 Autotorium: Remove from around door frames prroximately 3 feet of wall plaster including the door frame from around the doorw identified on the auditorium demo drawings number BR-A-17.

- E. WORK AREA #2 Autoitorium attach all hand rails and electrical componets to the walls in locations identified in the renovation drawings.BR-A-17.
- F. Dumpster locations and lift usage shall be subject to acceptance by the Architect/Certified Project Designer.
- G. If final clearance air samples do not meet the criteria as regulated by New York State Department of Labor and the New York State Education Department, the Contractor shall re-clean the work area and a complete, duplicate set of final clearance air samples, shall be collected by the Project Monitor/Air Sampling Technician. The Contractor shall be responsible for all cost of the air sampling and subsequent analysis until all final clearance air sample criteria has been achieved.
- H. An asbestos nrenovation survey is available for review. The Contractor shall be responsible for the abatement of all asbestos containing materials in preparation for demolition by others. If bulk sampling is required to determine a complete abatement the Owner shall perform all testing, and all sampling costs shall be the responsibility of the Contractor.

1.12 LICENSING AND CERTIFICATION

- A. The Contractor must have successfully completed a Contractor supervisor course approved by the EPA.
- B. The Contractor must hold a valid State of New York, Department of Labor asbestos Contractor's license. A copy of this asbestos license shall be conspicuously displayed proximate to but outside the work area during the duration of the project.
- C. The Contractor shall permit only those persons who hold valid State of New York Department of Labor asbestos handling certificates to engage in work on this project.
- D. The Contractor shall have EPA Certification as an Asbestos Contractor.

PART 2 UTILITIES

2.1 WATER:

- A. When feasible, interrupt the flow of water to areas where asbestos removal shall be conducted. This requirement shall be mandatory in areas of demolition.
- B. The Owner shall furnish access to water required for construction, at no cost to the Contractor. The Contractor shall be responsible for any plumbing work or fixtures necessary to connect to the Owner's existing system, and shall be required to provide anti-siphon devices at the connection to the Owner's water system.
- C. Contaminated water shall be treated by a several stage filter system consisting minimally of a 25 micron filter followed by a 5 micron filter and typically by a 5 micron, 50 micron and 100 micron filter series prior to disposal in a municipal sewage system. This process may only be used when not contrary to local ordinances.
- D. Coordinate with the Owner for the nearest hookup and drainage. It shall be the Contractor's responsibility to connect the water source to the location needed and to provide required drainage.

2.2 ELECTRICITY:

- A. Electricity shall be from the Owner's designated panel box, through the Contractor's power board, to the work area. The Contractor shall supply the air-monitoring firm with sufficient outlets.

- B. The Contractor shall label any circuits disabled in conjunction with the work; "TEMPORARILY DISCONNECTED DUE TO RENOVATION WORK. DO NOT ACTIVATE THESE CIRCUITS – SAFETY HAZARD".
- C. The Contractor shall supply a power board on site designed to handle the expected electrical load during the project. The power board shall be installed, tested and activated prior to any other site work for the execution of this contract. This work shall be accomplished by a properly trained and experienced electrician.
- D. Provide as required by 29 CFR 1926, temporary 120/240 Volt, single phase, three wire, 100 amp electric service with Ground Fault circuit Interrupters (GFCI) for electrical requirements for the project. No damaged electrical cords shall be allowed on site. Draw out power service from Owner's existing power panel to service the Contractor's power board. Each HEPA unit shall be circuited to a separate and unique breaker with a minimum of 15 amp. service to prevent multiple loss of negative pressure units.
- E. Provide temporary lighting with "weatherproof" fixtures for work areas including the decontamination chambers.
- F. Provide electrical service as needed by the Project Monitor and the AST (including GFCI). Minimum electrical services that are to be provided include:
 - 1. Six 15 amp. protected 3 prong outlets within the work area.
 - 2. Six 15 amp protected 3 prong outlets for work areas outside of the containment zone or area.
 - a. The Owner shall not be responsible for making available to the Contractor temporary electrical service systems.
 - b. The Contractor shall supply power and connections to maintain fire alarms and security system in non-work areas. The Contractor may also be required to provide temporary electrical service to occupied portions of the building.

PART 3 EXECUTION

3.1 WORK AREA PREPARATION

- A. The work area shall be vacated by the occupants prior to work area preparation and until satisfactory clearance air monitoring results have been achieved.
- B. Caution signs meeting the specifications of OSHA 29 CFR 1910.1001(j) shall be posted at all locations and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted that permit a person to read the sign and take the necessary protective measures to avoid exposure.
- C. Shut down and lock out electric power to all work areas. Provide temporary power and lighting and ensure safe installation of temporary power sources and equipment used where high humidity and/or water shall be sprayed in accordance with all applicable codes. All power to work areas shall be brought in from outside the area through a ground-fault circuit interrupter at the source.
- D. The personal decontamination enclosure system shall be installed or constructed prior to preparatory work in the work area and in particular before the disturbance of asbestos material. The waste decontamination enclosure system shall be installed or constructed prior to commencement of abatement activities.
- E. Heating, Ventilating and Air Conditioning (HVAC) System Isolation. Acceptable methods for HVAC system isolation shall include conformance with NYCRR Title 12, Subpart 56-8.
- F. Shutdown and isolation HVAC systems to prevent contamination and asbestos dispersal to other areas of the building or structure.

- G. Contaminated HVAC filters shall be handled and disposed of as asbestos waste material. The ducts and filter assembly shall be wet cleaned and/or HEPA vacuumed where system air samples and/or dust samples indicate asbestos contamination.
- H. Fixed objects and other items, which are to remain within the work area, shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning. Such objects and items shall be enclosed with two layers of at least six-mil plastic sheeting and sealed with tape.
- I. The work area shall be cleaned using HEPA filtered vacuum equipment and/or wet cleaning. Methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, shall not be permitted.
- J. Isolation barriers that seal off all openings, including but not limited to windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetrations of the work area shall be constructed using two layers of at least six mil, fire retardant plastic sheeting sealed with tape. Also, all seams in system components that pass through the work area shall be sealed. Doorways and corridors, which shall not be used for passage during work, shall also be sealed.
- K. Separation of the work area from the remainder of the work site by construction of isolation barriers shall be accomplished as follows:
 - 1. Wall shall be constructed of wood or metal framing to support barriers in all openings larger than thirty-two square feet, except where any one dimension is one foot, or less.
 - 2. A sheathing material of at least three-eighths inch thickness shall be applied to the work side of the barrier.
 - 3. Edges of the partition shall be caulked at the floor, ceiling, walls and fixtures to form an airtight seal.
 - 4. The work area side of the partition shall be covered with a double layer of at least six-mil, fire retardant plastic sheathing with staggered joints and sealed.
- L. Emergency and fire exits from the work area shall be maintained or alternate exits shall be established according to all applicable codes.

3.2 TRANSPORTATION AND DISPOSAL

- A. Applicable Regulations:
 - 1. All asbestos waste shall be stored, transported and disposed of as per, but not limited to, the following regulations:
 - a. NYS DEC 6 NYRCC part 360 and 364
 - b. USEPA NESHAPS 40 CFR 61
 - c. USEPA ASBESTOS WASTE MANAGEMENT GUIDANCE EPA/530-SW-85-007
- B. Transportation and Disposal Site:
 - 1. The Contractor's hauler and disposal site shall be subject to the approval of the Project Monitor.
 - 2. The Contractor shall give 24-hour notification prior to removing any waste from the site. Waste shall be removed from site only during normal working hours unless otherwise specified. No waste may be taken from the site without authorization from the Project Monitor.
- C. Prior to the removal of any waste materials from the site, the Contractor shall submit a complete and valid copy of an "Industrial Waste Transporter Permit" specifically for asbestos-containing materials, pursuant to 6 NYCRR 364 for the transporting of waste. Only vehicles listed on this permit shall be allowed to transport waste materials from the site.

- D. Waste Shipment Record; Prior to the transport of any waste materials from the site, the Contractor shall submit a Waste Shipment Record (WSR) to the Project Monitor with generator and transporter sections completely filled in and signed for each day on which asbestos waste is removed from the site. Provide originally signed WSR to Project Monitor so he can make copies for records and return the originally signed WSR to transporter so that original signature of landfill agent can be entered upon delivery to landfill. This documentation shall include the amount of waste removed, in both numbers of bags or containers, which correspond to the Project Monitor's logged count and cubic yards. The WSR shall include the, name and address of the transporter, the landfill to which the waste is transported, the quantity accepted by the landfill and the signature of the landfill official who accepts the delivery. Waste Shipment Records bearing the original signature (carbon copy bearing impressions of the original signatures are acceptable) of the landfill agent receiving the waste must be received by the Owner/Architect/Certified Project Designer within 35 days of shipment. Failure to comply shall result in a detailed report being transmitted to the New York State Department of Labor and EPA-NESHAPS.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.
- B. Demolishing designated building equipment and fixtures.
- C. Demolishing designated construction.
- D. Removing designated items for Owner retention.
- E. Protecting items designated to remain.
- F. Removing demolished materials.

1.2 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 35 17 - Alteration Project Procedures: Protection of existing facilities; cutting and patching requirements.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- F. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; earth stripping and stockpiling.
- G. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- H. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Areas for temporary construction and field offices.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Demolition firm qualifications.
 - 3. Indicate location of items designated for Owner retention.

- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.4 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of ten years of documented experience.
- B. Design shoring, bracing, underpinning under direct supervision of Professional Engineer experienced in design of this Work and licensed the State of New York.
- C. Conform to applicable code for demolition work, safety of adjacent structures, dust control, products requiring electrical disconnection and re-connection.
- D. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.
- E. Obtain required permits from authorities having jurisdiction.

1.5 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.
- B. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.7 SCHEDULING

- A. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.
- B. Schedule work to coincide with new construction.
- C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owner operations.
- D. Performance of noisy, malodorous, dusty, and removal of hazardous material work:
 - 1. Will not be permitted during school hours.
 - 2. All activities must be coordinated with the Owner to ensure that programming and services will be uninterrupted by construction activities and to ensure the safety of the students and occupants.
- E. Coordinate utility and building service interruptions with Owner.
 - 1. Do not disable or disrupt building fire or life safety systems without five days prior written notice to Owner.
 - 2. Schedule tie-ins to existing systems to minimize disruption.
 - 3. Coordinate work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.8 PROJECT CONDITIONS

- A. Buildings indicated to be demolished will be vacated before start of Work.
- B. Owner assumes no responsibility for actual condition of buildings to be demolished.
- C. Hazardous Materials: Known hazardous materials will be removed before start of Work. Notify Architect/Engineer upon discovery of a hazardous material.

- D. Each contractor shall be responsible for the cutting and patching of existing surfaces as required to complete the work of their contract unless noted otherwise.
- E. Conduct demolition to minimize interference with adjacent and occupied building areas.
- F. Cease operations immediately if structure appears to be in danger and notify Architect. Do not resume operations until directed.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Coordinate demolition sequence and procedures to prevent structures from becoming unstable.
 - 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 4. Layout cuts in post-tensioned concrete elements to avoid cutting concrete within 12 inches of any stressing tendon. Notify Architect five days in advance of cutting post-tensioned concrete.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks or hydrants without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- E. Protect existing structures and other elements to remain in place and not removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Verify hazardous material abatement is complete before beginning demolition.
- H. Carefully remove building components indicated to be reused.
 - 1. Mark components and packaged parts to permit reinstallation.
 - 2. Store components, protected from construction operations until reinstalled.
- I. At completion of the demolition work restore, repair or refinish all building systems, components and finishes disturbed as the result of the demolition process.

- J. Remove foundation walls and footings to minimum of two feet below finished grade .

3.2 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.3 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide sound retardant partitions of construction and in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- D. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove items indicated on drawings.
- E. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

3.4 SALVAGE REQUIREMENTS

- A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Carefully remove building components and equipment indicated to be salvaged.
- E. Disassemble as required to permit removal from building.
- F. Package small and loose parts to avoid loss.
- G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.
- I. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

3.5 DEBRIS AND WASTE REMOVAL

- A. Remove materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

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SECTION 02 83 13
LEAD HAZARD CONTROL ACTIVITIES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The work covered by this Specification shall consist of furnishing all labor, materials, and equipment necessary to control and mitigate potential lead-based paint (LBP) and lead-containing paint (LCP) material hazards during demolition/renovation activities pertaining to the project Broadway Academy/ Broadway Elementary School, 1000 Broadway Street, Elmira, New York.
- B. This Specification shall be used as a guideline for Contractors who complete the demolition/renovation activities pertaining to this Project. The intent of this Specification is to remain in conformance with Occupational Safety and Health Administration (OSHA) Regulation 29 CFR 1926.62 "Lead Exposure in Construction" and to maintain an airborne concentration of lead-dust below the Action Level. This Specification is written to outline the worst-case scenario regarding lead safe work practices.
- C. The following is a detailed listing of identified LBP and/or LCP, above the laboratory and/or device detection Limit:

Location	Component	Substrate	Concentration	Color	Condition
Room C-111 (old Cafeteria)	Ceramic tile	CMU	1.72-1,88 Mg/Cm ²	Green	Fair

It should be noted that several components tested did contain minimal lead-concentrations below the EPA threshold level of 1.0 mg/cm² or 0.5% by weight for classification as LBP and are considered lead-containing paints or coatings by 29 CFR 1926.62. OSHA does not recognize a minimum limit for lead concentration in paint for the purpose of disturbance. Personal Air monitoring of workers performing demolition/cleaning/disturbance of painted surfaces shall be completed to document personnel occupational exposure and reviewed by the Contractor's Competent Person. Items containing any amount of lead concentration are considered lead-containing paints or coatings per 29 CFR 1926.62. See project environmental survey report for lead paint reports. Lead paint summary information is located within the Appendices of this specification.

- D. For Storage, Transportation and Disposal requirements, see Section 01 74 19 - Construction Waste Management and Disposal.
- E. Manual demolition, scraping and sanding of LBP or LCP coated surfaces, power tool cleaning with dust collection systems shall be performed in conjunction with engineering and work practice controls meeting the requirements of 29 CFR 1926.62(e)1).
- F. Components with LBP and LCP shall be removed intact to the extent practicable. A 6-mil polyethylene drop cloth shall be placed around and/or beneath the component, prior to its removal, to catch any paint chips that may become dislodged. Intact components shall be wrapped in a layer of clear 6-mil polyethylene prior to movement to the disposal container. The area around the component removal shall be wet wiped and high-efficiency particulate air (HEPA) filter vacuumed, including the tent enclosure (if applicable). The polyethylene sheeting shall be carefully folded in on itself and placed in a 6-mil disposal bag and sealed closed. All debris shall be properly disposed of in accordance with the respective waste stream Resource Conservation Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) testing results.

- G. Chemical stripping may be used for LBP and LCP removal on surfaces that will be subjected to welding, cutting, torch burning or where it is the only acceptable procedure. No chemical strippers containing methylene chloride shall be used by the Contractor on this project. SDS for stripping and neutralizing chemicals must be reviewed and approved by the Consultant prior to use and a copy shall be posted at the site.
- H. The Contractor's use of a subcontractor (must be approved) shall not relieve the Contractor of full responsibility for the work to be performed.
- I. If available and approved by the Competent Person, the Contractor may utilize exposure assessment data that is compliant with OSHA and was obtained within the last twelve months from previous jobs conducted under similar conditions, control methods, work practices and environmental conditions to be used in this contract for LCP disturbances only. Other objective data may be used to demonstrate that work activities in this contract will not result in occupational exposures to airborne lead that exceeds the PEL for LCP disturbances only. The assessment shall include comparable lead concentrations (LCP only) in paint/coating materials, work practices, engineering controls and work schedules.
- J. The Contractor must provide his workers with the following: Respiratory protection in accordance with the Contractor's Respiratory Protection Program, personal protective clothing, lead-free change areas, hand washing/shower facilities, blood lead level monitoring and training per 29 CFR 1926.62. Respiratory Protection is required for all LBP disturbances.
- K. The Contractor shall ensure that any HVAC equipment intakes within and around the control areas are protected by shutting down the units. The Contractor shall alter the size and extent of the isolation barriers as necessary due to weather conditions, functional space use and density of building occupants in the vicinity, as required.

1.2 RELATED REQUIREMENTS

- A. Section 01 74 19 - Construction Waste Management and Disposal.

1.3 DEFINITIONS

- A. The following Definitions are excerpted from 29 CFR 1926.62 29 CFR 1926.62.
 - 1. **Action Level:** Employee exposure, without regard to the use of respirators, to an airborne lead concentration of 30 micrograms per cubic meter (30 ug/m³) calculated as an 8-hour time-weighted average (TWA). Exceedance of the Action Level requires blood lead monitoring implementation.
 - 2. **Competent Person:** One who can identify existing and predictable lead hazards in the surroundings or working conditions and who has the authorization to take prompt corrective measures to eliminate them. For LBP work, the Competent Person shall also be the on-site Supervisor/Foreman in-charge of the work crew.
 - 3. **Exposure Assessment:** Each employer who has a workplace or operation covered by 29 CFR 1926.62 shall initially determine if any employee may be exposed to lead at or above the Action Level.
 - 4. **Lead:** Metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.
 - 5. **Lead-Based Paint (LBP):** Paint, varnish, shellac or other coatings on surfaces that contain 1.0 milligram per square centimeter (1.0 mg/cm²) or more lead or 0.5% or more lead by weight. The concentration of 0.5% is equivalent to:
 - a. 5,000 parts per million (5,000 ppm) and.
 - b. 5,000 milligrams per kilogram (5,000 mg/kg)
 - 6. **Lead-Containing Paint (LCP):** Paint, varnish, shellac or other coatings on surfaces that contain measurable concentrations less than 1.0 milligrams per square centimeter (1.0 mg/cm²) lead or less than 0.5% or more lead by weight including equivalents less than 5,000 ppm and 5,000 mg/kg. This does not include paint, varnish, shellac or other coatings on surfaces where the concentration is below the detection limit of the respective laboratory method or device.

7. **LBP Inspection:** A surface-by-surface investigation to determine the presence of LBP. A report is then issued that identifies if there is LBP present and where it is located.
8. **Lead Risk Assessor:** EPA trained and certified to conduct LBP inspections and collect samples for the presence of lead in air, dust and soil for the purposes of abatement clearance testing as well as conduct risk assessments.
9. **Permissible Exposure Limit (PEL):** The limit above which the employer shall not expose workers to lead. The current PEL for lead is 50 ug/m³ over an eight-hour time-weighted-average for all employees covered.

1.4 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- B. 29 CFR 1926.62 - Lead; current edition.
- C. 29 CFR Part 1910.120 – Hazardous Waste Operations and Emergency Response.
- D. 29 CFR Part 1910.134 – Respiratory Protection.
- E. 29 CFR Part 1910.146 – Confined Space Entry Program.
- F. 29 CFR Part 1910.1025 – Lead (General Industry Standard).
- G. 29 CFR Part 1910.1200 – Hazard Communication.
- H. 29 CFR Part 1926.55 – Gases, Vapors, Fumes, Dusts and Mists.
- I. 29 CFR Part 1926.57 – Ventilation.
- J. 40 CFR Part 260 – Hazardous Waste Management Systems: General.
- K. 40 CFR Part 261 – Identification and Listing of Hazardous Waste.
- L. 40 CFR Part 262 – Generators of Hazardous Wastes.
- M. 40 CFR Part 263 – Transporters of Hazardous Waste.
- N. 40 CFR Part 264 – Owners and Operators of Hazardous Waste Treatment, Storage & Disposal Facilities.
- O. 40 CFR Part 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage & Disposal Facilities.
- P. 40 CFR Part 268 – Land Disposal Restrictions.
- Q. 40 CFR Part 745 – Lead; Requirements for Lead-Based Paint Activities in Child Occupied Facilities
- R. 49 CFR Parts 170-178 – Department of Transportation Regulations.
- S. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.
- T. UL 586 - High Efficiency, Particulate, Air Filter Units; Current Edition, Including All Revisions.
- U. ANSI Z9.2– Fundamentals Governing the Design and Operation of Local Exhaust Systems; 2018.
- V. ANSI Z88.2 – Practice for Respiratory Protection; 2015.
- W. New York Codes of Rules and Regulations (NYCRR)
 1. 6 NYCRR Part 360 – Solid Waste Regulations.
 2. 6 NYCRR Part 364 – Waste Transporter Permits.
 3. 6 NYCRR Part 370-373 – Hazardous Waste Regulations.
- X. SSPC-Guide 6 – Guide for Containing Debris Generated During Paint Removal Operations.

Y. SSPC-Guide 7 – Guide for the Disposal of Lead-Contaminated Surface Preparation Debris.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Maintain the following documentation on site:
 - 1. Copies of all documents required in the Submittal Article.
 - 2. Required certifications and licenses required for work of this section.
 - 3. Medical Examination and Records.
 - 4. Lead Paint Awareness Training Certification of all employees conducting work of this section.
 - 5. Copy of Respiratory Protection Program.
 - a. Include manufacturer's NIOSH certification for respiratory protection devices utilized on the site.
 - 6. Cartridges, Filters, and Vacuum Systems
 - a. Manufacturer's NIOSH certification of approval of respirator cartridges (organic vapor, acid gas, mist, dust, high efficiency particulate); High Efficiency Particulate Air (HEPA) filtration capabilities for all cartridges, filters, and HEPA vacuum systems.
 - 7. List of equipment items to be used in the work, including brand names, model, capacity, performance characteristics, quantities, and other pertinent information.
 - 8. Contractor's LBP and LCP Safe Work Practice Compliance Plan.
 - 9. All field sampling logs for all personal air samples taken, including copies of laboratory analysis reports and chain of custody records for all sample analyses.

1.6 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
 - 1. Copies of all submittals shall be maintained on site at all times.
- B. Contractor's qualification statement.
- C. Contractor's Supervisor/ Competent Person qualification statement.
- D. Certification of all Laboratories providing testing associated with the work of this section.
- E. Contractor's Compliance Program prepared in accordance with 29 CFR 1926.62 (e)(2).

1.7 QUALITY ASSURANCE

- A. General Requirements
 - 1. The Contractor is required to perform all work related to this project in strict accordance with all applicable Federal, State and Local regulations.
 - 2. Where these requirements vary, the most stringent shall apply.
- B. Contractor shall have a minimum five years documented experience on LBP and LCP activity projects similar in nature and extent to ensure the capability to perform the required work procedures in a satisfactory manner.
- C. Contractor's on site Supervisor shall meet the Competent Person requirements of 29 CFR 1926.62 and be experienced in administration and supervision of LBP and LCP activity projects, including work practices, protective measures for building and personnel, and disposal procedures.
- D. Contractor shall conform to the following regarding Health, Safety, and Training:
 - 1. Medical Examination and Records
 - a. Certification that employees who are involved in LBP and LCP work have received medical examinations and will receive continued medical surveillance, including blood lead level monitoring, as required by 29 CFR 1926.62, 29 CFR Part 910.1200, 29 CFR Part 1910.120 and by the state and local regulations pertaining to such work. Records shall be retained, at Contractor expense, in accordance with 29 CFR Part 1910.20.

- b. Provide medical surveillance to workers until exposure monitoring reveals that workers are not exposed to airborne lead at or above the Action Level of 30 ug/m³. This consists of a blood test measuring the level of lead and zinc protoporphyrin by a licensed physician. Further testing and medical exams may be necessary depending on the results of initial blood tests and/or the initial exposure assessment.
 2. Training
 - a. Training certification shall be maintained and posted at the site, prior to the start of work involving LBP and LCP work, for all of the Contractors' workers, supervisors and Competent Person. Training meets the requirements of 29 CFR 1926.62, 29 CFR Part 1926.59, 29 CFR Part 1910.1200 and 49 CFR 172. Training shall be provided prior to the time of job assignment and as required by the regulations thereafter. The specific training project shall, at a minimum, include the following:
 - 1) Lead Paint Awareness Training as per 29 CFR 1926.62.
 - 2) Specific nature of the operation, which could result in exposure to lead.
 - 3) Purpose, proper selection, fitting, use and limitations of respirators.
 - 4) Purpose and description of the medical surveillance program and the medical removal protection program, including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females, hazards to the fetus and additional precautions for employees who are pregnant).
 - 5) Relevant engineering controls and good work practices.
 - 6) The contents of any compliance plan in effect.
 - 7) Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician.
 - 8) The employee's right of access to records under 29 CFR part 1910.20.
 3. Respiratory Protection Program
 - a. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 12 months thereafter as required by 29 CFR Part 1910.134 and 29 CFR 1926.62.
 - b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR Part 1910.134 and 29 CFR 1926.62.
 - c. All workers are required to don respirator(s) with the appropriate level of protection commensurate with the airborne concentrations of lead in which they are working. The level of protection will be determined by the Contractor, based on objective air monitoring data.
- E. Contractor shall engage a Laboratory to perform the OSHA personal sample analysis that is an EPA National Lead Laboratory Accreditation Program (NLLAP) accredited laboratory and that it is listed proficient in the NIOSH/EPA Environmental Lead Proficiency Analytical Testing Program (ELPAT) and is certified by the Department of Health in the State of New York's Environmental Laboratory Approval Program (ELAP). Certification shall include accreditation for heavy metal analysis, and a Quality Assurance and Quality Control Program. Currently, the American Association for Laboratory Accreditation (ASLA) and the American Industrial Hygiene Association (AIHA) are the EPA recognized laboratory accreditors. Documentation shall include the date of accreditation or re-accreditation.
- F. Blood Lead Testing Laboratory: Adequate documentation that the laboratory is certified to perform blood lead analysis for the State of New York.
- G. Contractor shall prepare a detailed LBP and LCP Safe Work Practice Compliance Plan that identifies the work procedures, health and safety measures to be used in LBP and LCP work procedures; and that addresses spill prevention, containment, and emergency response procedures. The plan shall address the methods to be undertaken during LBP and LCP disturbances to include all requirements of 29 CFR 1926.62(e)(2)(ii) including, but not limited to the following key elements:
 1. LBP and LCP containment methods to control employee exposure to lead at or below the permissible exposure limit.
 2. Training requirements as required by Federal, State, and Local regulations.
 3. Unique problems associated with the LBP and LCP projects.

4. Sketch of location and details of LBP and LCP control areas and decontamination procedures. See Section 01 74 19 - Construction Waste Management and Disposal for waste storage area requirements.
5. Eating, drinking, smoking, and restroom procedures.
6. Sequencing of LBP and LCP related work.
7. Personal protective equipment and respiratory protection program, including controls.
8. Engineering controls, containment structures and safety measures. Refer to Negative Air Pressure System requirements in this section.
9. Worker exposure assessment procedures.
10. Work Practice controls.
11. Housekeeping.
12. Hygiene facilities and practice.
13. Medical surveillance, including medical removal procedures.
14. Sampling, testing and analytical methods for personal air sampling requirements of 29 CFR 1926.62. Procedures must include frequency, locations, sampling, and analytical methods to be used.
15. Contractor to include the segregation and minimization of lead waste streams from construction and demolition waste in their lead-based paint management plan.
16. Visual clearance log for each control area that is maintained by the Contractor's Competent Person.

1.8 POSTED WARNINGS & NOTICES

- A. The following regulations, warnings and notices shall be maintained or posted at the work site in accordance with 29 CFR 1926.62.
- B. A copy of applicable Federal, State, and Local regulations shall be maintained at the work site.
- C. Warning signs shall be provided at approaches to LBP/LCP control areas. Signs shall be located at a distance from the LBP and LCP control areas that will allow personnel to read the sign and take the necessary protective actions required before entering the LBP/LCP control area. The signs shall comply with the requirements of 29 CFR 1926.62.
- D. Right-to-know notices shall be placed in clearly visible areas of the work site in compliance with Federal, State and Local regulations.
- E. Exposure air monitoring results shall be prepared in order to be easily understood by the workers and shall be placed in a clearly visible area of the work site.
- F. A list of emergency telephone numbers shall be posted at the site. The list shall include numbers of the local hospital, emergency squad, police and fire departments, Government and Contractor representatives who can be reached 24 hours per day as well as professional consultants directly involved in the project.

PART 2 EQUIPMENT AND MATERIALS

2.1 GENERAL

- A. Enough health and safety materials required by 29 CFR 1926.62, and other materials and equipment needed to complete the project, shall be available and kept on the site.
- B. Respirators

1. Air-purifying respirators shall be approved by NIOSH for use with dust, fumes and mists having permissible exposure limits of less than 0.05 milligrams per cubic meter (i.e. have high-efficiency particulate air HEPA filters) and for other hazardous airborne contaminants that may be encountered, as determined by the Competent Person. The Contractor shall furnish, at no cost to personnel/employees, respirators to provide protection from airborne concentrations of lead. Respirators shall comply with the requirements of 29 CFR 1926.62 and shall be used in accordance with 29 CFR 1926.62, 29 CFR Part 1926.103 and 29 CFR Part 1910.134.
- C. Respirator Cartridges
1. A sufficient supply of respirator cartridges shall be maintained at the work site to provide new cartridges to employees and authorized visitors throughout the duration of the project. Cartridges shall be replaced according to the manufacturer's recommendations, when breathing becomes difficult, or if the cartridges become wet.
- D. Protective Clothing
1. The Contractor shall furnish, at no cost to personnel/employee, equipment/ clothing for protection from airborne and waterborne LBP and LCP debris. An adequate supply of these items shall be available for worker and authorized visitor use. Workers and visitors shall not take protective clothing and equipment off the work site at any time. Protective clothing includes:
 - a. Coveralls (Whole Body Protective Coverings): Full-body coveralls and head covers shall be worn by workers in the control area as necessary. Sleeves shall be secured at the wrist and pants legs at the ankle with tape. Permeable clothing shall be provided in heat-stress conditions. Where non-disposable coveralls are provided, these coveralls shall be cleaned after each wearing and kept within the control area or decon/airlock (bagged). Cleaning of coveralls and other non-disposable clothing shall be in accordance with the provisions for cleaning in 29 CFR 1926.62.
 - b. Boots: Work boots with nonskid soles or impermeable work boot covers shall be worn by workers. Where required by OSHA, safety boots (steel toe or steel toe and shank) shall be worn. Paint the uppers of boots red with waterproof enamel. Do not allow boots to be removed from the control area for any reason after being contaminated with LBP or LCP debris. Keep within control area or decon/airlock (bagged).
 - c. Gloves: Inner gloves, appropriate for items and hazards encountered, and disposable outer work gloves shall be provided to each worker and shall be worn while the worker is in the control area. Glove materials should be appropriate for the specific chemical exposure. Gloves shall not be removed from the control area and shall be disposed of as LBP or LCP contaminated waste at the end of the work.
 - d. Hard Hats: Head protection shall be provided as required by OSHA for workers and authorized visitors. Protective plastic-strap suspension hats shall be used. Hard hats shall be always worn when work is in progress. Hard hats shall remain in the control area until the project is completed. Hard hats shall be thoroughly cleaned, decontaminated, dried and bagged before being removed from the control area at the end of the project.
 - e. Eye Protection: Fog-proof goggles for personnel engaged in LBP and LCP operations shall be worn when the use of a full-face piece respirator is not required and kept within control area or decon/airlock (bagged) until completion of project.
- E. Negative Air Pressure System
1. When a LBP or LCP control area requires the use of an airtight containment barrier, a negative air pressure system shall be used and pressure differential recordings taken. LBP and LCP shall not be removed from the LBP/LCP control area until the proper engineering controls and HEPA filtration systems are in place.
 2. The negative air pressure system shall be equipped with approved HEPA filters per UL 586. Negative air pressure equipment shall be equipped with new HEPA filters and shall be sufficient to maintain a minimum pressure differential of minus 5 Pascals (Pa), equivalent to 0.02 inch of water column relative to adjacent, unsealed areas. Negative air pressure system minimum requirements are listed below.
 - a. The unit shall be capable of delivering its rated volume of air with a clean first stage filter, an intermediate filter and a primary HEPA filter in place. The units shall be clean and sealed (intake & exhaust) at all times when not operating in a control area.

- b. The HEPA filter shall be certified as being capable of removing particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent. 700 hours is the manufacturer life recommendation of a HEPA filter (approximately 1 month of continuous operating).
 - c. The unit shall be capable of delivering no less than 70 percent of rated capacity when the HEPA filter is 70 percent full or measures 620 Pa 2.5 inches of water) static pressure differential on a magnehelic gauge.
 - d. The unit shall be equipped with a manometer-type negative pressure differential monitor with a minor scale division of 0.02 inches of water and accuracy within plus or minus 1.0 percent. The manometer shall be calibrated in accordance with the manufacturer's recommendations. Record manually manometer readings of the pressure differential between the LBP control area and adjacent unsealed areas at the beginning and end of each workday.
 - e. The unit shall be equipped with a means for the operator to easily interpret the readings in terms of the volumetric flow rate of air per minute moving through the machine at any given moment.
 - f. The unit shall be equipped with an electronic mechanism that automatically shuts the machine off in the event of a filter breach or absence of a filter.
 - g. The unit shall be equipped with an audible horn that sounds like an alarm when the machine has shut itself off.
 - h. The unit shall be equipped with an automatic safety mechanism that prevents a worker from improperly inserting the main HEPA filter.
 - i. The unit shall be ducted through the containment barrier wall to the exterior of the building. The unit shall not be exhausted into any interior areas. If exhausting to the exterior is not feasible, utilize an unoccupied area or room that is large enough to handle the volume of air with two units connected in series. Applicable warning signage shall be posted at this location. Owner's prior approval is required if exhausting into the interior of the building.
3. Number of Units Required:
 - a. The air within the containment barrier shall be changed at least once every 15 minutes by a continuously operating negative air pressure system, until the LBP/LCP control area barrier is removed. Filters shall be replaced as necessary to maintain the efficiency of the system. A back-up unit shall be maintained on-site.
 4. Auxiliary Generator
 - a. If site conditions can't provide power, an auxiliary generator shall be provided. The generator shall not present a carbon monoxide hazard to workers.
 5. Discontinuing Negative Air Pressure System
 - a. The negative air pressure system shall not be shut down during LBP/LCP work unless authorized by the Owner's third-party environmental consultant. At the completion of the LBP/LCP work procedures and disposal project, units shall be run until the removal is completed satisfactorily and full cleanup has been completed, and satisfactory clearance has been achieved. Dismantling of the negative air pressure systems shall conform to the written decontamination procedures. Prefilters shall be removed and properly disposed. The intake and exhaust of the machines shall be sealed with polyethylene to prevent environmental contamination.

F. Vacuum Systems

1. HEPA filtered vacuum systems shall be used during LBP/LCP operations which generate dust. The systems shall be suitable for the project, and filters shall be capable of removing particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent. Vacuum opening, wands and hoses shall be sealed at all times when not in a control area.

2.2 EXPENDABLE MATERIALS

A. Polyethylene Sheet and Bags - General

1. Polyethylene sheet and bags shall be minimum 6-mil thick. Bags shall have pre-printed labels, and 5-inch (minimum) long plastic ties, pointed and looped to secure the filled bags. Polyethylene sheets shall be in roll sizes to minimize seams.

B. Polyethylene Sheet - Flame Resistant

LEAD HAZARD CONTROL ACTIVITIES

1. Where a potential for fire exists, flame-resistant polyethylene sheets shall be provided. Polyethylene film shall conform to the requirements of NFPA 701.
- C. Polyethylene Sheet - Reinforced
 1. Reinforced polyethylene sheet shall be provided where high skin strength is required such as where it constitutes the only barrier between the LBP control area and the indoor and outdoor environments. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between two layers of polyethylene film. Films meet flame resistant standards of NFPA 701.
- D. Tape and Adhesive Spray
 1. Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water. Tape shall be minimum 2 inches wide, industrial strength.
- E. Containers
 1. DOT approved impermeable containers shall be used to receive and retain LBP and LCP waste and debris and lead contaminated material until disposal. Containers shall be labeled in accordance with EPA, DOT and OSHA standards, as applicable for the type of waste. Waste streams shall be segregated in a manner to reduce the potential volume of hazardous waste generated.
- F. Chemicals
 1. Chemicals, including caustics and paint strippers, shall be properly labeled, stored in leak-tight containers and properly/safely secured from the public.
 2. Chemical paint strippers shall contain no methylene chloride.
- G. Chemical Paint Stripper Neutralizer: Neutralizers for paint strippers shall be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.
- H. Storage of Materials: Materials shall be stored in an approved enclosed structure, which protects them from damage, rain, wind, etc. and contamination. During periods of cold weather, plastic materials shall be protected from the cold. Regularly inspect materials to identify damaged or deteriorating items. Damaged or deteriorated items shall not be used and shall be removed from the site as soon as they are discovered. Store materials shall not present a hazard or an inconvenience to workers, visitors, employees and/or other building occupants.

PART 3 EXECUTION

3.1 WORK PROCEDURES

- A. LBP and LCP work procedures and related work shall be performed in accordance with the accepted Contractor's LBP and LCP Safe Work Practice Compliance Plan, 29 CFR 1926.62 and as specified herein. LBP/LCP waste and debris, lead contaminated debris and personal protective clothing and equipment shall be disposed of in compliance with Federal, State, and Local regulations and in accordance with the respective waste stream TCLP testing results.
- B. Personal Protection Procedures
 1. Respiratory Protection is required for all LBP disturbances. Personnel shall wear and use protective clothing and equipment as specified and required by 29 CFR 1926.62 and 29 CFR Part 1910.120. Eating, smoking, drinking, chewing tobacco, chewing gum, applying makeup and use of non-work-related walkie-talkies/phones shall not be permitted in the LBP and LCP control area. Personnel of trades not engaged in the LBP or LCP work procedures and disposal of LBP and LCP shall not be exposed at any time to airborne concentrations of lead equal to or in excess of 30 micrograms per cubic meter of air (30 ug/m3). Electrical service shall be disconnected when wet removal is performed, and temporary electrical service protected by a ground fault circuit interrupter (GFCI) shall be provided.

LEAD HAZARD CONTROL ACTIVITIES

- C. Safety and Health Procedures
 - 1. The Competent Person shall be present on the work site throughout the LBP and LCP project to supervise, monitor and document the project's health and safety provisions. A daily log shall be maintained showing the results of air sampling tests throughout the project area. LBP and LCP work being conducted within a LBP or LCP control area where an airtight barrier is required shall be stopped if measured airborne lead concentrations, collected during LBP or LCP work procedures, exceed the Action Level.
- D. Safety and Health Responsibilities
 - 1. The Competent Person shall:
 - a. Verify that training meets applicable requirements.
 - b. Review and approve LBP/LCP Safe Work Practice Compliance Plan for conformance to the applicable referenced standards.
 - c. Inspect LBP and LCP removal work for conformance with the accepted Safe Work Practice Compliance Plan.
 - d. Ensure that worker exposure air monitoring activities are in accordance with 29 CFR 1926.62.
 - e. Ensure work is performed in strict accordance with specifications.
 - f. Ensure hazardous exposure to personnel and to the environment are adequately controlled.
 - g. The Contractor's Competent Person shall be responsible for directing personal air monitoring and shall also perform visual inspections prior to the visual inspection conducted by Owner's third-Party Environmental Consultant (if applicable), to verify the control areas are free of all visible debris.
 - h. If required, the Contractor's Competent Person shall coordinate with the Owner's third-party environmental consultant for any control areas requiring final air/wipe testing clearance testing (Action Level/wipe) in accordance with OSHA and/or US Department of Housing and Urban Development (HUD) protocols.
- E. Medical Surveillance Procedures
 - 1. Medical surveillance shall be implemented in accordance with the accepted Contractor's LBP/LCP Safe Work Practice Compliance Plan and shall comply with the requirements of 29 CFR 1926.62, including the provisions for blood lead monitoring, medical removal, protection and a physician's written opinion, signed by the physician performing the employee examination. The Contractor's Competent Person shall maintain on-site, a copy of the written opinion for Contractor's employees prior to each employee's commencement of work.
- F. Engineering Controls and Containment Structures
 - 1. Engineering and work practice controls are the primary means of maintaining exposures to lead below the PEL. Paint removal and surface preparation activities must keep dust levels at a minimum. Power tools must be equipped with manufacturer equipped vacuum shrouds including an attached HEPA filtered vacuum system.
 - 2. LBP/LCP Control Area
 - a. The control area is where LBP/LCP work procedures occur and as such shall be considered contaminated. The LBP/LCP control area shall be isolated to prevent LBP/LCP containing dust or debris from passing into adjacent areas. The control area shall be decontaminated at the completion of the LBP/LCP work procedures and disposal work.
 - 3. Boundary Requirements.
 - a. Physical boundaries along with Warning Signage shall be provided around exterior LBP/LCP control areas by taping off the area indicated in the Safe Work Practice Compliance Plan.
 - 4. Control Barriers
 - a. The LBP/LCP control area shall be designated and separated from other outside areas with control barriers. The polyethylene sheeting shall mask and seal all openings. The LBP/LCP control area shall be erected according to the Contractors LBP/LCP Safe Work Practice Compliance Plan. Polyethylene sheeting shall be mechanically supported, independent of duct tape or spray adhesive.
 - 5. Exterior Masking and Sealing

- a. Exterior LBP/LCP control area requirements: Where the construction of a contained LBP/LCP control area is impractical or not required based on the method of lead work procedures, a taped-off perimeter shall be installed around the area where the LBP/LCP handling procedures are performed and other requirements for LBP/LCP control areas shall be maintained. Personal monitoring of airborne concentrations is still required and shall be conducted in accordance with 29 CFR 1926.62.
6. Hand Wash Station
 - a. An operational hand washing station shall be provided to all workers adjacent to each LBP/LCP control area utilizing polyethylene sheeting as a drop cloth. Water shall be hot and cold or warm. Soap dishes, continuing supply of soap, and clean towels shall be provided. The hand washing station shall be maintained in a sanitary condition. Wastewater shall be collected and placed within 6-mil polyethylene bags and sealed. Bags shall be immediately placed within non-leaking, drums and sealed.
7. Equipment Decontamination
 - a. An equipment decontamination area shall be installed at the entrance to each LBP/LCP control area to allow for the cleaning of all equipment utilized on the project. Polyethylene sheeting shall be utilized as a drop cloth, along with a utility tub to clean and capture debris/water during the cleaning process. Water shall be hot and cold or warm. Continuing supply of detergent, and clean towels shall be provided. The equipment decontamination area shall be maintained in a sanitary condition. Wastewater shall be collected and placed within 6-mil polyethylene bags and sealed. Bags shall be immediately placed within non-leaking, drums and sealed.
8. Temporary Utilities
 - a. Temporary equipment as necessary to provide adequate power, light, heat, and water shall be installed, as needed, to accomplish the LBP/LCP operations properly and safely. The Contractor shall maintain the security and maintenance of the utility system in the LBP/LCP control areas. In the event of a failure of any utility system, the Owner will not be responsible for any loss of time or other expenses incurred by the Contractor. In addition to any site-specific temporary utility requirements, the Contractor shall provide:
 - 1) Back-flow protection on all water connections. Fittings installed by the Contractor shall be removed after completion of work with no damage or alteration to existing water piping and equipment.
 - 2) When applicable, heavy-duty abrasion-resistant hoses provide water to each control area and decontamination area.
 - 3) A hot water heater, if necessary, to provide warm water to the decontamination showers, hand wash station and equipment decontamination area.
 - 4) Electrical service to control areas. Electrical service shall comply with the National Electric Code, State and Local requirements and UL standards. Warning signs shall be posted at power outlets, which are other than 110–120-volt power. Only grounded extension cords connected into a GFCI shall be used. Incandescent lamps and light fixtures shall be of adequate wattage to provide good lighting in LBP/LCP control areas.
 - 5) Temporary heating units, when needed, that have been tested and labeled by UL, FM, or another recognized trade association related to the fuel being consumed. Forced air or fan type units shall not be utilized inside a control area. Units shall have tip-over protection.

3.2 LEAD-BASED/CONTAINING PAINT WORK PRACTICES

A. Component Removal:

1. Components shall be removed intact to the extent practicable. A 6-mil polyethylene drop cloth shall be placed around and/or beneath the component, prior to its removal, to catch any paint chips that may become dislodged. The component shall be wrapped and sealed in a layer of clear 6-mil polyethylene prior to movement to the disposal container. Follow proper disposal requirements. The area around the component removal shall be wet wiped and HEPA vacuumed. The polyethylene sheeting shall be carefully folded in on itself and placed in a 6-mil disposal bag. Containment debris shall be properly stored in accordance with the respective waste stream as per the Contractor's LBP/LCP Safe Work Practice Compliance Plan

LEAD HAZARD CONTROL ACTIVITIES

B. Chemical Stripping:

1. Chemical stripping may be used for LBP and LCP removal on surfaces that will be subjected to welding, cutting, torch burning or where it is the only acceptable procedure. No chemical strippers or associated neutralizer chemicals containing methylene chloride shall be used by the Contractor on this project.
 - a. Horizontal surfaces directly below and in a radial direction from the area where chemical stripping is to be performed shall be covered with 6-mil plastic sheeting and shall also extend ten (10) feet on either side of the control area or to the furthest practical distance to catch any paint chips that may become dislodged.
 - b. All LBP/LCP on specified surfaces shall be removed to the bare substrate. The job is not considered complete until the substrate is dry, free of paint, debris, and LBP/LCP residue.
 - c. LBP/LCP stripping agents shall be brushed or troweled on the designated surfaces or otherwise applied to a minimum thickness in accordance with manufacturer's specifications.
 - d. The required application/reaction time for stripping will depend upon the ambient temperature, humidity, and thickness of LBP/LCP. If LBP/LCP is not completely removed following the initial application of stripper, additional applications and wet scrapings may be required.
 - e. Removed LBP/LCP shall not be deposited on the polyethylene containment surfaces but shall be transferred directly into clear 6-mil polyethylene bags from the scraper and sealed. LBP/LCP shall be removed by wet scraping to the maximum extent feasible. If the substrate is to be reused, the removal activities shall not damage the substrate.
 - f. Any residue not removable by wet scraping shall be washed down to the bare metal substrate with an appropriate, pre-approved solution. LBP/LCP-contaminated wastewater shall be kept to a minimum using wet scrub brushes or sponges. These residues and disposable cleaning media shall also be directly transferred to 6-mil polyethylene bags and sealed. Bags shall be immediately placed within non-leaking, drums and sealed. Free standing water shall be eliminated by use of a drying agent. Contractor to include the segregation and minimization of lead waste from construction and demolition waste in their LBP/LCP Safe Work Practice Compliance Plan.

C. Manual Demolition/Scraping/Cleaning:

1. Manual demolition, scraping, sanding and power tool cleaning with dust collection systems shall be performed in conjunction with engineering and work practice controls meeting the requirements of 29 CFR 1926.62(e)(1).
2. Seal openings of HVAC ductwork and other penetrations (doors, windows, etc.) within the Control Area with two layers of 6-mil polyethylene sheeting. For work on vertical surfaces, place a layer of 6-mil polyethylene sheeting below the area prior to manual demolition/scraping/sanding/cleaning. The sheeting shall extend ten (10) feet on either side of the control area or to the furthest practical distance to catch any paint chips that may become dislodged.
3. Wet methods shall be used during manual scraping, sanding and power tool cleaning with dust collection systems. Local HEPA ventilation shall be utilized in conjunction with manual scraping, sanding and power tool cleaning with dust collection systems. In the case that local HEPA ventilation is not sufficient to control dust hazards, the Contractor shall be required to install engineering controls to meet Negative Air Pressure System requirements in this section.
4. Removed LBP/LCP shall not be allowed to accumulate on surfaces within the Control Area but shall be HEPA vacuumed or placed directly into 6-mil polyethylene bags. The Contractor shall maintain all surfaces as free as practicable of accumulated lead dust to prevent the dispersal of lead into the work places that are outside of the lead paint control areas. LBP/LCP shall be removed by manual methods to the maximum extent feasible.

5. Debris shall be bagged in 6-mil polyethylene bags, sealed, and secured in leak proof drums. The area around the surfaces subject to work shall be wet wiped and HEPA vacuumed, including the polyethylene sheeting. Upon a satisfactory clearance inspection by the Owner's Third-Party Environmental Consultant (if applicable) and the Contractor's Competent Person, the cleaned polyethylene sheeting shall be carefully folded in on itself and placed in a 6-mil disposal bag. Containment debris shall be properly stored in accordance with the respective waste stream as indicated in the contractor's LBP/LCP Safe Work Practice Compliance Plan. The contractor shall coordinate with the Owner's third-party environmental consultant to test the waste streams for disposal.

D. Alternative Lead Work Procedures

1. Any work procedure deviating from the outlined procedures above shall be submitted to Architect and the Owner's third-party Environmental Consultant for review and approval prior to the start of the project. As there are many different components in different areas of the building(s), it is impractical to address every potential work procedure. The intent of alternative lead work procedures shall be to maintain compliance with 29 CFR 1926.62 and maintain airborne concentrations of lead dust below the Action Level of 30 ug/m³.

3.3 PERSONAL AIR MONITORING, WASTE SAMPLING & CLEARANCE SAMPLING

- A. During all LBP/LCP removal and disposal operations, the Contractor's OSHA Competent Person shall be on-site inspecting the work to ensure that the health and safety requirements of this contract are satisfied. The building Owner may elect to have a Third-Party Environmental Consultant on-site to perform visual clearance inspections and/or clearance sampling.
- B. Personal Air Monitoring (Provided by the Contractor, as necessary)
 1. Personal air monitoring samples for airborne concentrations of lead shall be collected and analyzed in accordance with 29 CFR 1926.62. Results shall be reported in micrograms per cubic meter of air. The Competent Person shall use personal air monitoring results to determine the effectiveness of engineering controls, the adequacy of PPE and to determine if proper work practices are being employed. The Owner's third-party environmental consultant shall be notified if any personal air monitoring result meets or exceeds 30 ug/m³ of air. The Contractor shall stop work and take steps to reduce the concentration of lead in the air. Such corrective actions shall be documented in the daily log. Personal air sampling results shall be verbally available within 24 hours of sampling with hard copy reports available within five (5) calendar days of sampling.
- C. Waste Sampling and Testing's Third-Party Environmental Consultant
 1. Sampling and testing of all waste streams shall be in accordance with 40 CFR Part 261, 6 NYCRR Part 371 and SW-846, Chapter 9, Sampling Plan. See Paragraph 2.05 C. of this specification section for waste sampling and analyses requirements.
- D. Dust/Wipe Sampling Owner's Third-Party Environmental Consultant).
 1. Dust/wipe samples shall be taken after clean-up activities have been completed and the control areas passed a visual inspection. Refer to Section 2.01 C. 7. for visual inspection requirements.
 2. Sampling for clearance criteria shall be performed in compliance with HUD Guidance document.
 3. If clearance fails, the recleaning and any additional costs (dust/wipe sample analyses, etc.) to clear the control area shall be the responsibility of the Contractor. The control area shall remain in place until satisfactory clearance has been achieved.
 4. Clearance Levels:
 - a. Floors: 5 ug/ft².
 - b. Windowsills: 40 ug/ft².
 - c. Window troughs: 100 ug/ft².

3.4 ADJACENT AREAS

- A. Damage to adjacent areas shall be repaired by the Contractor to the approval of the Owner.

3.5 CLEAN-UP & DISPOSAL

LEAD HAZARD CONTROL ACTIVITIES

A. Cleanup

1. Daily: Surfaces in the LBP/LCP control area shall be maintained free of accumulations of paint chips, LBP/LCP debris and dust. Spread of dust and debris shall be restricted; waste shall not be distributed over the control area. Dry sweeping or compressed air shall not be used for cleanup. At the end of each shift, the area shall be cleaned of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet wiping the area. LBP/LCP work procedures shall cease during the cleanup.
2. At completion of LBP/LCP work and a satisfactory visual inspection by Owner's Third-Party Environmental Consultant (if applicable) and OSHA Competent Person, a clean-up shall be performed by the Contractor. This clean-up includes removal of any contaminated material, equipment or debris including polyethylene sheeting from the control area. The polyethylene sheeting shall be sprayed or misted with water for dust control, construction debris removed and polyethylene sheeting wet wiped. Then the sheeting shall be removed by folding it in upon itself.
 - a. Lead-contaminated debris shall be containerized in accordance with the Contractor's LBP/LCP Safe Work Practice Compliance Plan. Waste bags shall not be overloaded and shall be securely sealed and stored in the designated area.
 - b. Removal of surface polyethylene sheeting shall begin from top to bottom. Removal of floor polyethylene sheeting shall begin at the corners and fold in the middle to contain the dust. Polyethylene shall be disposed of as per the Contractor's LBP/LCP Safe Work Practice Compliance Plan Cleaning Equipment. The Contractor shall decontaminate the lead abatement equipment and equipment used in the control area. The wastewater from cleaning shall be contained, sampled and disposed of as specified within Section 2.01 E. 6. and 2.02 B. 7 and as per contractor's LBP/LCP Safe Work Practice Compliance Plan.

B. Certification

1. The Contractor's Competent Person shall certify and sign within the log that the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR 1926.62 and that there was no visible accumulations of LBP/LCP paint/coating or dust on the worksite. Do not remove warning signs at the lead control area or roped-off boundary signs prior to the completion of the Competent Person's signed certification. If applicable, the Contractor's Competent Person's certification shall be forwarded to the Owner's Project Manager, Third Party Environmental Consultant's for review prior to removing warning signs at the lead control area or roped-off boundary signs.

C. Waste Storage and Disposal (Provided by the Contractor) and Sampling/Analysis (Provided by building Owner's Third Party Environmental Consultant).

3.6 CLOSEOUT ACTIVITIES

- A. Submit signed certification that all documentation has been provided, including but not limited to:
1. Hazardous waste disposal reports.
 2. Copies of all Visual Clearance Logs.

3.7 ATTACHMENTS

- A. LBP and LCP Survey Report Documentation Summary.

END OF SECTION

TAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Inspection Date: 12/28/99
 Report Date: 1/6/00
 Statement Level: 1.0
 Report No. S#01262 - 12/28/99 09:46
 Total Readings: 313
 Job Started: 12/28/99 09:46
 Job Finished: 12/28/99 15:42

Broadway Middle&Elementary School
 1000 Broadway Street
 Elmira, New York 14904

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Exterior Room 001 B Wing									
028	C	Fascia			I	Metal	Brown	0.1	QM
029	C	Soffit			I	Metal	OffWhite	0.0	QM
032	C	Door	Rgt	Rgt casing	I	Metal	Red	0.0	QM
034	C	Door	Rgt	Lft jamb	I	Metal	Red	-0.1	QM
033	C	Door	Rgt	L Lft	I	Metal	Red	0.0	QM
030	C	Panel	Rgt		P	Metal	Red	2.7	QM
031	C	Panel	Rgt		P	Metal	Red	2.4	QM
Comment: Readings 30 & 31 taken at fill panels at side of door unit.									
Exterior Room 002 F Wing									
285	A	Fascia			I	Metal	Red	0.3	QM
286	A	Soffit			I	Metal	Beige	1.5	QM
287	A	Door	Rgt	Lft casing	I	Metal	Red	-0.1	QM
288	A	Door	Rgt	L Rgt	I	Metal	Red	-0.1	QM
Exterior Room 003 Cafeteria									
002	B	Door	Lft	L Ctr	I	Metal	Red	0.1	QM
001	B	Transom	Lft		I	Metal	Red	2.3	QM
Interior Room 001 Class B-4									
047	B	Panel	Rgt		I	Metal	Beige	0.2	QM
026	C	BarJoist Fl	Ctr		I	Metal	Gray	-0.1	QM
027	C	BarJoist Str	Ctr		I	Metal	Gray	1.0	QM
011	D	Wall	L Ctr		I	Metal	OffWhite	-0.1	QM
010	D	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
013	D	Door	Lft	Rgt casing	I	Metal	Tan	-0.1	QM
014	D	Door	Lft	U Ctr	I	Metal	Tan	0.0	QM
007	D	Corrig Deck	Lft		I	Metal	Gray	0.4	QM
008	D	BarJoist Fl	Lft		I	Metal	Gray	-0.1	QM
009	D	BarJoist Str	Lft		I	Metal	Gray	1.0	QM
012	D	Column	Lft		I	Metal	OffWhite	-0.2	QM
Interior Room 002 Class B-4									
019	A	Wall	U Rgt		I	Drywall	OffWhite	0.0	QM
020	A	Door	Lft	Lft jamb	I	Metal	Tan	-0.1	QM
021	A	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
018	B	HVAC Unit	Ctr		I	Metal	Tan	-0.1	QM
048	B	Panel	Ctr		I	Metal	Beige	0.3	QM
015	C	Wall	L Rgt		I	ConcBlock	OffWhite	-0.2	QM
016	C	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
017	C	Column	Lft		I	Metal	OffWhite	0.0	QM
Interior Room 003 Class B-4									
022	A	Wall	L Lft		I	Drywall	Yellow	0.0	QM
024	C	Wall	L Ctr		I	Drywall	Yellow	0.0	QM
025	C	Column	Lft		I	Metal	Yellow	-0.1	QM
023	C	Frame	Ctr		I	Wood	Yellow	-0.1	QM
Interior Room 004 Corridor B									

TAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
082	B	Wall	U Lft		I	Metal	Yellow	0.0	QM
043	B	Wall	U Rgt		I	Metal	Yellow	-0.1	QM
086	B	Door	Ctr	Rgt casing	I	Metal	Tan	0.0	QM
085	B	Door	Ctr	U Rgt	I	Metal	Tan	0.5	QM
081	B	Lockers	Lft		I	Metal	Blue	0.0	QM
073	B	Corrig Deck	Ctr		I	Metal	Gray	0.2	QM
074	B	I Beam	Ctr		I	Metal	Gray	0.0	QM
075	B	Grill	Ctr		I	Metal	Gray	0.0	QM
093	B	Frame	Ctr		I	Metal	Yellow	0.0	QM
045	B	Lockers	Rgt		I	Metal	Blue	0.0	QM
040	C	Door	Ctr	Rgt casing	I	Metal	Tan	-0.1	QM
039	C	Door	Ctr	Lft jamb	I	Metal	Tan	0.0	QM
038	C	Door	Ctr	U Rgt	I	Metal	Tan	0.0	QM
035	C	Panel	Lft		I	Metal	Tan	3.0	QM
036	C	Panel	Ctr		I	Metal	Tan	3.1	QM
037	C	Panel	Rgt		I	Metal	Tan	3.0	QM
041	C	Panel Jamb	Rgt		I	Wood	Tan	-0.2	QM
083	D	Wall	L Ctr		I	Metal	Yellow	0.0	QM
042	D	Wall	U Lft		I	Metal	Yellow	0.0	QM
078	D	Door	Ctr	Rgt casing	I	Metal	Blue	-0.1	QM
079	D	Door	Ctr	U Ctr	I	Wood	Natural	-0.0	QM
044	D	HVAC Unit	Lft		I	Metal	Tan	-0.1	QM
046	D	Lockers	Lft		I	Metal	Blue	-0.1	QM
076	D	Fire Cabinet	Ctr		I	Metal	Red	-0.1	QM
077	D	Fire Cabinet	Ctr		I	Metal	White	0.0	QM
080	D	Lockers	Ctr		I	Metal	Blue	0.0	QM
084	D	Soffit	Rgt		I	Drywall	White	-0.2	QM

Comment: Readings 35 - 37 taken at fill panels of door unit.

Readings 73 & 74 taken above suspended ceiling.

Readings 78 & 79 taken at B7.

Reading 93 taken at display case.

Interior Room 005 Class B-2

062	A	Closet	Lft	Wall	I	Metal	Beige	-0.1	QM
063	A	Closet	Lft	Wall	I	Metal	Green	-0.1	QM
060	B	Panel	Lft		I	Metal	Beige	0.0	QM
057	B	Shelf	Ctr		I	Metal	Beige	0.0	QM
058	B	Shelf	Ctr		I	Metal	Beige	0.2	QM
059	B	Column	Ctr		I	Metal	OffWhite	-0.1	QM
052	C	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
049	C	Ceiling			I	Metal	White	0.1	QM
053	D	Wall	L Ctr		I	Metal	OffWhite	0.0	QM
056	D	Door	Lft	Lft jamb	I	Metal	Tan	0.2	QM
055	D	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
061	D	Vent	Lft		I	Metal	OffWhite	-0.1	QM
050	D	Frame	Ctr		I	Metal	White	0.2	QM
051	D	Louver	Ctr		I	Metal	White	0.0	QM
054	D	Column	Ctr		I	Metal	OffWhite	-0.1	QM

Comment: Readings 50 & 51 taken at ceiling.

Interior Room 006 Class B-3

066	A	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
072	A	Door	Lft	Lft casing	I	Metal	Tan	-0.1	QM
071	A	Door	Lft	U Ctr	I	Metal	Tan	0.6	QM
070	A	Closet	Lft	Wall	I	Metal	OffWhite	-0.1	QM
067	A	Corner Guard	Lft		I	Metal	OffWhite	0.0	QM
064	C	Wall	L Ctr		I	Metal	OffWhite	0.0	QM

ETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
065	D	Wall	U Lft		I	Metal	OffWhite	0.0	QM
068	D	Column	Rgt		I	Metal	OffWhite	-0.1	QM
069	D	Vent	Rgt		I	Metal	OffWhite	0.1	QM

Interior Room 007 Class B-6

092	B	Door	Lft	Header	I	Metal	Blue	-0.1	QM
091	B	Column	Lft		I	Metal	White	-0.2	QM
087	B	BarJoist Pl	Ctr		I	Metal	Tan	4.0	QM
088	B	BarJoist Str	Ctr		I	Metal	Tan	1.0	QM
089	B	BarJoist Pl	Ctr		I	Metal	Tan	1.7	QM
090	B	BarJoist Fl	Ctr		I	Metal	Gray	0.3	QM

Comment: BarJoist Pl = Bar Joist Plate at union.

Interior Room 008 Class B-1

102	B	Column	Ctr		I	Metal	Brown	1.6	QM
103	B	Column	Ctr		I	Metal	OffWhite	0.0	QM
101	B	HVAC Unit	Rgt		I	Metal	Beige	-0.1	QM
096	C	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
098	C	Column	Rgt		I	Metal	OffWhite	-0.1	QM
097	D	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
100	D	Door	Lft	Header	I	Metal	Tan	0.0	QM
099	D	Door	Lft	L Ctr	I	Metal	Tan	0.0	QM
094	D	BarJoist Fl	Rgt		I	Metal	Gray	-0.1	QM
095	D	Corrig Deck	Rgt		I	Metal	Gray	0.2	QM

Comment: Readings 94 & 95 taken above suspended ceiling.

Interior Room 009 Class A-9

117	A	Wall	L Rgt		I	Metal	OffWhite	-0.1	QM
116	A	Wall	U Lft		I	Metal	OffWhite	0.0	QM
112	A	Door	Lft	Header	I	Metal	Tan	0.0	QM
113	A	Door	Lft	U Lft	I	Metal	Tan	0.4	QM
118	A	Column	Ctr		I	Metal	OffWhite	-0.1	QM
110	B	Wall	U Rgt		I	ConcBlock	OffWhite	0.1	QM
115	B	Door	Lft	Lft jamb	I	Metal	Tan	0.0	QM
114	B	Door	Lft	L Rgt	I	Metal	Tan	0.0	QM
105	C	Panel	Ctr		I	Metal	Beige	0.1	QM
107	C	Shelf	Ctr		I	Metal	Beige	0.0	QM
104	C	Panel	Rgt		I	Metal	Beige	0.2	QM
106	C	Shelf	Rgt		I	Metal	Beige	0.3	QM
109	D	Wall	U Lft		I	Metal	OffWhite	0.0	QM
111	D	Ceiling			I	Metal	White	-0.1	QM
108	D	Column	Rgt		I	Metal	OffWhite	-0.1	QM

Interior Room 010 Corridor A

119	C	Wall	U Lft		I	Metal	Yellow	0.0	QM
122	C	I Beam	Lft		I	Metal	Gray	0.0	QM
123	C	I Beam	Lft		I	Metal	DkGray	1.8	QM
124	C	BarJoist Fl	Lft		I	Metal	Gray	0.3	QM
125	C	BarJoist Str	Lft		I	Metal	Gray	1.0	QM
121	C	Lockers	Ctr		I	Metal	Green	0.0	QM
120	C	Trim	Lft		I	Metal	Yellow	0.0	QM

Comment: Reading 123 taken at union.

Interior Room 011 Room A-30

130	B	Wall	L Lft		I	GlazedTile	Gray	-0.2	QM
131	C	Ceiling			I	Metal	White	0.0	QM
131	D	Door	Rgt	Rgt casing	I	Metal	Tan	0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
130	D	Door	Rgt	Lft jamb	I	Metal	Tan	0.0	QM
129	D	Door	Rgt	U Ctr	I	Metal	Tan	0.0	QM
127	D	Partition	Ctr		I	Metal	Tan	0.3	QM
128	D	Partion Door	Ctr		I	Metal	Tan	-0.1	QM
Interior Room 012 Room A-32									
137	A	Ceiling			I	Metal	White	0.3	QM
134	B	Door	Lft	Rgt casing	I	Metal	Tan	1.0	QM
136	B	Door	Lft	Lft jamb	I	Metal	Tan	1.0	QM
135	B	Door	Lft	U Ctr	I	Metal	Tan	-0.1	QM
133	B	Partition	Lft		I	Metal	Tan	0.0	QM
138	B	PapTowHolder	Rgt		I	Metal	Tan	0.0	QM
307	D	Wall	L Rgt		I	GlazedTile	Green	-0.1	QM
132	D	Partion Door	Lft		I	Metal	Tan	0.0	QM
Interior Room 013 Class A-35									
140	A	Wall	U Lft		I	Metal	OffWhite	0.0	QM
139	A	Ceiling			I	Metal	White	0.2	QM
143	A	Door	Lft	Header	I	Metal	Tan	1.0	QM
144	A	Door	Lft	Lft jamb	I	Metal	Tan	1.0	QM
145	A	Door	Lft	U Ctr	I	Metal	Tan	0.3	QM
146	B	Door	Lft	Rgt casing	I	Metal	Tan	0.0	QM
147	B	Door	Lft	Lft jamb	I	Metal	Tan	0.0	QM
148	B	Door	Lft	L Ctr	I	Metal	Tan	0.5	QM
141	D	Wall	L Ctr		I	Metal	OffWhite	0.0	QM
142	D	Column	Rgt		I	Metal	OffWhite	0.0	QM
Interior Room 014 Corridor									
150	C	Wall	L Rgt		I	Metal	OffWhite	0.6	QM
149	C	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
151	C	Lockers	Rgt		I	Metal	Green	-0.1	QM
152	C	BarJoist Str	Rgt		I	Metal	DkGray	1.0	QM
153	C	BarJoist Fl	Rgt		I	Metal	Gray	0.1	QM
Comment: Readings 152 & 153 taken above suspended ceiling.									
Interior Room 015 Class A-36									
154	B	Wall	L Ctr		I	Metal	OffWhite	0.0	QM
156	C	Wall	U Rgt		I	Metal	OffWhite	0.3	QM
158	C	Door	Rgt	Rgt casing	I	Metal	Tan	0.0	QM
159	C	Door	Rgt	U Lft	I	Metal	Tan	0.0	QM
155	D	Wall	L Lft		I	Metal	OffWhite	0.1	QM
157	D	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
Interior Room 016 36A Toilet									
163	A	Wall	L Lft		I	Metal	OffWhite	0.0	QM
162	B	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
161	C	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
160	C	Ceiling			I	Metal	White	-0.1	QM
165	C	Partition	Rgt		I	Metal	Salmon	0.2	QM
164	D	Wall	U Lft		I	ConcBlock	OffWhite	0.0	QM
Interior Room 017 36B Office									
170	A	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
168	A	Door	Rgt	Rgt jamb	I	Metal	Tan	0.0	QM
169	A	Door	Rgt	Lft jamb	I	Wood	Tan	0.0	QM
167	B	Wall	U Ctr		I	Metal	OffWhite	0.2	QM
166	B	Ceiling			I	Metal	White	-0.1	QM

MAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
171	B	Column	Rgt		I	Metal	OffWhite	0.0	QM
Interior Room 018 Corridor104									
175	A	Wall	L Rgt		I	Metal	OffWhite	0.3	QM
174	A	Wall	U Lft		I	Metal	OffWhite	0.0	QM
176	A	Door	Rgt	Lft jamb	I	Metal	Blue	0.3	QM
177	A	Door	Rgt	U Ctr	I	Metal	Gray	0.1	QM
172	C	BarJoist Fl	Ctr		I	Metal	Gray	0.0	QM
173	C	Corrig Deck	Ctr		I	Metal	Gray	0.4	QM
Comment: Readings 172 & 173 taken above suspended ceiling.									
Interior Room 019 WeightRoom									
179	B	Wall	L Rgt		I	ConcBlock	OffWhite	0.2	QM
178	C	Wall	L Ctr		I	Metal	OffWhite	0.2	QM
180	C	Wall	U Ctr		I	Drywall	OffWhite	-0.2	QM
183	C	Door	Lft	Lft jamb	I	Metal	Blue	-0.1	QM
184	C	Door	Lft	U Ctr	I	Metal	Gray	0.0	QM
181	D	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
182	D	Column	Lft		I	Metal	OffWhite	0.4	QM
Interior Room 020 Room D-11									
187	A	Wall	L Rgt		I	Metal	Tan	0.0	QM
189	A	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
188	A	Door	Rgt	Rgt casing	I	Metal	Tan	0.2	QM
186	B	Wall	L Ctr		I	Metal	OffWhite	0.0	QM
185	C	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM
Interior Room 021 Room D-18									
190	B	Wall	U Lft		I	Metal	OffWhite	0.0	QM
191	C	Wall	U Lft		I	Metal	OffWhite	0.0	QM
192	C	Door	Lft	Header	I	Metal	Tan	0.0	QM
193	C	Door	Lft	L Ctr	I	Metal	Tan	0.0	QM
Interior Room 022 Corridor103									
195	D	Wall	U Lft		I	ConcBlock	OffWhite	-0.1	QM
194	D	Wall	U Rgt		I	ConcBlock	OffWhite	-0.1	QM
196	D	Door	Ctr	Rgt casing	I	Metal	Blue	0.3	QM
197	D	Door	Ctr	L Ctr	I	Metal	Gray	0.1	QM
Interior Room 023 Room D-30									
210	A	Wall	U Ctr		I	ConcBlock	OffWhite	0.0	QM
207	A	Ceiling			I	Metal	White	0.0	QM
211	A	Door	Rgt	Lft jamb	I	Metal	Tan	0.0	QM
208	A	Corrig Deck	Ctr		I	Metal	Gray	0.2	QM
209	A	Clg Panel	Ctr		I	Metal	OffWhite	0.1	QM
198	B	Wall	L Lft		I	ConcBlock	OffWhite	-0.1	QM
199	B	Wall	U Rgt		I	ConcBlock	OffWhite	0.0	QM
202	B	Door	Rgt	Lft casing	I	Metal	Tan	0.0	QM
203	B	Door	Rgt	U Lft	I	Metal	Tan	0.4	QM
200	B	Column	Lft		I	Metal	OffWhite	1.0	QM
205	B	Lockers	Lft		I	Metal	Tan	-0.1	QM
201	B	Column	Rgt		I	Metal	OffWhite	0.1	QM
204	B	Lockers	Rgt		I	Metal	Tan	0.1	QM
219	D	Wall	L Ctr		I	ConcBlock	OffWhite	0.0	QM
217	D	Door	Ctr	Rgt casing	I	Metal	Tan	0.2	QM
206	D	Door	Ctr	U Ctr	I	Metal	Tan	0.0	QM
206	D	Lockers	Rgt		I	Metal	Tan	-0.1	QM

TAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Interior Room 024 D-30 Toilet									
213	B	Partition	Lft		I	Metal	Tan	0.1	QM
214	B	Partition	Lft		I	Metal	Tan	0.2	QM
216	B	ShowerStall	Rgt		I	Concrete	Black	-0.2	QM
212	C	Ceiling			I	Metal	White	0.4	QM
215	D	Wall	U Lft		I	GlazedTile	Salmon	-0.2	QM
Interior Room 025 Room D-29									
223	A	HVAC Unit	Ctr		I	Metal	Tan	-0.1	QM
225	B	Wall	L Rgt		I	ConcBlock	OffWhite	0.0	QM
224	B	Wall	U Lft		I	ConcBlock	OffWhite	-0.2	QM
220	B	Ceiling			I	Metal	OffWhite	0.4	QM
226	B	Column	Ctr		I	Metal	OffWhite	1.0	QM
236	B	Lockers	Rgt		I	Metal	Tan	0.0	QM
237	B	Lockers	Rgt		I	Metal	Tan	0.3	QM
227	C	Wall	U Ctr		I	ConcBlock	OffWhite	0.2	QM
228	C	Door	Lft	Header	I	Metal	Tan	0.0	QM
221	C	Corrig Deck	Ctr		I	Metal	Gray	0.4	QM
222	C	Clg Panel	Ctr		I	Metal	OffWhite	0.1	QM
229	D	Door	Ctr	Rgt jamb	I	Metal	Tan	0.0	QM
230	D	Door	Ctr	U Ctr	I	Metal	Tan	0.0	QM
235	D	Lockers	Lft		I	Metal	Tan	-0.1	QM
Comment: Reading 223 at ceiling.									
Interior Room 026 D-29 Toilet									
231	A	Ceiling			I	Metal	OffWhite	0.2	QM
234	B	Coat Rack	Ctr		I	Wood	Tan	0.1	QM
232	C	Partition	Lft		I	Metal	Tan	0.0	QM
233	D	Wall	U Ctr		I	GlazedTile	Orange	0.0	QM
Interior Room 027 Corridor									
239	C	Door	Ctr	Rgt casing	I	Metal	Tan	0.1	QM
240	C	Door	Ctr	L Ctr	I	Metal	Tan	0.3	QM
238	D	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
Interior Room 028 Gymnasium									
241	B	Wall	L Lft		I	ConcBlock	Green	-0.1	QM
243	B	Wall	L Rgt		I	ConcBlock	Green	0.1	QM
242	B	Wall	U Lft		I	ConcBlock	LtGreen	0.1	QM
244	B	Wall	U Rgt		I	ConcBlock	LtGreen	-0.1	QM
245	B	Column	Lft		I	Metal	Green	0.0	QM
246	B	Molding	Lft		I	Wood	Green	0.0	QM
Comment: Reading 246 at roll-up door.									
Interior Room 029 CoachOffice									
249	A	Wall	U Ctr		I	ConcBlock	OffWhite	0.0	QM
250	B	Wall	U Ctr		I	ConcBlock	OffWhite	0.1	QM
258	B	Door	Lft	Lft jamb	I	Metal	Tan	0.0	QM
257	B	Closet	Lft	Wall	I	ConcBlock	Beige	0.0	QM
248	C	Wall	L Ctr		I	ConcBlock	OffWhite	-0.1	QM
254	C	Door	Rgt	Lft jamb	I	Metal	Tan	0.0	QM
253	C	Door	Rgt	L Ctr	I	Metal	Tan	0.4	QM
259	C	Closet	Rgt	Wall	I	ConcBlock	Beige	0.3	QM
247	D	Wall	U Rgt		I	ConcBlock	OffWhite	0.2	QM
255	D	Ceiling			I	Metal	White	0.4	QM
256	D	Window	Rgt	Lft casing	I	Metal	Tan	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
251	D	Door	Lft	Header	I	Metal	Tan	0.0	QM
252	D	Door	Lft	U Ctr	I	Metal	Tan	0.0	QM
Interior Room 030 Toilet									
262	D	Wall	L Lft		I	GlazedTile	Orange	-0.1	QM
261	D	Wall	U Lft		I	Concrete	OffWhite	0.2	QM
260	D	Wall	U Rgt		I	Concrete	OffWhite	0.2	QM
263	D	Door	Rgt	Rgt casing	I	Metal	Tan	0.2	QM
264	D	Door	Rgt	U Ctr	I	Metal	Tan	0.2	QM
Interior Room 031 Office D-31									
268	A	Wall	U Rgt		I	ConcBlock	OffWhite	0.0	QM
272	A	Door	Lft	Lft jamb	I	Metal	Tan	0.3	QM
273	A	Door	Lft	U Rgt	I	Metal	Tan	-0.1	QM
275	A	Closet	Rgt	Wall	I	ConcBlock	Beige	0.5	QM
276	A	Closet	Rgt	Wall	I	ConcBlock	Beige	0.0	QM
267	B	Wall	L Ctr		I	ConcBlock	OffWhite	0.0	QM
277	B	Closet	Rgt	Wall	I	ConcBlock	Beige	0.0	QM
266	C	Wall	U Rgt		I	ConcBlock	OffWhite	0.1	QM
274	C	Ceiling			I	Metal	White	0.2	QM
265	D	Wall	L Ctr		I	ConcBlock	OffWhite	0.2	QM
269	D	Window	Lft	Rgt casing	I	Metal	Tan	0.0	QM
270	D	Door	Rgt	Header	I	Metal	Tan	0.2	QM
271	D	Door	Rgt	L Ctr	I	Metal	Tan	0.2	QM
Interior Room 032 Toilet									
278	A	Ceiling			I	Metal	White	0.0	QM
278	B	Wall	U Rgt		I	Concrete	OffWhite	0.5	QM
280	D	Wall	L Rgt		I	GlazedTile	Blue	-0.2	QM
279	D	Wall	U Rgt		I	Concrete	OffWhite	0.0	QM
Interior Room 033 Corridor F									
291	A	Wall	L Rgt		I	ConcBlock	OffWhite	0.0	QM
293	A	Door	Ctr	Rgt casing	I	Metal	Tan	-0.1	QM
292	A	Door	Ctr	L Lft	I	Metal	Tan	0.0	QM
290	B	Wall	L Lft		I	ConcBlock	OffWhite	-0.1	QM
296	B	Door	Ctr	Rgt jamb	I	Metal	Tan	0.0	QM
297	B	Door	Ctr	U Lft	I	Metal	Tan	0.2	QM
282	D	Wall	U Ctr		I	ConcBlock	OffWhite	0.0	QM
289	D	Wall	U Rgt		I	ConcBlock	OffWhite	-0.1	QM
283	D	Door	Ctr	Lft casing	I	Metal	Tan	0.1	QM
284	D	Door	Ctr	U Ctr	I	Metal	Tan	0.5	QM
294	D	Corrig Deck	Rgt		I	Metal	Gray	0.4	QM
295	D	BarJoist Fl	Rgt		I	Metal	Red	0.0	QM
Comment: Readings 294 & 295 taken above suspended ceiling.									
Interior Room 034 Cafeteria									
305	A	Wall	L Rgt		I	Brick	Green	0.0	QM
304	A	Wall	U Rgt		I	ConcBlock	Blue	-0.1	QM
303	B	Wall	L Rgt		I	Metal	Beige	-0.1	QM
298	B	Column	Ctr		I	Metal	Beige	-0.1	QM
299	B	Panel	Ctr		I	Metal	Beige	0.4	QM
300	B	Transom	Ctr		I	Metal	Beige	1.0	QM
Calibration Readings									
001								2.0	QM
								1.8	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
003								1.9	QM
004								0.0	QM
005								0.1	QM
006								0.0	QM
308								2.0	QM
309								1.8	QM
310								2.1	QM
311								0.2	QM
312								-0.1	QM
313								0.1	QM
----- End of Readings -----									

Summary Report of Lead Paint Inspection for: Elmira City School District

Inspection Date: 12/28/99
 Report Date: 1/6/00
 Statement Level: 1.0
 Report No. S#01262 - 12/28/99 09:46
 Total Readings: 313 Actionable: 23
 Inspection Started: 12/28/99 09:46
 Inspection Finished: 12/28/99 15:42

Broadway Middle & Elementary School
 1000 Broadway Street
 Elmira, New York 14904

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Exterior Room 001 B Wing									
030	C	Panel	Rgt		P	Metal	Red	2.7	QM
031	C	Panel	Rgt		P	Metal	Red	2.4	QM
Comment: Readings 30 & 31 taken at fill panels at side of door unit.									
Exterior Room 002 F Wing									
086	A	Soffit			I	Metal	Beige	1.5	QM
Exterior Room 003 Cafeteria									
0301	B	Transom	Lft		I	Metal	Red	2.3	QM
Interior Room 001 Class B-4									
027	C	BarJoist Str	Ctr		I	Metal	Gray	1.0	QM
009	D	BarJoist Str	Lft		I	Metal	Gray	1.0	QM
Interior Room 004 Corridor B									
035	C	Panel	Lft		I	Metal	Tan	3.0	QM
036	C	Panel	Ctr		I	Metal	Tan	3.1	QM
037	C	Panel	Rgt		I	Metal	Tan	3.0	QM
Comment: Readings 35 - 37 taken at fill panels of door unit.									
Readings 73 & 74 taken above suspended ceiling.									
Readings 78 & 79 taken at B7.									
Reading 93 taken at display case.									
Interior Room 007 Class B-6									
087	B	BarJoist Pl	Ctr		I	Metal	Tan	4.0	QM
088	B	BarJoist Str	Ctr		I	Metal	Tan	1.0	QM
089	B	BarJoist Pl	Ctr		I	Metal	Tan	1.7	QM
Comment: BarJoist Pl = Bar Joist Plate at union.									
Interior Room 008 Class B-1									
102	B	Column	Ctr		I	Metal	Brown	1.6	QM
Comment: Readings 94 & 95 taken above suspended ceiling.									
Interior Room 010 Corridor A									
123	C	I Beam	Lft		I	Metal	DkGray	1.8	QM
125	C	BarJoist Str	Lft		I	Metal	Gray	1.0	QM
Comment: Reading 123 taken at union.									
Interior Room 012 Room A-32									
134	B	Door	Lft	Rgt casing	I	Metal	Tan	1.0	QM
136	B	Door	Lft	Lft jamb	I	Metal	Tan	1.0	QM
Interior Room 013 Class A-35									
143	A	Door	Lft	Header	I	Metal	Tan	1.0	QM
144	A	Door	Lft	Lft jamb	I	Metal	Tan	1.0	QM
Interior Room 014 Corridor									
152	C	BarJoist Str	Rgt		I	Metal	DkGray	1.0	QM
Comment: Readings 152 & 153 taken above suspended ceiling.									

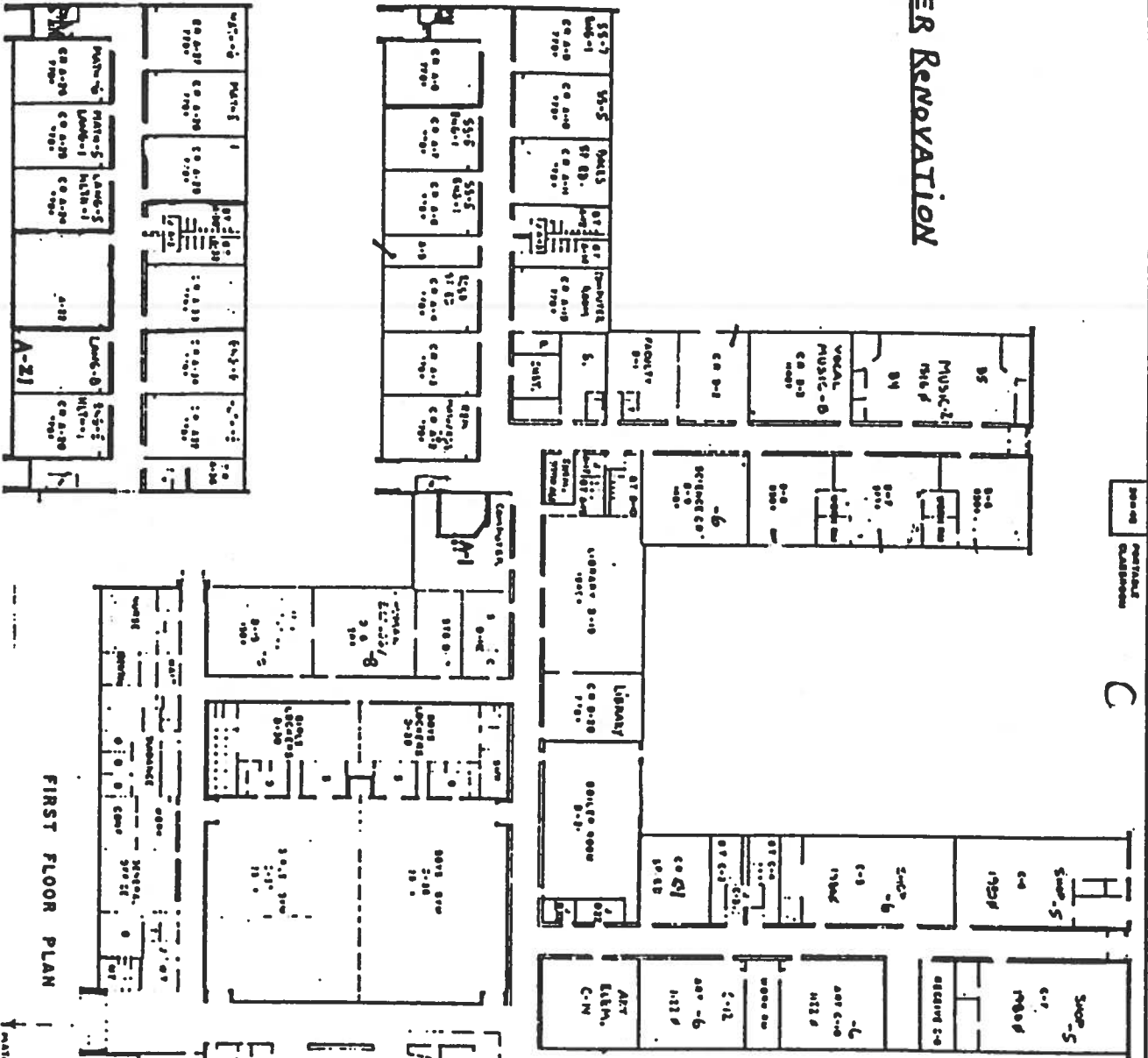
INARY REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

ding	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
terior Room 023 Room D-30									
0	B	Column	Lft		I	Metal	OffWhite	1.0	QM
terior Room 025 Room D-29									
6	B	Column	Ctr		I	Metal	OffWhite	1.0	QM
mmment: Reading 223 at ceiling.									
terior Room 034 Cafeteria									
0	B	Transom	Ctr		I	Metal	Beige	1.0	QM

libration Readings

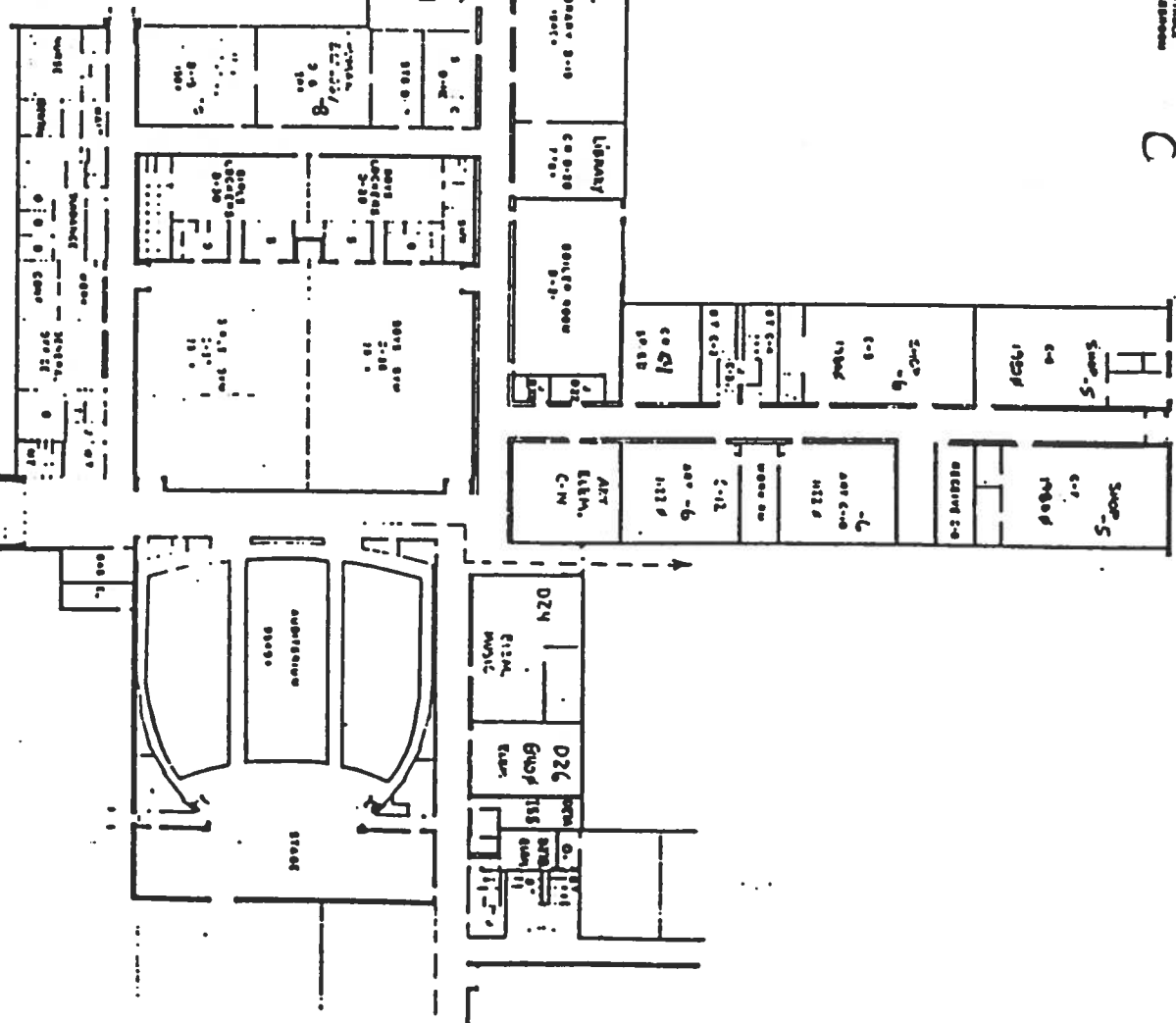
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UNDER RENOVATION

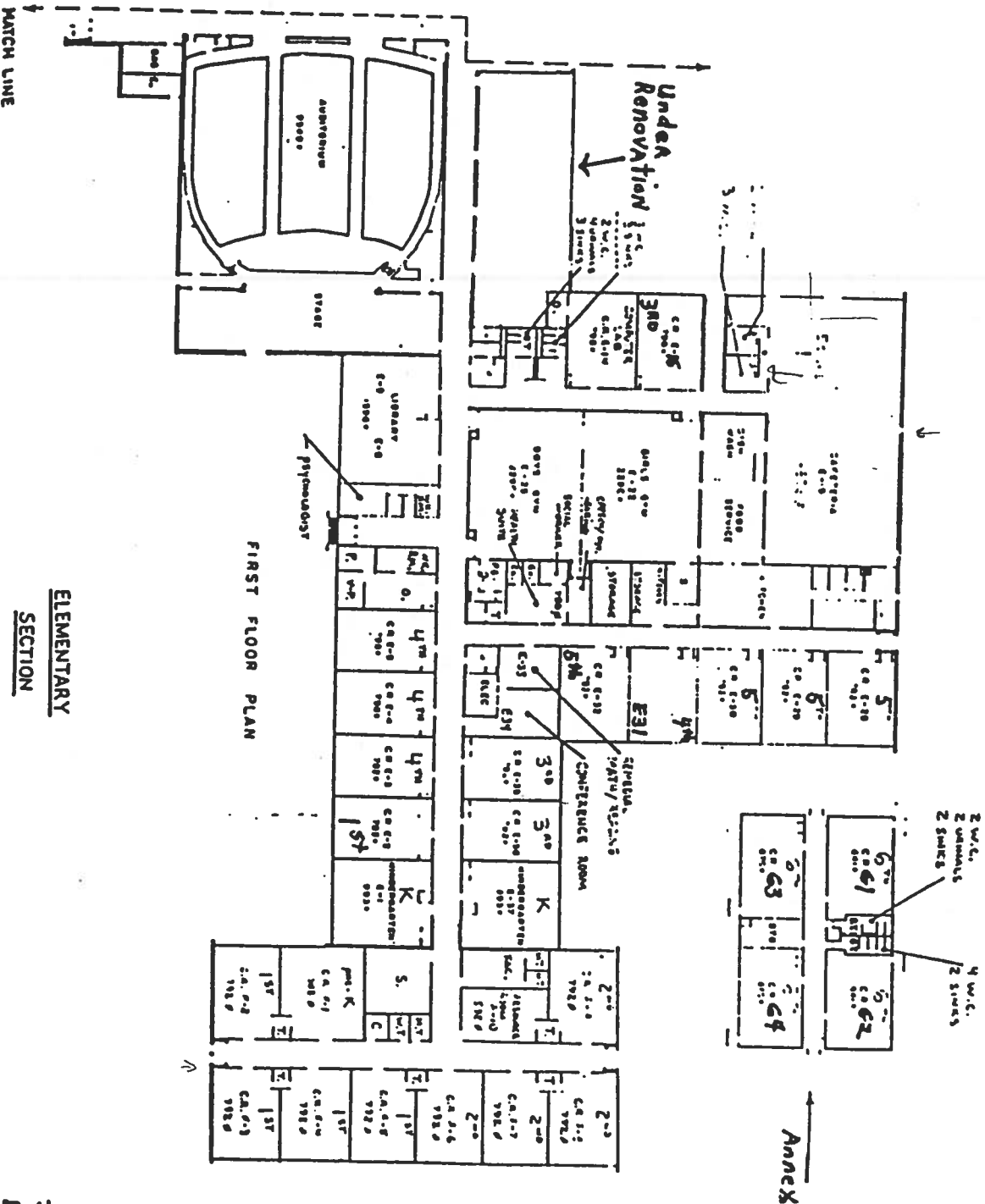


SECOND FLOOR PLAN

FIRST FLOOR PLAN



Art
C-14
2004
B
774
(on other map)



ELEMENTARY
SECTION

A

2/12/97
10/7/94, APFL
10/15, 12/2/96,
BROADWAY SCHOOL 2/6/97

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Inspection Date: 10/15/01
 Report Date: 10/22/2001
 Abatement Level: 1.0
 Report No. S#01133 - 10/15/01 15:13
 Total Readings: 549
 Job Started: 10/15/01 15:13
 Job Finished: 10/15/01 21:56

Broadway Elementary School
 1000 Broadway
 Elmira, New York 14904

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Exterior Room 001 Exterior									
181	A	Door	Lft	Rgt casing	I	Metal	Burgundy	-0.1	QM
180	A	Door	Lft	U Ctr	I	Metal	Burgundy	-0.1	QM
187	A	Door	Rgt	Lft casing	I	Metal	Burgundy	0.0	QM
186	A	Door	Rgt	U Lft	I	Metal	Burgundy	0.1	QM
179	A	Wall Panel	Lft		I	Metal	Beige	0.1	QM
182	A	Door Panel	Lft		I	Metal	Burgundy	2.6	QM
183	A	Fascia	Ctr		I	Metal	Burgundy	0.1	QM
184	A	Soffit	Ctr		I	Metal	OffWhite	0.0	QM
185	A	WindowPanel	Rgt		I	Metal	Burgundy	0.2	QM
188	A	Door Panel	Rgt		I	Metal	Burgundy	3.3	QM
192	A	Wall Panel	Rgt		I	Metal	Beige	0.3	QM
194	B	Door	Rgt	Header	I	Metal	Burgundy	-0.1	QM
193	B	Door	Rgt	U Lft	I	Metal	Burgundy	0.0	QM
205	B	WindowPanel	Ctr		I	Metal	Burgundy	1.4	QM
206	B	Wall Panel	Ctr		I	Metal	Beige	1.7	QM
189	B	Door Panel	Rgt		I	Metal	Burgundy	2.1	QM
190	B	WindowPanel	Rgt		I	Metal	Burgundy	1.6	QM
191	B	Wall Panel	Rgt		I	Metal	Beige	1.8	QM
195	B	Fascia	Rgt		I	Metal	Burgundy	-0.2	QM
196	B	Soffit	Rgt		I	Metal	Beige	1.5	QM
203	C	Door	Lft	Header	I	Metal	Burgundy	-0.1	QM
202	C	Door	Lft	U Ctr	I	Metal	Burgundy	0.0	QM
214	C	Door	Rgt	Lft casing	I	Metal	Burgundy	0.1	QM
213	C	Door	Rgt	U Ctr	I	Metal	Burgundy	-0.1	QM
201	C	CeilingPanel	Lft		I	Metal	Beige	1.9	QM
204	C	Fascia	Lft		I	Metal	Burgundy	-0.1	QM
207	C	WindowPanel	Lft		I	Metal	Burgundy	0.3	QM
212	C	Door Panel	Rgt		I	Metal	Burgundy	2.5	QM
215	C	CeilingPanel	Rgt		I	Metal	Beige	0.3	QM
216	C	Door Lintel	Rgt		I	Metal	Burgundy	0.0	QM
217	C	WindowPanel	Rgt		I	Metal	Beige	0.0	QM
197	D	Wall Panel	Lft		I	Metal	Beige	1.5	QM
198	D	WindowPanel	Lft		I	Metal	Burgundy	1.9	QM
199	D	Fascia	Lft		I	Metal	Burgundy	-0.2	QM
200	D	Soffit	Lft		I	Metal	Beige	1.6	QM
208	D	Fascia	Rgt		I	Metal	Burgundy	0.1	QM
209	D	Soffit	Rgt		I	Metal	Beige	0.0	QM
210	D	Wall Panel	Rgt		I	Metal	Beige	0.3	QM
211	D	WindowPanel	Rgt		I	Metal	Burgundy	0.2	QM
Comment: Reading 182, above door. Reading 201, above door at entry.									

Interior Room 001 CompLab E5

007	A	Wall	U Rgt		I	Metal	Beige	0.2	QM
011	A	WindowPanel	Lft		I	Metal	Beige	0.2	QM
012	A	Shelf Unit	Lft		I	Metal	Tan	0.2	QM
008	B	Wall	L Rgt		I	Metal	OffWhite	0.1	QM
023	B	Ceiling			I	Metal	White	0.2	QM
009	C	Wall	U Lft		I	Metal	OffWhite	0.0	QM
013	C	Door	Ctr	Lft jamb	I	Metal	Tan	-0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
014	C	Door	Ctr	U Rgt	I	Metal	Tan	0.3	QM
020	C	Closet	Lft	Door	I	Wood	Natural	-0.1	QM
021	C	Closet	Lft	Door Casing	I	Wood	Natural	-0.1	QM
017	C	Closet	Lft	Wall	I	Metal	Yellow	0.0	QM
019	C	Closet	Lft	Shelf	I	Wood	Natural	-0.1	QM
018	C	Closet	Lft	Ceiling	I	Metal	Yellow	-0.1	QM
022	C	CeilingGrill	Lft		I	Metal	Yellow	0.0	QM
010	D	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
016	D	Closet	Lft	Door	I	Metal	Tan	0.1	QM
015	D	Closet	Lft	Wall	I	Metal	LtBlue	0.1	QM

Interior Room 002 Class E4

024	A	Wall	U Lft		I	Metal	Beige	0.4	QM
034	A	Column	Ctr	U column	I	Metal	OffWhite	-0.1	QM
027	B	Wall	L Rgt		I	Metal	OffWhite	0.0	QM
037	B	Clg Louver	Rgt		I	Metal	White	-0.1	QM
026	C	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
029	C	Door	Ctr	Rgt jamb	I	Metal	Tan	-0.1	QM
028	C	Door	Ctr	U Lft	I	Metal	Tan	0.2	QM
036	C	Closet	Lft	Door Jamb	I	Wood	Natural	0.0	QM
035	C	Closet	Lft	Wall	I	Metal	LtBlue	0.3	QM
030	C	Cabinet	Rgt		I	Wood	Natural	0.0	QM
025	D	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
039	D	Window	Rgt	Lft jamb	I	Wood	OffWhite	0.0	QM
038	D	Door	Ctr	Header	I	Wood	OffWhite	0.0	QM
033	D	Closet	Lft	Door	I	Metal	Tan	0.3	QM
031	D	Closet	Lft	Wall	I	Metal	Green	0.0	QM
032	D	Closet	Lft	Shelf	I	Wood	Natural	0.0	QM

Interior Room 003 Class E3

047	A	Door	Lft	Lft jamb	I	Metal	Tan	0.1	QM
046	A	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
045	A	Column	Ctr	U column	I	Metal	OffWhite	-0.1	QM
048	A	Frame	Lft		I	Metal	Tan	0.1	QM
044	A	WindowPanel	Ctr		I	Metal	Beige	0.2	QM
042	B	Wall	U Lft		I	Metal	OffWhite	0.0	QM
043	C	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
052	C	Closet	Lft	Door	I	Wood	Natural	-0.1	QM
050	C	Closet	Lft	Wall	I	Metal	Yellow	-0.1	QM
051	C	Closet	Lft	Shelf	I	Wood	Natural	-0.2	QM
041	D	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM
049	D	Shelf Unit	Ctr		I	Wood	Natural	0.0	QM
040	D	LightFixture	Rgt		I	Metal	White	-0.1	QM

Interior Room 004 Toilet

054	A	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
057	A	Door	Rgt	Header	I	Metal	Tan	0.0	QM
058	A	Door	Rgt	U Lft	I	Metal	Tan	0.0	QM
055	B	Baseboard	Ctr		I	Metal	Gray	-0.1	QM
053	C	Wall	U Lft		I	Metal	OffWhite	0.0	QM
056	D	Floor			I	Concrete	Gray	-0.1	QM

Interior Room 005 Class E2

063	A	Wall	U Rgt		I	Metal	Beige	0.1	QM
067	A	Door	Lft	Lft casing	I	Metal	Tan	-0.1	QM
066	A	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
064	A	Column	Ctr	U column	I	Metal	OffWhite	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm²)	Mode
065	A	Shelf Unit	Rgt		I	Metal	Tan	-0.1	QM
062	B	Wall	L Ctr		I	Metal	OffWhite	-0.1	QM
061	C	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
069	C	Closet	Lft	Door	I	Wood	Natural	0.0	QM
068	C	Closet	Lft	Wall	I	Metal	LtBlue	0.0	QM
070	C	CeilingGrill	Lft		I	Metal	Yellow	0.0	QM
060	D	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
059	D	Ceiling			I	Metal	White	0.0	QM

Comment: Reading 70 at closet.

Interior Room 006 Toilet

074	A	Door	Rgt	Lft casing	I	Metal	Tan	-0.1	QM
075	A	Door	Rgt	U Ctr	I	Metal	Tan	0.2	QM
072	B	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
073	C	Baseboard	Lft		I	Metal	Gray	0.0	QM
071	D	Wall	U Ctr		I	Metal	OffWhite	0.4	QM

Interior Room 007 Class E1

083	A	Door	Lft	Rgt jamb	I	Metal	Tan	0.0	QM
082	A	Door	Lft	U Lft	I	Metal	Tan	0.2	QM
076	A	WindowPanel	Lft		I	Metal	Beige	0.4	QM
080	A	Shelf Unit	Ctr		I	Metal	Tan	0.0	QM
079	B	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
085	B	Shelf Unit	Rgt		I	Wood	Natural	0.0	QM
078	C	Wall	U Ctr		I	Metal	OffWhite	0.1	QM
089	C	Closet	Ctr	Door	I	Metal	Tan	0.1	QM
088	C	Closet	Ctr	Door Casing	I	Metal	Tan	0.0	QM
087	C	Closet	Ctr	Wall	I	Metal	Green	0.1	QM
086	C	Closet	Ctr	Ceiling	I	Metal	Green	0.1	QM
084	C	Wall Vent	Lft		I	Metal	OffWhite	0.0	QM
077	D	Wall	U Rgt		I	ConcBlock	OffWhite	0.0	QM
081	D	Column	Rgt	L column	I	Metal	OffWhite	0.0	QM

Interior Room 008 Toilet

091	A	Wall	L Lft		I	Metal	OffWhite	0.0	QM
094	A	Door	Rgt	Header	I	Metal	Tan	0.1	QM
093	B	Floor			I	Concrete	Gray	-0.1	QM
090	C	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
092	D	Baseboard	Rgt		I	Metal	Gray	0.0	QM

Interior Room 009 Office E6

098	A	Wall	U Ctr		I	Drywall	OffWhite	0.0	QM
099	B	Wall	L Rgt		I	Drywall	OffWhite	-0.2	QM
102	B	Door	Ctr	Lft jamb	I	Metal	Tan	-0.1	QM
096	C	Wall	L Ctr		I	Metal	OffWhite	0.2	QM
101	C	Door	Lft	U Ctr	I	Metal	Tan	0.0	QM
100	C	Column	Lft	L column	I	Metal	OffWhite	-0.1	QM
095	C	Wall Vent	Ctr		I	Metal	OffWhite	0.2	QM
097	D	Wall	L Lft		I	Metal	OffWhite	0.2	QM

Interior Room 010 Workrm E6A

106	A	Wall	U Lft		I	Drywall	Beige	0.0	QM
104	B	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
107	B	Window	Ctr	Lft casing	I	Wood	Tan	0.0	QM
103	C	Wall	L Rgt		I	Metal	OffWhite	0.1	QM
105	D	Wall	U Ctr		I	Drywall	Beige	0.1	QM
108	D	Door	Ctr	Header	I	Metal	Tan	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Interior Room 011 PrinOff E6B									
110	A	Wall	U Rgt		I	Metal	Beige	0.0	QM
109	D	Ceiling			I	Metal	White	0.2	QM
112	D	Door	Lft	Rgt casing	I	Metal	Tan	0.0	QM
111	D	Door	Lft	U Ctr	I	Metal	Tan	-0.1	QM
Interior Room 012 VPrinOffE6C									
114	A	WindowPanel	Ctr		I	Metal	Beige	0.0	QM
118	A	Shelf Unit	Rgt		I	Metal	Tan	0.0	QM
116	C	Door	Lft	Header	I	Metal	Tan	0.0	QM
117	C	Door	Lft	U Ctr	I	Metal	Tan	0.3	QM
113	D	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
115	D	Column	Rgt	U column	I	Metal	OffWhite	0.1	QM
Interior Room 013 Lobby									
123	A	Door	Lft	Rgt jamb	I	Metal	Tan	-0.1	QM
122	A	Door	Rgt	U Lft	I	Metal	Tan	-0.1	QM
124	A	HVAC Unit	Ctr		I	Metal	Tan	-0.1	QM
121	B	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM
125	B	Window	Ctr	Header	I	Metal	Blue	-0.1	QM
120	C	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
126	C	Door	Lft	U Ctr	I	Metal	Gray	0.0	QM
127	C	Door	Rgt	Rgt casing	I	Metal	Blue	0.0	QM
119	D	Wall	L Rgt		I	Metal	OffWhite	-0.1	QM
128	D	Window	Lft	Rgt casing	I	Wood	Blue	0.0	QM
131	D	Ceiling Grid	Lft		I	Metal	White	0.1	QM
129	D	Corrig Deck	Ctr		I	Metal	Gray	-0.1	QM
130	D	Bar Joist	Ctr		I	Metal	Gray	-0.1	QM
Comment: Reading 124, mounted at ceiling.									
Interior Room 014 Workroom									
132	A	Wall	U Lft		I	Metal	Beige	0.0	QM
136	A	Shelf Unit	Ctr		I	Metal	Tan	-0.1	QM
135	B	Wall	U Lft		I	Metal	OffWhite	0.0	QM
134	C	Wall	L Rgt		I	Metal	OffWhite	0.0	QM
137	C	Door	Lft	Rgt jamb	I	Metal	Tan	0.0	QM
133	D	Wall	U Ctr		I	Metal	OffWhite	-0.2	QM
138	D	Door	Lft	U Rgt	I	Metal	Gray	0.0	QM
Interior Room 015 Hallway									
139	A	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
144	A	Door	Ctr	Header	I	Metal	Tan	0.0	QM
140	B	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
141	C	Wall	U Ctr		I	Metal	OffWhite	0.2	QM
143	C	Door	Ctr	U Lft	I	Metal	Tan	0.0	QM
142	D	Wall	L Rgt		I	Metal	OffWhite	0.1	QM
Interior Room 016 Storage									
146	A	Wall	U Lft		I	Metal	OffWhite	0.0	QM
147	B	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM
150	B	Door	Ctr	Header	I	Metal	Tan	0.0	QM
149	B	Door	Ctr	U Rgt	I	Metal	Tan	0.0	QM
148	C	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
145	D	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
Interior Room 017 Toilet									

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
153	A	Wall	L Ctr		I	Metal	OffWhite	0.0	QM
152	B	Wall	L Rgt		I	Metal	OffWhite	0.0	QM
155	B	Door	Lft	Rgt casing	I	Metal	Tan	0.0	QM
156	B	Door	Lft	U Ctr	I	Metal	Tan	0.0	QM
151	C	Wall	U Lft		I	Metal	OffWhite	0.1	QM
154	D	Wall	U Lft		I	Metal	OffWhite	-0.1	QM

Interior Room 018 Workrm E7

159	A	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
163	A	Door	Rgt	Header	I	Metal	Tan	0.0	QM
158	B	Wall	L Ctr		I	Metal	OffWhite	0.1	QM
157	C	Wall	U Lft		I	Metal	OffWhite	0.1	QM
162	C	Door	Lft	U Ctr	I	Metal	Tan	0.0	QM
161	C	Column	Rgt	L column	I	Metal	OffWhite	0.2	QM
160	D	Wall	U Rgt		I	Metal	OffWhite	0.0	QM

Interior Room 019 Library

169	A	Wall	U Rgt		I	Metal	Beige	0.1	QM
165	A	Column	Lft	U column	I	Metal	OffWhite	0.1	QM
170	A	Shelf Unit	Ctr		I	Metal	Tan	0.0	QM
168	B	Wall	U Rgt		I	Wood	Blue	0.0	QM
173	B	Clg Louver	Rgt		I	Metal	White	0.0	QM
167	C	Wall	L Rgt		I	Metal	OffWhite	0.0	QM
171	C	Door	Lft	U Ctr	I	Metal	Tan	-0.1	QM
172	C	Door	Rgt	Lft casing	I	Metal	Tan	0.1	QM
177	C	Closet	Lft	Door	I	Wood	Natural	0.0	QM
175	C	Closet	Lft	Wall	I	Metal	OffWhite	0.0	QM
178	C	Closet	Lft	Shelf	I	Wood	Natural	0.0	QM
176	C	CeilingGrill	Lft		I	Metal	OffWhite	0.1	QM
174	C	Cabinet	Ctr		I	Wood	Natural	0.0	QM
164	C	Wall Vent	Rgt		I	Metal	OffWhite	0.0	QM
166	D	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM

Comment: Reading 176 at closet.

Interior Room 020 Toilet E11

219	A	Wall	L Rgt		I	GlazedTile	OffWhite	-0.1	QM
222	A	Door	Lft	Rgt casing	I	Metal	Blue	-0.1	QM
223	A	Door	Lft	U Ctr	I	Wood	Natural	-0.1	QM
221	B	Wall	L Ctr		I	GlazedTile	Burgundy	0.0	QM
218	C	Wall	U Ctr		I	Drywall	OffWhite	0.0	QM
220	D	Wall	L Rgt		I	GlazedTile	Aqua	-0.1	QM

Interior Room 021 Toilet E11A

227	A	Wall	L Lft		I	GlazedTile	Beige	-0.1	QM
229	A	Door	Rgt	Header	I	Metal	Blue	0.3	QM
228	A	Door	Rgt	U Ctr	I	Metal	Gray	0.0	QM
225	B	Wall	L Lft		I	GlazedTile	Beige	0.0	QM
224	C	Wall	U Ctr		I	GlazedTile	Beige	-0.2	QM
226	D	Wall	U Rgt		I	GlazedTile	Beige	-0.1	QM

Interior Room 022 Cust E15

232	A	Door	Rgt	Lft jamb	I	Metal	Blue	-0.2	QM
233	A	Door	Rgt	U Ctr	I	Metal	Gray	0.2	QM
230	A	Corrig Deck	Rgt		I	Metal	Gray	0.1	QM
231	A	Bar Joist	Rgt		I	Metal	Gray	0.0	QM
234	B	Shelf Unit	Lft		I	Wood	Natural	0.0	QM

Comment: Readings 230 & 231, above suspended ceiling.

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Interior Room 023 Corridor100									
236	A	Wall	L Rgt		I	GlazdBrick	Aqua	0.6	QM
242	A	Wall	U Ctr		I	Metal	Yellow	0.0	QM
237	A	Wall	U Rgt		I	ConcBlock	White	0.0	QM
248	A	Door	Lft	Rgt jamb	I	Metal	Tan	0.1	QM
246	A	Door	Lft	U Ctr	I	Metal	Tan	0.0	QM
249	A	Door	Ctr	Lft casing	I	Metal	Blue	0.1	QM
250	A	Door	Ctr	U Rgt	I	Metal	Blue	-0.1	QM
253	A	Fire Cabinet	Lft		I	Metal	White	0.0	QM
251	A	Wall Grill	Ctr		I	Metal	Yellow	0.0	QM
235	B	Wall	U Rgt		I	GlazedTile	Aqua	-0.1	QM
239	C	Wall	L Lft		I	GlazedTile	OffWhite	-0.1	QM
238	C	Wall	U Lft		I	Drywall	White	-0.2	QM
243	C	Wall	U Rgt		I	Metal	Yellow	0.2	QM
241	C	Baseboard	Lft		I	GlazedTile	Black	-0.3	QM
240	C	Chair rail	Lft		I	GlazedTile	Black	-0.1	QM
254	C	Door	Lft	Lft jamb	I	Metal	Blue	0.0	QM
247	C	Door	Rgt	Lft casing	I	Metal	Tan	-0.1	QM
255	C	Column	Lft	U column	I	Metal	Burgundy	0.0	QM
252	C	Fire Cabinet	Ctr		I	Metal	Red	0.3	QM
244	D	Door	Ctr	Header	I	Metal	Blue	0.0	QM
245	D	HVAC Unit	Ctr		I	Metal	Tan	0.0	QM
Comment: Reading 245, mounted at ceiling.									

Interior Room 024 BToiletE12									
256	A	Wall	L Lft		I	GlazedTile	Green	0.0	QM
260	A	Partition	Lft		I	Metal	Tan	0.3	QM
259	B	Wall	L Rgt		I	GlazedTile	Green	-0.1	QM
258	C	Wall	U Ctr		I	GlazedTile	Green	-0.3	QM
257	D	Wall	U Ctr		I	GlazedTile	Green	-0.1	QM
262	D	Door	Rgt	Lft casing	I	Metal	Blue	0.1	QM
261	D	Door	Rgt	U Ctr	I	Wood	Tan	0.0	QM

Interior Room 025 GToiletE13									
267	A	Wall	U Rgt		I	GlazedTile	Beige	0.1	QM
266	B	Wall	L Rgt		I	GlazedTile	Beige	-0.1	QM
265	C	Wall	U Ctr		I	GlazedTile	Beige	0.0	QM
263	C	Corrig Deck	Ctr		I	Metal	Gray	0.0	QM
264	C	SkyLightWall	Ctr		I	Drywall	White	0.2	QM
271	C	Partition	Ctr		I	Metal	Tan	0.2	QM
268	D	Wall	U Ctr		I	GlazedTile	Beige	-0.2	QM
270	D	Door	Lft	Header	I	Metal	Blue	0.1	QM
269	D	Door	Lft	U Ctr	I	Wood	Gray	0.0	QM

Interior Room 026 Pract E14A									
272	A	Wall	U Rgt		I	Metal	White	0.2	QM
275	B	Wall	U Lft		I	Drywall	White	0.0	QM
276	B	Door	Lft	Rgt casing	I	Metal	Blue	0.0	QM
274	C	Wall	U Rgt		I	Drywall	White	-0.1	QM
278	C	Window	Lft	Lft casing	I	Metal	Burgundy	0.0	QM
273	D	Wall	L Ctr		I	Metal	White	0.0	QM
277	D	Door	Lft	U Ctr	I	Wood	Natural	-0.2	QM

Interior Room 027 ElInstr E14									
283	A	Wall	U Rgt		I	Metal	White	0.0	QM
289	A	Door	Rgt	U Lft	I	Wood	Natural	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
286	B	Wall	U Ctr		I	Metal	Beige	0.1	QM
287	B	Column	Ctr	U column	I	Metal	White	0.1	QM
291	B	Univent	Ctr		I	Metal	Beige	0.0	QM
292	B	Shelf Unit	Rgt		I	Wood	Natural	-0.1	QM
285	C	Wall	L Rgt		I	Drywall	White	0.0	QM
290	C	Window	Rgt	Lft casing	I	Metal	Burgundy	-0.1	QM
288	C	Door	Lft	Rgt casing	I	Metal	Blue	0.0	QM
284	D	Wall	L Ctr		I	Drywall	LtOrange	-0.1	QM
Interior Room 028 Pract E14B									
293	A	Wall	U Lft		I	Drywall	White	-0.3	QM
295	B	Wall	U Ctr		I	Drywall	White	-0.1	QM
299	B	Window	Lft	Rgt casing	I	Metal	Burgundy	0.0	QM
298	B	Door	Rgt	U Ctr	I	Wood	Natural	-0.1	QM
296	C	Wall	L Rgt		I	Metal	White	-0.1	QM
294	D	Wall	U Rgt		I	Drywall	White	0.0	QM
297	D	Door	Lft	Header	I	Metal	Blue	0.0	QM
Interior Room 029 GToiletE19C									
300	A	Wall	U Rgt		I	ConcBlock	Gray	0.0	QM
307	A	Partition	Ctr		I	Metal	Blue	0.1	QM
301	B	Wall	U Ctr		I	ConcBlock	Gray	-0.1	QM
305	B	Door	Rgt	Header	I	Metal	Tan	0.0	QM
304	B	Door	Rgt	U Ctr	I	Metal	Tan	-0.1	QM
306	B	Door Lintel	Rgt		I	Metal	Tan	0.0	QM
302	C	Wall	L Lft		I	ConcBlock	Gray	0.0	QM
303	D	Wall	U Rgt		I	ConcBlock	Gray	-0.1	QM
308	D	Column	Rgt	U column	I	Metal	Gray	0.5	QM
Interior Room 030 BToiletE19D									
309	A	Wall	L Rgt		I	ConcBlock	Gray	-0.1	QM
313	A	Partition	Ctr		I	Metal	Blue	-0.1	QM
310	B	Wall	U Lft		I	ConcBlock	Gray	0.1	QM
311	C	Wall	L Ctr		I	ConcBlock	Gray	0.0	QM
312	D	Wall	U Rgt		I	ConcBlock	Gray	0.0	QM
316	D	Door	Lft	Rgt jamb	I	Metal	Tan	0.0	QM
315	D	Door	Lft	U Rgt	I	Metal	Tan	0.1	QM
314	D	Door Lintel	Lft		I	Metal	Tan	0.3	QM
Interior Room 031 Cafe E19									
319	A	Wall	L Lft		I	GlazedTile	Beige	4.2	QM
320	A	Wall	L Rgt		I	GlazdBrick	Aqua	0.2	QM
321	A	Wall	L Rgt		I	GlazdBrick	Tan	0.2	QM
329	A	Door	Ctr	Lft casing	I	Metal	Tan	0.2	QM
325	A	Column	Rgt	U column	I	Metal	Beige	0.4	QM
331	A	Wall Vent	Lft		I	Metal	Tan	0.0	QM
322	B	Wall	U Lft		I	GlazedTile	OffWhite	-0.2	QM
323	B	Baseboard	Rgt		I	GlazedTile	Black	-0.2	QM
332	B	Column	Ctr	U column	I	Metal	Burgundy	0.0	QM
317	C	Wall	U Rgt		I	ConcBlock	Blue	-0.1	QM
328	C	Door	Lft	U Rgt	I	Metal	Tan	-0.1	QM
324	C	Column	Lft	U column	I	Metal	Blue	0.0	QM
326	C	WindowPanel	Ctr		I	Metal	Beige	0.4	QM
327	C	HVAC Unit	Ctr		I	Metal	Blue	-0.1	QM
318	D	Wall	L Ctr		I	GlazedTile	Beige	4.4	QM
330	D	Column	Ctr	L column	I	Metal	Tan	0.0	QM

Comment: Reading 325, free standing. Reading 326, above window.

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Interior Room 032 DWashE21B									
336	A	Wall	L Ctr		I	GlazedBlk	Green	-0.2	QM
339	A	Bar Joist	Rgt		I	Metal	Gray	-0.1	QM
334	B	Wall	U Rgt		I	GlazedBlk	Green	2.1	QM
338	B	Door	Lft	Rgt casing	I	Metal	Blue	-0.3	QM
333	C	Wall	U Lft		I	GlazedBlk	Green	1.9	QM
337	C	Door	Ctr	U Lft	I	Metal	Tan	-0.1	QM
335	D	Wall	U Rgt		I	GlazedBlk	Green	1.8	QM
Comment: Reading 339, above suspended ceiling.									
Interior Room 033 FoodSerE21A									
342	A	Wall	U Lft		I	GlazedBlk	Green	2.7	QM
344	A	Door	Lft	U Rgt	I	Metal	Tan	0.2	QM
341	B	Wall	U Rgt		I	GlazedBlk	Green	2.2	QM
340	C	Wall	L Ctr		I	GlazedBlk	Green	2.4	QM
345	C	Door	Rgt	Lft jamb	I	Metal	Tan	0.1	QM
343	D	Wall	L Rgt		I	GlazedBlk	Green	2.6	QM
Interior Room 034 Kitchen E21									
346	A	Wall	L Ctr		I	GlazedBlk	Green	2.9	QM
353	A	Cabinet	Ctr		I	Metal	White	0.4	QM
347	B	Wall	U Lft		I	GlazedBlk	Green	1.8	QM
354	B	Column	Lft	L column	I	Metal	Tan	2.2	QM
348	C	Wall	U Rgt		I	GlazedBlk	Green	2.4	QM
351	C	Door	Ctr	Header	I	Metal	Tan	0.1	QM
352	C	HVAC Unit	Ctr		I	Metal	Tan	0.4	QM
349	D	Wall	U Lft		I	GlazedBlk	Green	2.8	QM
350	D	Door	Lft	U Ctr	I	Metal	Gray	0.0	QM
Comment: Reading 352, mounted at ceiling. Reading 354, free standing.									
Interior Room 035 Hallway									
355	A	Wall	U Ctr		I	ConcBlock	Green	0.0	QM
357	B	Wall	L Rgt		I	GlazedTile	LtGray	0.2	QM
360	B	Door	Lft	Rgt casing	I	Metal	Tan	0.1	QM
356	C	Wall	U Ctr		I	ConcBlock	Green	-0.2	QM
359	C	Door	Ctr	U Lft	I	Metal	Tan	0.3	QM
358	D	Wall	L Lft		I	GlazedTile	LtGray	0.0	QM
Interior Room 036 StorageE21A									
364	A	Wall	U Rgt		I	GlazedBlk	LtGray	0.2	QM
367	A	Shelf Unit	Ctr		I	Wood	Natural	-0.1	QM
363	B	Wall	U Rgt		I	GlazedBlk	LtGray	-0.2	QM
362	C	Wall	L Rgt		I	GlazedBlk	LtGray	-0.1	QM
361	D	Wall	U Lft		I	GlazedBlk	LtGray	0.2	QM
365	D	Door	Lft	Rgt jamb	I	Metal	Tan	0.1	QM
366	D	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
Interior Room 037 WLocker E13									
368	A	Wall	U Lft		I	GlazedBlk	Green	0.0	QM
371	B	Wall	U Rgt		I	GlazedBlk	Green	0.2	QM
372	B	Locker	Ctr		I	Metal	Tan	0.2	QM
370	C	Wall	U Ctr		I	GlazedBlk	Green	0.0	QM
374	C	Door	Rgt	Header	I	Metal	Tan	-0.1	QM
369	D	Wall	L Ctr		I	GlazedBlk	Green	-0.1	QM
373	D	Door	Rgt	U Lft	I	Metal	Tan	0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Interior Room 038 WomenToilet									
378	A	Wall	L Ctr		I	GlazedTile	LtGray	-0.1	QM
381	A	Door	Lft	U Ctr	I	Metal	Tan	0.1	QM
380	A	Partition	Ctr		I	Metal	Green	0.3	QM
377	B	Wall	U Ctr		I	GlazedBlk	Green	-0.1	QM
376	C	Wall	U Lft		I	GlazedBlk	Green	-0.2	QM
375	C	CeilingGrill	Lft		I	Metal	White	-0.2	QM
379	D	Wall	L Lft		I	GlazedTile	LtGray	-0.1	QM
Interior Room 039 Storage E12									
383	A	Wall	L Ctr		I	ConcBlock	LtGray	0.0	QM
382	B	Wall	U Lft		I	ConcBlock	LtGray	0.0	QM
387	B	Door	Lft	Header	I	Metal	Tan	-0.1	QM
386	B	Door	Lft	U Rgt	I	Metal	Tan	0.3	QM
384	D	Wall	U Rgt		I	ConcBlock	LtGray	0.2	QM
385	D	Column	Rgt	U column	I	Metal	LtGray	0.1	QM
Interior Room 040 Receiving									
392	A	Wall	L Ctr		I	ConcBlock	Green	0.0	QM
389	B	Wall	U Rgt		I	ConcBlock	Green	0.3	QM
388	B	Ceiling			I	Plaster	White	0.0	QM
394	B	Door	Rgt	Lft jamb	I	Metal	Tan	0.2	QM
390	C	Wall	L Lft		I	ConcBlock	Green	0.2	QM
393	C	Door	Ctr	U Lft	I	Metal	Tan	0.0	QM
391	D	Wall	U Rgt		I	ConcBlock	Green	0.0	QM
395	D	Column	Lft	U column	I	Metal	Green	0.6	QM
Interior Room 041 Corridor									
396	A	Wall	U Lft		I	Drywall	White	0.3	QM
399	B	Wall	U Ctr		I	Metal	White	0.0	QM
403	B	Door	Lft	Rgt casing	I	Metal	Blue	0.2	QM
404	B	Door	Lft	U Rgt	I	Wood	Gray	0.2	QM
400	C	Wall	U Ctr		I	ConcBlock	White	0.2	QM
401	C	Door	Ctr	Header	I	Metal	Blue	0.0	QM
398	D	Wall	L Ctr		I	GlazdBrick	Aqua	0.4	QM
397	D	Wall	U Rgt		I	ConcBlock	White	0.0	QM
402	D	Door	Lft	Rgt jamb	I	Metal	Blue	0.2	QM
405	D	Door	Lft	U Ctr	I	Metal	Gray	0.5	QM
406	D	ElectricPanel	Lft		I	Metal	Gray	0.2	QM
Interior Room 042 StorageE21C									
411	A	Wall	U Rgt		I	ConcBlock	White	0.2	QM
410	B	Wall	U Rgt		I	ConcBlock	White	0.2	QM
412	B	Door	Ctr	Header	I	Metal	Beige	0.3	QM
407	B	Corrig Deck	Rgt		I	Metal	White	0.2	QM
409	C	Wall	U Lft		I	ConcBlock	White	0.2	QM
408	C	Bar Joist	Lft		I	Metal	White	0.0	QM
Interior Room 043 Speech E23									
418	A	Wall	U Lft		I	ConcBlock	White	0.0	QM
417	B	Wall	U Ctr		I	ConcBlock	Tan	-0.1	QM
416	C	Wall	L Rgt		I	ConcBlock	Tan	-0.1	QM
415	D	Wall	U Ctr		I	ConcBlock	Tan	0.1	QM
421	D	Door	Ctr	Header	I	Metal	Blue	0.3	QM
422	D	Door	Ctr	U Rgt	I	Metal	Gray	0.0	QM
419	D	Column	Rgt	U column	I	Metal	Tan	-0.1	QM
413	D	Corrig Deck	Ctr		I	Metal	White	-0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
414	D	Bar Joist	Ctr		I	Metal	White	0.0	QM
420	D	Door Lintel	Ctr		I	Metal	Blue	0.0	QM
Interior Room 044 Speech E24D									
423	A	Wall	U Ctr		I	ConcBlock	White	0.1	QM
429	A	Door	Ctr	Header	I	Metal	Tan	0.0	QM
428	A	Door	Ctr	U Lft	I	Metal	Tan	0.0	QM
427	A	HVAC Unit	Lft		I	Metal	Beige	0.1	QM
424	B	Wall	L Lft		I	ConcBlock	White	0.0	QM
425	C	Wall	U Ctr		I	ConcBlock	White	-0.4	QM
426	D	Wall	U Lft		I	ConcBlock	White	0.1	QM
Comment: Reading 427, mounted at ceiling.									
Interior Room 045 Health E24									
432	A	Wall	U Ctr		I	ConcBlock	White	0.0	QM
436	A	Door	Lft	Header	I	Metal	Tan	-0.1	QM
433	B	Wall	L Lft		I	ConcBlock	White	0.0	QM
430	C	Wall	L Ctr		I	ConcBlock	White	0.1	QM
431	D	Wall	U Lft		I	ConcBlock	White	0.1	QM
435	D	Door	Lft	U Rgt	I	Metal	Gray	-0.1	QM
437	D	Column	Lft	L column	I	Metal	White	0.5	QM
434	D	HVAC Unit	Rgt		I	Metal	Beige	0.1	QM
Interior Room 046 SocWk E24C									
441	A	Wall	U Lft		I	ConcBlock	White	-0.1	QM
440	B	Wall	L Rgt		I	ConcBlock	White	0.1	QM
439	C	Wall	U Ctr		I	ConcBlock	White	0.0	QM
438	C	Column	Rgt	U column	I	Metal	White	0.3	QM
442	D	Wall	L Ctr		I	ConcBlock	White	0.0	QM
443	D	Door	Lft	Rgt casing	I	Metal	Tan	-0.1	QM
444	D	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
Interior Room 047 PreExamE24B									
448	A	Wall	U Ctr		I	ConcBlock	White	0.0	QM
447	B	Wall	L Ctr		I	ConcBlock	White	0.2	QM
446	C	Wall	U Lft		I	ConcBlock	White	0.2	QM
445	C	Ceiling Vent	Ctr		I	Metal	White	0.0	QM
449	D	Wall	L Lft		I	ConcBlock	White	0.0	QM
450	D	Door	Rgt	Lft jamb	I	Metal	Tan	0.1	QM
451	D	Door	Rgt	U Lft	I	Metal	Tan	0.5	QM
Interior Room 048 Exam E34A									
453	A	Wall	U Ctr		I	ConcBlock	White	0.2	QM
452	A	PipeCovering	Rgt		I	Fabric	White	0.2	QM
456	B	Wall	L Rgt		I	ConcBlock	White	0.0	QM
455	C	Wall	U Ctr		I	ConcBlock	White	-0.1	QM
454	D	Wall	L Rgt		I	ConcBlock	White	0.2	QM
458	D	Door	Lft	Rgt casing	I	Metal	Tan	-0.2	QM
457	D	Door	Lft	U Rgt	I	Metal	Tan	0.1	QM
Interior Room 049 Toilet									
459	A	Wall	U Rgt		I	ConcBlock	White	0.0	QM
463	A	Door	Lft	U Rgt	I	Wood	Natural	0.1	QM
462	B	Wall	L Ctr		I	GlazedTile	Orange	-0.1	QM
461	C	Wall	L Ctr		I	GlazedTile	Orange	-0.1	QM
464	C	Door	Rgt	Lft casing	I	Metal	Tan	0.0	QM
460	D	Wall	U Ctr		I	ConcBlock	White	-0.2	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Interior Room 050 StorageE24E									
468	A	Wall	L Lft		I	GlazedTile	Orange	-0.1	QM
469	B	Wall	L Rgt		I	GlazedTile	Orange	0.0	QM
466	C	Wall	U Rgt		I	GlazedTile	Orange	0.0	QM
465	C	Ceiling			I	Metal	White	-0.2	QM
467	D	Wall	L Lft		I	GlazedTile	Orange	-0.1	QM
Interior Room 051 PEOfficeE26									
470	A	Wall	L Rgt		I	ConcBlock	Beige	0.2	QM
477	A	Closet	Lft	Door Jamb	I	Metal	Beige	-0.1	QM
476	A	Closet	Lft	Wall	I	ConcBlock	Beige	0.0	QM
471	B	Wall	U Lft		I	ConcBlock	Beige	0.1	QM
475	B	Door	Lft	Header	I	Metal	Tan	0.3	QM
474	B	Door	Lft	U Ctr	I	Metal	Tan	0.2	QM
472	C	Wall	U Lft		I	ConcBlock	Beige	0.2	QM
473	D	Wall	L Ctr		I	ConcBlock	Beige	0.0	QM
Interior Room 052 Toilet									
479	A	Wall	U Ctr		I	ConcBlock	OffWhite	0.3	QM
480	B	Wall	L Ctr		I	GlazedTile	Orange	-0.1	QM
482	B	Door	Lft	U Rgt	I	Metal	Tan	0.5	QM
481	C	Wall	U Lft		I	GlazedTile	Orange	0.2	QM
478	D	Wall	U Rgt		I	ConcBlock	OffWhite	0.2	QM
Interior Room 053 Gym E22&E25									
483	A	Wall	U Lft		I	ConcBlock	Beige	0.2	QM
500	A	Floor			I	Wood	Yellow	0.0	QM
492	A	Door	Lft	Rgt jamb	I	Metal	Tan	0.0	QM
491	A	Door	Rgt	U Lft	I	Metal	Tan	0.2	QM
488	A	HVAC Unit	Ctr		I	Metal	Beige	0.1	QM
486	B	Wall	L Ctr		I	ConcBlock	Tan	0.0	QM
487	B	Wall	U Ctr		I	ConcBlock	Orange	0.0	QM
490	B	Column	Lft	L column	I	Metal	Tan	0.3	QM
485	C	Wall	L Rgt		I	ConcBlock	Tan	0.0	QM
498	C	Floor			I	Wood	Natural	0.0	QM
499	C	Floor			I	Wood	Red	-0.1	QM
495	C	Wall Grill	Ctr		I	Metal	Tan	0.1	QM
496	C	BackboardSpt	Ctr		I	Metal	Black	0.0	QM
497	C	Backboard	Ctr		I	Wood	White	-0.1	QM
494	C	Wall Vent	Rgt		I	Metal	Tan	-0.2	QM
484	D	Wall	U Rgt		I	ConcBlock	Beige	0.2	QM
493	D	Door	Lft	Rgt jamb	I	Wood	Beige	0.2	QM
489	D	Column	Rgt	U column	I	Metal	Beige	0.3	QM
Interior Room 054 Corridor101									
503	B	Wall	L Rgt		I	GlazdBrick	Aqua	0.5	QM
501	B	Wall	U Lft		I	ConcBlock	OffWhite	0.2	QM
508	B	Door	Lft	Rgt casing	I	Metal	Tan	0.3	QM
509	B	Door	Rgt	Lft jamb	I	Metal	Blue	0.3	QM
510	B	Door	Rgt	U Ctr	I	Metal	Gray	0.3	QM
511	B	ElectricPanel	Ctr		I	Metal	Gray	-0.1	QM
504	B	Wall Grill	Rgt		I	Metal	OffWhite	0.3	QM
507	C	Door	Ctr	Header	I	Metal	Tan	0.0	QM
506	C	Door	Rgt	U Lft	I	Metal	Tan	0.1	QM
505	C	Door Panel	Ctr		I	Metal	Tan	2.7	QM
502	D	Wall	U Ctr		I	Metal	Yellow	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
512	D	Fire Cabinet	Ctr		I	Metal	Red	0.0	QM
513	D	Fire Cabinet	Ctr		I	Metal	White	0.0	QM
Interior Room 055 Class E28									
514	A	Wall	L Rgt		I	Metal	OffWhite	0.1	QM
515	B	Wall	U Lft		I	Metal	OffWhite	0.0	QM
520	B	Door	Rgt	U Lft	I	Metal	Tan	-0.1	QM
525	B	Closet	Lft	Door	I	Wood	Natural	-0.2	QM
522	B	Closet	Lft	Wall	I	Metal	Green	0.0	QM
524	B	Closet	Lft	Shelf	I	Wood	Natural	0.0	QM
523	B	Closet	Lft	Ceiling	I	Metal	Green	0.0	QM
516	C	Wall	U Lft		I	ConcBlock	OffWhite	0.0	QM
521	C	Door	Lft	Header	I	Metal	Tan	0.1	QM
518	C	Column	Rgt	U column	I	Metal	OffWhite	0.1	QM
517	D	WindowPanel	Ctr		I	Metal	Beige	0.4	QM
519	D	Shelf Unit	Rgt		I	Metal	Tan	-0.1	QM
Interior Room 056 Toilet									
527	A	Wall	L Ctr		I	Metal	OffWhite	0.0	QM
526	B	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
528	C	Baseboard	Rgt		I	Metal	Gray	0.0	QM
529	D	Floor			I	Concrete	Gray	0.1	QM
530	D	Door	Rgt	U Lft	I	Metal	Tan	0.0	QM
Interior Room 057 Stairwell									
538	A	Wall	L Lft		I	GlazedBlk	Beige	0.0	QM
537	C	Wall	L Rgt		I	ConcBlock	Beige	0.2	QM
541	C	Stairs	Rgt	Treads	I	Metal	Black	-0.1	QM
539	C	Stairs	Rgt	Stringer	I	Metal	Beige	-0.1	QM
540	C	Stairs	Rgt	Railing cap	I	Metal	Beige	0.0	QM
542	C	I Beam	Ctr		I	Metal	Beige	0.0	QM
Interior Room 058 Mechanical									
543	A	Corrig Deck	Ctr		I	Metal	Gray	-0.1	QM
547	B	Door	Rgt	Lft jamb	I	Metal	LtGray	0.3	QM
546	B	Door	Rgt	U Lft	I	Metal	LtGray	0.2	QM
548	B	Door Lintel	Rgt		I	Metal	LtGray	0.0	QM
544	C	Bar Joist	Lft		I	Metal	Gray	-0.1	QM
545	C	I Beam	Lft		I	Metal	Gray	0.0	QM
549	C	ElectricPanel	Lft		I	Metal	Gray	-0.1	QM
Calibration Readings									
001								1.9	QM
002								2.0	QM
003								1.9	QM
004								0.1	QM
005								0.0	QM
006								0.1	QM
279								2.1	QM
280								2.0	QM
281								0.2	QM
282								-0.1	QM
531								1.7	QM
532								1.7	QM
533								2.1	QM
534								0.0	QM
535								0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
536								0.1	QM
----- End of Readings -----									

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Inspection Date: 10/15/01
 Report Date: 10/21/01
 Abatement Level: 1.0
 Report No. S#01262 - 10/15/01 15:32
 Total Readings: 550
 Job Started: 10/15/01 15:32
 Job Finished: 10/15/01 22:06

Broadway Elementary School
 1000 Broadway
 Elmira, New York 14904

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Exterior Room 500 Annex									
133	A	Wall	L Ctr		I	Wood	Beige	0.0	QM
139	A	Door	Lft	Lft casing	I	Metal	Burgundy	0.0	QM
138	A	Door	Lft	U Lft	I	Metal	Burgundy	0.0	QM
140	A	Dr Kickplate	Lft		I	Wood	Beige	-0.1	QM
134	A	Fascia	Rgt		I	Wood	Beige	0.0	QM
135	A	Wall Mldg	Rgt		I	Wood	White	-0.1	QM
136	A	Wall Panel	Rgt		I	Metal	Burgundy	0.0	QM
137	A	Wall Panel	Rgt		I	Metal	Beige	-0.1	QM
141	B	Wall	L Rgt		I	Wood	Beige	0.1	QM
142	B	Floor	Ctr		I	Wood	Gray	0.1	QM
143	B	Base Mldg	Ctr		I	Wood	Beige	-0.1	QM
144	C	Wall	L Ctr		I	Wood	Beige	0.1	QM
145	D	Wall	L Rgt		I	Wood	Beige	0.2	QM
148	D	Door	Ctr	Lft casing	I	Metal	Burgundy	-0.1	QM
147	D	Door	Ctr	U Lft	I	Metal	Burgundy	0.0	QM
150	D	Ramp	Lft		I	Wood	Gray	0.2	QM
151	D	Column	Lft		I	Metal	Burgundy	-0.1	QM
152	D	I Beam	Lft		I	Metal	White	0.3	QM
153	D	Corrug Deck	Lft		I	Metal	White	0.1	QM
154	D	Bar Joist	Lft		I	Metal	Beige	0.3	QM
155	D	Fascia	Lft		I	Metal	Burgundy	0.1	QM
156	D	Column	Lft		I	Metal	Burgundy	-0.2	QM
146	D	Ceiling	Ctr		I	Wood	Beige	0.1	QM
149	D	Floor	Ctr		I	Wood	Tan	-0.1	QM

Comment: Readings #151 through 156 taken in Canopy area leading to Annex.

Interior Room 059 Class G4									
007	A	Wall	U Rgt		I	Drywall	Beige	0.0	QM
017	A	Window	Rgt	Rgt casing	I	Wood	Beige	-0.1	QM
018	A	Window	Rgt	Sill	I	Wood	Beige	-0.1	QM
022	A	Door	Lft	Rgt jamb	I	Metal	Tan	-0.1	QM
021	A	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
019	A	HVAC Unit	Rgt		I	Metal	Beige	0.2	QM
008	B	Wall	U Lft		I	Drywall	Beige	-0.2	QM
023	B	Closet	Lft	Wall	I	Wood	Stained	-0.1	QM
024	B	Closet	Lft	Shelf	I	Wood	Stained	0.0	QM
016	B	Shelf	Ctr		I	Wood	Natural	0.0	QM
013	B	Ceiling Mldg	Rgt		I	Wood	White	0.2	QM
009	C	Wall	L Rgt		I	Wood	Beige	0.0	QM
011	C	Door	Lft	Lft jamb	I	Wood	Beige	0.0	QM
012	C	Door	Lft	U Lft	I	Wood	Natural	-0.2	QM
014	C	Wall Mldg	Lft		I	Wood	Beige	0.1	QM
015	C	Ceiling Grid	Lft		I	Metal	White	0.0	QM
020	C	Partit Mldg	Lft		I	Wood	Beige	-0.1	QM
010	D	Wall	L Lft		I	Drywall	Beige	0.0	QM

Interior Room 060 Storage G-6									
025	A	Wall	U Ctr		I	Wood	Stained	-0.1	QM
026	B	Wall	U Rgt		I	Wood	Stained	-0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm²)	Mode
027	C	Wall	L Lft	Rgt jamb	I	Wood	Stained	-0.1	QM
029	C	Door	Ctr		I	Wood	Tan	-0.1	QM
028	D	Wall	L Ctr		I	Wood	Stained	0.1	QM
Interior Room 061 Toilet G-7									
030	A	Wall	U Rgt		I	Drywall	Blue	-0.1	QM
031	B	Wall	U Lft		I	Drywall	Blue	-0.2	QM
034	B	Crown Mldg	Rgt		I	Wood	Beige	0.1	QM
032	C	Wall	L Ctr		I	Drywall	Blue	-0.2	QM
033	D	Wall	L Lft		I	Drywall	Blue	-0.1	QM
Interior Room 062 Toilet G-8									
035	A	Wall	U Rgt	Lft casing	I	Drywall	Pink	-0.2	QM
036	B	Wall	U Lft		I	Drywall	Pink	-0.2	QM
037	C	Wall	L Lft		I	Drywall	Pink	-0.1	QM
039	C	Door	Ctr		I	Wood	Natural	0.1	QM
045	C	Partition	Rgt		I	Peg Board	White	-0.2	QM
038	D	Wall	L Ctr		I	Drywall	Pink	-0.1	QM
Interior Room 063 Hallway G-9									
040	A	Wall	U Ctr	U Rgt	I	Wood	Beige	0.2	QM
041	B	Wall	U Rgt		I	Wood	Beige	0.1	QM
044	B	Door	Ctr		I	Wood	Natural	-0.2	QM
042	C	Wall	L Ctr		I	Wood	Beige	-0.1	QM
043	D	Wall	L Lft		I	Wood	Beige	0.0	QM
Interior Room 064 Storage Rm									
046	A	Wall	U Rgt	Lft casing	I	Wood	Stained	-0.1	QM
050	A	Elec Panel	Lft		I	Metal	Gray	-0.1	QM
051	A	Wall Panel	Ctr		I	Wood	Gray	-0.1	QM
047	B	Wall	U Ctr		I	Wood	Stained	-0.1	QM
048	C	Wall	L Lft		I	Wood	Stained	-0.1	QM
052	C	Door	Ctr		I	Wood	Natural	0.1	QM
053	C	Crown Mldg	Rgt		I	Wood	Stained	0.2	QM
049	D	Wall	L Ctr		I	Wood	Stained	-0.1	QM
Interior Room 065 Class G3									
054	A	Wall	L Ctr	Sill Lft casing Header U Ctr	I	Wood	Beige	0.1	QM
059	A	Window	Lft		I	Wood	Beige	0.1	QM
060	A	Window	Lft		I	Wood	Beige	0.0	QM
065	A	Door	Rgt		I	Metal	Tan	0.0	QM
064	A	Door	Rgt		I	Metal	Tan	0.0	QM
058	A	HVAC Unit	Lft		I	Metal	Tan	0.0	QM
061	A	Wall Mldg	Lft		I	Wood	Beige	0.2	QM
062	A	Ceiling Grid	Lft		I	Metal	White	-0.1	QM
063	A	Ceiling Mldg	Lft		I	Wood	Beige	0.0	QM
055	B	Wall	L Lft	Lft jamb	I	Wood	Beige	-0.1	QM
056	C	Wall	U Ctr		I	Wood	Beige	-0.2	QM
067	C	Door	Rgt		I	Wood	Beige	0.0	QM
057	D	Wall	U Rgt		I	Wood	Beige	-0.1	QM
066	D	Shelf	Ctr		I	Wood	Stained	-0.1	QM
068	D	Ceiling Vent	Ctr		I	Wood	Beige	0.0	QM
Interior Room 066 Class G1									
069	A	Wall	U Ctr		I	Wood	Beige	-0.1	QM
070	B	Wall	U Lft		I	Wood	Beige	-0.2	QM
071	C	Wall	L Ctr		I	Wood	Beige	-0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
075	C	Window	Lft	Lft casing	I	Wood	Beige	0.0	QM
074	C	Door	Lft	Lft jamb	I	Metal	Tan	0.4	QM
073	C	Door	Lft	L Ctr	I	Metal	Tan	-0.1	QM
076	C	Ceiling Mldg	Rgt		I	Wood	Beige	0.0	QM
077	C	Wall Mldg	Rgt		I	Wood	Beige	-0.1	QM
072	D	Wall	L Lft		I	Wood	Beige	-0.1	QM
078	D	Door	Ctr	Rgt jamb	I	Wood	Beige	0.1	QM
Interior Room 067 G Toilet									
079	A	Wall	U Lft		I	Drywall	Pink	-0.1	QM
086	A	Door	Rgt	U Lft	I	Wood	Natural	0.0	QM
080	B	Wall	U Ctr		I	Drywall	Pink	-0.2	QM
081	C	Wall	L Lft		I	Drywall	Pink	-0.1	QM
084	C	Window	Ctr	Lft casing	I	Wood	White	-0.2	QM
082	D	Wall	L Ctr		I	Drywall	Pink	0.0	QM
083	D	Partition	Lft		I	Peg Board	White	-0.2	QM
085	D	Crown Mldg	Ctr		I	Wood	White	0.1	QM
Interior Room 068 B Toilet									
087	A	Wall	U Rgt		I	Drywall	Blue	-0.2	QM
092	A	Door	Ctr	Rgt jamb	I	Wood	Natural	0.1	QM
088	B	Wall	U Lft		I	Drywall	Blue	-0.2	QM
089	C	Wall	L Rgt		I	Drywall	Blue	-0.1	QM
091	C	Window	Ctr	Sill	I	Wood	Beige	0.1	QM
090	D	Wall	L Lft		I	Drywall	Blue	-0.1	QM
Interior Room 069 Hallway									
093	A	Wall	U Rgt		I	Wood	Beige	0.0	QM
097	A	Ceiling Grid	Lft		I	Metal	White	0.0	QM
094	B	Wall	U Ctr		I	Wood	Beige	0.0	QM
098	B	Door	Ctr	Rgt casing	I	Wood	Natural	0.2	QM
095	C	Wall	L Lft		I	Wood	Beige	0.1	QM
096	D	Wall	L Lft		I	Wood	Beige	0.0	QM
Interior Room 070 Storage Rm									
099	A	Wall	U Ctr		I	Wood	Stained	-0.1	QM
103	A	Shelf	Lft		I	Wood	Natural	0.1	QM
100	B	Wall	U Rgt		I	Wood	Stained	0.0	QM
101	C	Wall	L Lft		I	Wood	Stained	-0.1	QM
104	C	Door	Ctr	Lft casing	I	Wood	Natural	0.3	QM
102	D	Wall	L Rgt		I	Wood	Stained	0.0	QM
Interior Room 071 Custod G-5									
105	A	Wall	U Lft		I	Wood	Stained	0.1	QM
110	A	Door	Ctr	Rgt jamb	I	Wood	Natural	0.1	QM
106	B	Wall	U Ctr		I	Wood	Stained	0.0	QM
107	C	Wall	L Ctr		I	Wood	Stained	-0.1	QM
108	D	Wall	L Lft		I	Wood	Stained	-0.1	QM
109	D	Shelf	Rgt		I	Wood	Natural	0.1	QM
Interior Room 072 Class G2									
111	A	Wall	U Rgt		I	Wood	Beige	0.0	QM
117	A	Door	Rgt	Lft casing	I	Metal	Beige	0.0	QM
112	B	Wall	U Lft		I	Wood	Beige	-0.1	QM
118	B	Ceiling Mldg	Lft		I	Wood	Beige	-0.1	QM
119	B	Wall Mldg	Lft		I	Wood	Beige	0.1	QM
122	B	Shelf	Rgt		I	Wood	Stained	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
113	C	Wall	L Ctr		I	Wood	Beige	-0.1	QM
120	C	Window	Rgt	Sill	I	Wood	Beige	-0.1	QM
116	C	Door	Rgt	Rgt jamb	I	Metal	Tan	0.0	QM
115	C	Door	Rgt	U Ctr	I	Metal	Tan	-0.1	QM
121	C	HVAC Unit	Ctr		I	Metal	Beige	0.0	QM
114	D	Wall	L Lft		I	Wood	Beige	-0.1	QM

Interior Room 073 Corridor104

123	A	Wall	U Lft		I	Wood	Beige	0.0	QM
131	A	Door	Rgt	Rgt casing	I	Metal	Tan	0.0	QM
129	A	Corner Mldg	Lft		I	Wood	Beige	0.4	QM
130	A	Fire Cabinet	Ctr		I	Metal	Red	0.0	QM
124	B	Wall	U Ctr		I	Wood	Beige	-0.1	QM
125	C	Wall	L Lft		I	Wood	Beige	-0.2	QM
132	C	Door	Ctr	Rgt jamb	I	Wood	Tan	0.0	QM
126	D	Wall	L Ctr		I	Wood	Beige	0.1	QM
128	D	Door	Rgt	Rgt jamb	I	Metal	Tan	-0.1	QM
127	D	Door	Rgt	U Rgt	I	Metal	Tan	0.0	QM

Interior Room 074 Storage E-17

160	B	I Beam	Rgt		I	Metal	DkRed	-0.1	QM
161	B	Bar Joist	Rgt		I	Metal	DkRed	0.2	QM
162	B	Corrug Deck	Rgt		I	Metal	LtGray	0.1	QM
163	B	Elec Panel	Rgt		I	Metal	LtGray	-0.2	QM
157	C	Door	Lft	Lft jamb	I	Metal	Blue	-0.2	QM
158	C	Door	Lft	U Rgt	I	Metal	LtGray	0.0	QM
159	C	Column	Lft		I	Metal	Tan	-0.1	QM

Comment: Readings #160 through 162 taken above suspended Ceiling.

Interior Room 075 Mens Toilet

164	A	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
165	B	Wall	U Lft		I	ConcBlock	OffWhite	-0.1	QM
166	C	Wall	L Ctr		I	ConcBlock	OffWhite	-0.1	QM
167	D	Wall	L Lft		I	ConcBlock	OffWhite	-0.2	QM
168	D	Door	Ctr	Lft casing	I	Metal	Blue	-0.1	QM
169	D	Door	Ctr	U Lft	I	Metal	LtGray	-0.1	QM
170	D	Door Louver	Ctr		I	Metal	LtGray	0.6	QM
171	D	Column	Rgt		I	Metal	OffWhite	-0.1	QM

Interior Room 076 W Toilet

172	A	Wall	U Rgt		I	ConcBlock	OffWhite	0.0	QM
178	A	Ceiling Vent	Rgt		I	Metal	White	0.0	QM
173	B	Wall	U Lft		I	ConcBlock	OffWhite	0.0	QM
174	C	Wall	L Rgt		I	ConcBlock	OffWhite	0.0	QM
175	D	Wall	L Lft		I	ConcBlock	OffWhite	0.1	QM
176	D	Door	Lft	Lft jamb	I	Metal	Blue	0.0	QM
177	D	Door	Lft	L Ctr	I	Metal	LtGray	-0.1	QM

Interior Room 077 Cust Closet

179	A	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
180	B	Wall	U Lft		I	ConcBlock	OffWhite	0.2	QM
181	C	Wall	L Ctr		I	ConcBlock	OffWhite	0.4	QM
186	C	Cabinet Door	Ctr		I	Metal	Gray	0.0	QM
182	D	Wall	L Lft		I	ConcBlock	OffWhite	0.3	QM
183	D	Door	Rgt	Header	I	Metal	Blue	-0.1	QM
184	D	Door	Rgt	U Rgt	I	Metal	Gray	-0.1	QM
185	D	Column	Ctr		I	Metal	OffWhite	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
Interior Room 078 Class F-1									
187	A	Wall	U Lft		I	ConcBlock	OffWhite	-0.1	QM
194	B	Door	Lft	Lft jamb	I	Metal	Tan	0.0	QM
193	B	Door	Lft	U Lft	I	Metal	Tan	0.0	QM
195	B	Shelf Unit	Lft		I	Metal	Beige	0.1	QM
196	B	Univent	Ctr		I	Metal	Beige	0.0	QM
188	C	Wall	U Rgt		I	ConcBlock	OffWhite	-0.1	QM
197	C	Closet	Rgt	Wall	I	ConcBlock	OffWhite	-0.1	QM
198	C	Closet	Rgt	Shelf	I	Wood	OffWhite	-0.2	QM
189	D	Wall	L Lft		I	ConcBlock	OffWhite	0.0	QM
191	D	Door	Ctr	Lft jamb	I	Metal	Blue	0.0	QM
192	D	Door	Ctr	U Ctr	I	Metal	Gray	-0.1	QM
190	D	Column	Lft		I	Metal	OffWhite	0.0	QM
Interior Room 079 Toilet Room									
199	A	Wall	U Lft		I	ConcBlock	OffWhite	-0.2	QM
201	A	Door	Rgt	U Ctr	I	Metal	Gray	0.1	QM
200	C	Wall	L Rgt		I	ConcBlock	OffWhite	0.1	QM
202	C	Door	Lft	Header	I	Metal	Blue	0.0	QM
203	D	Ceiling Vent	Ctr		I	Metal	White	0.0	QM
Interior Room 080 Class F-2									
204	A	Wall	U Rgt		I	ConcBlock	OffWhite	0.2	QM
205	B	Wall	U Lft		I	Drywall	OffWhite	-0.1	QM
208	B	Door	Lft	L Ctr	I	Metal	Tan	-0.1	QM
213	B	Door Panel	Lft		I	Metal	Beige	2.2	QM
210	B	Column	Ctr		I	Metal	OffWhite	0.0	QM
206	C	Wall	L Rgt		I	ConcBlock	OffWhite	-0.1	QM
207	D	Wall	L Ctr		I	ConcBlock	OffWhite	0.1	QM
209	D	Door	Rgt	Lft casing	I	Metal	Blue	-0.1	QM
211	D	Closet	Lft	Wall	I	ConcBlock	OffWhite	0.0	QM
212	D	Closet	Lft	Ceiling	I	Drywall	OffWhite	0.1	QM
Interior Room 081 Class F-3									
214	A	Wall	L Ctr		I	ConcBlock	OffWhite	-0.1	QM
215	B	Wall	L Rgt		I	ConcBlock	OffWhite	-0.1	QM
225	B	Wall	U Lft		I	Drywall	OffWhite	0.0	QM
221	B	Door	Ctr	Rgt casing	I	Metal	Blue	-0.1	QM
222	B	Door	Ctr	L Rgt	I	Metal	Gray	0.0	QM
224	B	Closet	Lft	Door Jamb	I	Wood	Natural	-0.1	QM
223	B	Closet	Lft	Wall	I	ConcBlock	OffWhite	0.0	QM
216	C	Wall	U Ctr		I	ConcBlock	OffWhite	0.1	QM
219	D	Univent	Lft		I	Metal	Beige	0.0	QM
220	D	Window Panel	Lft		I	Metal	Beige	2.9	QM
218	D	Column	Ctr		I	Metal	OffWhite	-0.1	QM
217	D	Wall Panel	Rgt		I	Metal	Beige	1.7	QM
Interior Room 082 Toilet Room									
229	A	Door	Lft	U Rgt	I	Metal	Gray	0.0	QM
226	B	Wall	U Ctr		I	ConcBlock	OffWhite	0.1	QM
228	C	Door	Rgt	Lft jamb	I	Metal	Blue	0.0	QM
227	D	Wall	L Ctr		I	ConcBlock	OffWhite	0.0	QM
Interior Room 083 Class F-4									
230	A	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
231	B	Wall	U Rgt		I	Drywall	OffWhite	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
235	B	Door	Ctr	Rgt jamb	I	Metal	Blue	0.0	QM
241	B	Door	Ctr	Lft casing	I	Wood	Natural	-0.1	QM
236	B	Door	Ctr	U Lft	I	Metal	Gray	0.4	QM
243	B	Closet	Rgt	Door Jamb	I	Wood	Natural	0.1	QM
242	B	Closet	Rgt	Wall	I	ConcBlock	OffWhite	0.1	QM
237	B	Column	Ctr		I	Metal	OffWhite	0.1	QM
232	C	Wall	L Lft		I	ConcBlock	OffWhite	0.1	QM
239	C	Window	Rgt	Lft casing	I	Metal	Blue	0.0	QM
240	C	Door	Rgt	Rgt jamb	I	Metal	Blue	0.0	QM
233	D	Window Panel	Ctr		I	Metal	Burgundy	1.8	QM
234	D	Wall Panel	Rgt		I	Metal	Beige	1.7	QM
238	D	Shelf Unit	Rgt		I	Metal	Beige	-0.1	QM

Interior Room 084 Class F-5

244	A	Wall	U Rgt		I	ConcBlock	OffWhite	-0.1	QM
258	A	Window	Lft	Sill	I	Wood	Blue	-0.1	QM
259	A	Door	Lft	Lft casing	I	Metal	Blue	-0.1	QM
253	A	Ceiling Vent	Rgt		I	Metal	White	-0.1	QM
254	A	Ceiling Grid	Rgt		I	Metal	White	0.1	QM
245	B	Wall	U Lft		I	Drywall	OffWhite	0.0	QM
251	B	Door	Rgt	Header	I	Metal	Blue	-0.1	QM
252	B	Door	Rgt	U Rgt	I	Metal	Gray	0.1	QM
255	B	Closet	Ctr	Wall	I	ConcBlock	OffWhite	0.2	QM
256	B	Closet	Ctr	Ceiling	I	Drywall	OffWhite	0.0	QM
260	B	I Beam	Ctr		I	Metal	Brown	0.0	QM
261	B	Bar Joist	Ctr		I	Metal	Brown	0.0	QM
262	B	Corrug Deck	Ctr		I	Metal	Gray	-0.1	QM
263	B	Light Fix	Ctr		I	Metal	White	0.4	QM
246	C	Wall	L Rgt		I	ConcBlock	OffWhite	-0.1	QM
247	D	Univent	Lft		I	Metal	Beige	0.0	QM
248	D	Window Panel	Lft		I	Metal	Burgundy	2.7	QM
249	D	Wall Panel	Lft		I	Metal	Beige	1.8	QM
250	D	Column	Ctr		I	Metal	OffWhite	-0.2	QM
257	D	Shelf Unit	Rgt		I	Metal	Beige	0.2	QM

Comment: Readings #260 through 263 taken above suspended Ceiling.

Interior Room 085 Toilet Room

264	A	Wall	U Rgt		I	ConcBlock	OffWhite	-0.1	QM
267	A	Door	Lft	L Rgt	I	Metal	Gray	0.3	QM
268	B	Ceiling Vent	Ctr		I	Metal	White	0.1	QM
266	C	Door	Rgt	Rgt jamb	I	Metal	Blue	0.5	QM
265	D	Wall	L Ctr		I	ConcBlock	OffWhite	0.3	QM

Interior Room 086 Class F-6

269	A	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
270	B	Wall	U Rgt		I	Drywall	OffWhite	0.1	QM
275	B	Door	Ctr	Lft casing	I	Metal	Blue	-0.1	QM
276	B	Door	Ctr	U Lft	I	Metal	Gray	0.0	QM
279	B	Closet	Ctr	Door Casing	I	Wood	Natural	0.0	QM
277	B	Closet	Ctr	Wall	I	ConcBlock	OffWhite	0.2	QM
278	B	Closet	Ctr	Ceiling	I	Drywall	OffWhite	0.0	QM
271	C	Wall	L Lft		I	ConcBlock	OffWhite	0.0	QM
272	D	Wall Panel	Lft		I	Metal	Beige	1.7	QM
273	D	Univent	Lft		I	Metal	Beige	-0.1	QM
274	D	Column	Ctr		I	Metal	Beige	0.0	QM

Interior Room 087 Class F-7

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
280	A	Wall	U Ctr		I	ConcBlock	OffWhite	0.0	QM
281	B	Wall	U Lft		I	Drywall	OffWhite	-0.2	QM
288	B	Door	Ctr	Header	I	Metal	Blue	-0.1	QM
289	B	Door	Ctr	L Rgt	I	Metal	Gray	0.0	QM
291	B	Closet	Lft	Door Jamb	I	Wood	Natural	0.2	QM
290	B	Closet	Lft	Wall	I	ConcBlock	OffWhite	-0.1	QM
282	C	Wall	L Ctr		I	ConcBlock	OffWhite	0.1	QM
287	C	Window	Rgt	Rgt casing	I	Wood	Blue	0.1	QM
286	C	Door	Rgt	Lft casing	I	Metal	Blue	-0.1	QM
283	D	Window Panel	Ctr		I	Metal	Burgundy	1.5	QM
284	D	Column	Ctr		I	Metal	Beige	-0.1	QM
285	D	Shelf Unit	Rgt		I	Metal	Beige	0.1	QM
Interior Room 088 Toilet Room									
294	A	Door	Lft	U Rgt	I	Metal	Gray	0.1	QM
292	B	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
295	C	Door	Rgt	Rgt jamb	I	Metal	Blue	0.0	QM
293	D	Wall	L Rgt		I	ConcBlock	OffWhite	-0.1	QM
Interior Room 089 Class F-8									
296	A	Wall	U Lft		I	ConcBlock	OffWhite	-0.1	QM
306	A	Window	Ctr	Sill	I	Wood	Blue	0.0	QM
307	A	Door	Lft	Lft jamb	I	Metal	Blue	0.4	QM
297	B	Wall	U Rgt		I	Drywall	OffWhite	0.1	QM
302	B	Door	Ctr	Lft casing	I	Metal	Blue	-0.1	QM
303	B	Door	Ctr	L Lft	I	Metal	Gray	0.0	QM
305	B	Closet	Rgt	Door Casing	I	Wood	Natural	0.1	QM
304	B	Closet	Rgt	Ceiling	I	Drywall	OffWhite	0.1	QM
298	C	Wall	L Lft		I	ConcBlock	OffWhite	-0.1	QM
299	D	Wall Panel	Lft		I	Metal	Beige	1.7	QM
300	D	Column	Ctr		I	Metal	OffWhite	0.2	QM
301	D	Wall Vent	Rgt		I	Metal	Beige	0.5	QM
Interior Room 090 Class F-9									
308	A	Wall	U Ctr		I	ConcBlock	OffWhite	-0.2	QM
309	B	Window Panel	Lft		I	Metal	Beige	1.8	QM
316	B	Column	Ctr		I	Metal	OffWhite	0.1	QM
317	B	Univent	Rgt		I	Metal	Beige	0.1	QM
310	C	Wall	L Lft		I	ConcBlock	OffWhite	0.0	QM
314	C	Ceiling Vent	Rgt		I	Metal	White	0.2	QM
315	C	Ceiling Grid	Rgt		I	Metal	White	0.2	QM
311	D	Wall	U Rgt		I	Drywall	OffWhite	-0.2	QM
312	D	Door	Lft	Header	I	Metal	Blue	-0.1	QM
313	D	Door	Lft	U Ctr	I	Metal	Gray	0.1	QM
320	D	Closet	Rgt	Door Jamb	I	Wood	Natural	0.0	QM
319	D	Closet	Rgt	Wall	I	ConcBlock	OffWhite	0.0	QM
318	D	Closet	Rgt	Ceiling	I	Drywall	OffWhite	0.2	QM
Interior Room 091 Toilet Room									
321	A	Wall	U Lft		I	ConcBlock	OffWhite	-0.1	QM
323	A	Door	Rgt	U Lft	I	Metal	Gray	0.3	QM
322	B	Wall	L Ctr		I	ConcBlock	OffWhite	0.0	QM
324	C	Door	Lft	Rgt jamb	I	Metal	Blue	0.0	QM
Interior Room 092 Corridor									
330	A	Wall	L Rgt		I	Glazed Blk	OffWhite	-0.1	QM
329	A	Door	Rgt	Rgt casing	I	Metal	Yellow	-0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
331	B	Wall	L Lft		I	ConcBlock	White	-0.1	QM
332	B	Wall	L Rgt		I	ConcBlock	White	-0.1	QM
339	B	Wall	U Lft		I	Drywall	White	-0.2	QM
336	B	Door	Lft	Lft casing	I	Metal	Blue	-0.1	QM
337	B	Door	Lft	U Lft	I	Metal	Gray	-0.1	QM
338	B	Fire Cabinet	Lft		I	Metal	Red	0.0	QM
342	B	Door Louver	Ctr		I	Metal	Gray	0.4	QM
340	C	Wall	L Lft		I	ConcBlock	White	0.0	QM
333	C	Wall	U Rgt		I	ConcBlock	White	0.0	QM
345	C	Door	Ctr	Rgt jamb	I	Metal	Tan	0.3	QM
344	C	Door	Ctr	U Rgt	I	Metal	Tan	0.0	QM
334	D	Wall	L Lft		I	ConcBlock	White	0.0	QM
335	D	Wall	L Rgt		I	ConcBlock	White	0.0	QM
341	D	Door	Lft	Header	I	Metal	Blue	0.0	QM
343	D	Door	Ctr	U Rgt	I	Metal	Gray	0.0	QM
Interior Room 093 Resour F-10									
346	A	Wall	U Lft		I	Drywall	OffWhite	-0.1	QM
350	A	Door	Lft	Rgt casing	I	Metal	Blue	0.0	QM
351	A	Door	Lft	U Lft	I	Metal	Gray	0.0	QM
347	B	Wall	U Ctr		I	ConcBlock	OffWhite	-0.2	QM
348	C	Wall	L Ctr		I	ConcBlock	OffWhite	-0.1	QM
354	C	HVAC Unit	Ctr		I	Metal	Beige	0.0	QM
349	D	Wall	L Lft		I	ConcBlock	OffWhite	0.2	QM
352	D	Column	Rgt		I	Metal	OffWhite	-0.2	QM
353	D	Coat Hanger	Rgt		I	Wood	Natural	0.1	QM
Interior Room 094 FaculLounge									
355	A	Wall	U Lft		I	ConcBlock	OffWhite	0.2	QM
359	A	Door	Lft	Header	I	Metal	Blue	-0.1	QM
360	A	Door	Lft	U Rgt	I	Metal	Gray	0.0	QM
356	B	Column	Lft		I	Metal	OffWhite	-0.1	QM
357	C	Wall	U Ctr		I	ConcBlock	OffWhite	0.0	QM
358	D	Wall	L Lft		I	ConcBlock	OffWhite	0.0	QM
Interior Room 095 Mens Toilet									
361	A	Wall	U Lft		I	ConcBlock	OffWhite	0.0	QM
365	A	Door	Rgt	Rgt jamb	I	Metal	Blue	-0.1	QM
366	A	Door	Rgt	U Ctr	I	Metal	Gray	0.4	QM
368	A	Ceiling Vent	Ctr		I	Metal	White	0.4	QM
362	B	Wall	U Rgt		I	Drywall	OffWhite	0.0	QM
363	C	Wall	L Rgt		I	ConcBlock	OffWhite	0.0	QM
367	C	Shelf	Ctr		I	Wood	Gray	0.0	QM
364	D	Wall	L Lft		I	ConcBlock	OffWhite	0.0	QM
Interior Room 096 W Toilet									
369	A	Wall	U Rgt		I	ConcBlock	OffWhite	0.0	QM
373	A	Door	Lft	Lft casing	I	Metal	Blue	0.0	QM
374	A	Door	Lft	L Rgt	I	Metal	Gray	0.1	QM
370	B	Wall	U Ctr		I	ConcBlock	OffWhite	-0.1	QM
371	C	Wall	L Lft		I	ConcBlock	OffWhite	0.4	QM
372	D	Wall	L Ctr		I	ConcBlock	OffWhite	0.1	QM
Interior Room 097 Class E-37									
375	A	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
381	A	Door	Rgt	Rgt jamb	I	Metal	Tan	0.0	QM
382	A	Door	Rgt	U Rgt	I	Metal	Tan	-0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm²)	Mode
391	A	Wall Vent	Rgt		I	Metal	OffWhite	0.2	QM
376	B	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
383	B	Cabinet Door	Rgt		I	Wood	Natural	0.0	QM
378	C	Window Panel	Ctr		I	Metal	Beige	0.0	QM
384	C	Shelf Unit	Ctr		I	Metal	Tan	0.3	QM
377	C	Wall Panel	Lft		I	Metal	OffWhite	0.2	QM
379	D	Wall	L Lft		I	ConcBlock	OffWhite	-0.1	QM
386	D	Ceiling			I	Metal	White	0.0	QM
389	D	Closet	Rgt	Door	I	Metal	Tan	-0.1	QM
388	D	Closet	Rgt	Door Jamb	I	Metal	Tan	0.3	QM
387	D	Closet	Rgt	Wall	I	Metal	Tan	0.0	QM
390	D	Closet	Rgt	Shelf	I	Wood	Natural	0.2	QM
380	D	Column	Lft		I	Metal	OffWhite	0.4	QM
385	D	Ceiling Louver	Rgt		I	Metal	OffWhite	0.2	QM

Interior Room 098 Toilet Room

392	A	Wall	U Rgt		I	Metal	Beige	-0.1	QM
393	B	Wall	U Lft		I	Metal	Beige	0.0	QM
394	C	Wall	L Lft		I	Metal	Beige	-0.1	QM
398	C	Door	Rgt	Header	I	Metal	Tan	-0.1	QM
399	C	Door	Rgt	U Rgt	I	Metal	Tan	0.3	QM
400	C	Door Louver	Rgt		I	Metal	Tan	0.3	QM
395	D	Wall	L Ctr		I	Metal	Beige	0.0	QM
396	D	Baseboard	Ctr		I	Metal	Gray	0.2	QM
397	D	Floor			I	Concrete	Gray	-0.1	QM

Interior Room 099 Class E-36

401	A	Wall	U Lft		I	Metal	OffWhite	0.0	QM
405	A	Door	Ctr	Lft jamb	I	Metal	Tan	-0.1	QM
406	A	Door	Ctr	U Rgt	I	Metal	Tan	0.0	QM
410	A	Closet	Lft	Wall	I	Metal	Tan	0.1	QM
412	A	Closet	Lft	Shelf	I	Wood	Natural	-0.1	QM
411	A	Ceiling Vent	Lft		I	Metal	Tan	0.0	QM
402	B	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
409	B	Locker	Ctr		I	Wood	Natural	0.1	QM
407	C	Column	Ctr		I	Metal	OffWhite	0.1	QM
403	C	Window Panel	Rgt		I	Metal	Beige	0.2	QM
408	C	Shelf Unit	Rgt		I	Metal	Tan	0.0	QM
404	D	Wall	L Lft		I	Metal	Beige	0.2	QM

Comment: Reading #411 taken inside Closet.

Interior Room 100 Toilet Room

413	A	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM
414	B	Wall	L Rgt		I	Metal	OffWhite	0.0	QM
415	B	Baseboard	Rgt		I	Metal	Gray	0.3	QM
416	C	Floor			I	Concrete	Gray	-0.1	QM
417	C	Door	Rgt	Rgt casing	I	Metal	Tan	0.2	QM
418	C	Door	Rgt	U Lft	I	Metal	Tan	0.0	QM

Interior Room 101 Class E-35

419	A	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
425	A	Door	Ctr	Rgt casing	I	Metal	Tan	-0.1	QM
426	A	Door	Ctr	L Ctr	I	Metal	Tan	-0.1	QM
430	A	Closet	Lft	Door	I	Wood	Natural	0.2	QM
429	A	Closet	Lft	Ceiling	I	Metal	Blue	0.1	QM
427	A	Ceiling Louver	Lft		I	Metal	White	-0.1	QM
420	A	Corner Guard	Rgt		I	Metal	OffWhite	0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
421	B	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
423	C	Column	Ctr		I	Metal	OffWhite	0.0	QM
422	C	Wall Panel	Lft		I	Metal	Beige	0.0	QM
424	D	Wall	L Ctr		I	Metal	OffWhite	0.2	QM
428	D	Ceiling			I	Metal	White	0.1	QM
Interior Room 102 Toilet Room									
431	A	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
434	C	Door	Rgt	Header	I	Metal	Tan	-0.1	QM
435	C	Door	Rgt	U Lft	I	Metal	Tan	0.0	QM
436	C	Door Louver	Rgt		I	Metal	Tan	0.3	QM
432	D	Wall	L Ctr		I	Metal	OffWhite	-0.1	QM
433	D	Baseboard	Ctr		I	Metal	Gray	0.4	QM
Interior Room 103 Confer E-34									
437	A	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
445	A	Door	Lft	Header	I	Metal	Tan	0.0	QM
447	A	Door	Lft	L Ctr	I	Metal	Tan	0.3	QM
444	A	Soffit	Lft		I	Drywall	OffWhite	0.0	QM
448	A	Door Louver	Lft		I	Metal	Tan	-0.1	QM
439	A	Light Fix	Ctr		I	Metal	White	0.0	QM
438	A	Ceiling Grid	Lft		I	Metal	White	0.0	QM
440	B	Wall	U Ctr		I	Drywall	OffWhite	0.0	QM
449	B	HVAC Unit	Rgt		I	Metal	Tan	0.1	QM
441	C	Wall	L Lft		I	Metal	OffWhite	0.0	QM
442	C	Column	Lft		I	Metal	OffWhite	0.0	QM
446	C	Ceiling Grid	Ctr		I	Metal	White	0.2	QM
443	D	Wall	L Ctr		I	Metal	OffWhite	0.0	QM
Interior Room 104 Electric Rm									
450	A	Elec Panel	Ctr		I	Metal	Gray	-0.2	QM
451	B	Wall Panel	Ctr		I	Wood	Gray	-0.1	QM
454	C	Bar Joist	Rgt		I	Metal	Tan	-0.1	QM
452	D	Door	Lft	Rgt casing	I	Metal	Tan	0.3	QM
453	D	Door	Lft	U Rgt	I	Metal	Tan	0.0	QM
455	D	Corrug Deck	Lft		I	Metal	Gray	0.0	QM
Interior Room 105 Janitor									
456	A	Wall	U Rgt		I	Tile	Orange	0.0	QM
460	A	Door	Ctr	Rgt jamb	I	Metal	Tan	0.0	QM
461	A	Door	Ctr	U Rgt	I	Metal	Tan	0.0	QM
462	A	Light Fix	Ctr		I	Metal	White	0.3	QM
457	C	Wall	L Ctr		I	Tile	Orange	-0.1	QM
459	C	Baseboard	Rgt		I	Tile	Red	-0.1	QM
458	C	Floor			I	Tile	Red	-0.1	QM
Interior Room 106 Class E-33									
463	A	Wall	U Rgt		I	Drywall	OffWhite	-0.1	QM
464	B	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
467	B	Door	Ctr	Lft jamb	I	Metal	Tan	-0.1	QM
468	B	Door	Ctr	U Ctr	I	Metal	Tan	0.0	QM
465	C	Wall	L Ctr		I	Metal	OffWhite	0.2	QM
466	C	Column	Ctr		I	Metal	OffWhite	-0.1	QM
Interior Room 107 Comput Rm									
469	A	Wall	U Ctr		I	Drywall	OffWhite	0.1	QM
470	B	Wall	U Lft		I	Drywall	OffWhite	0.0	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
473	B	Door	Ctr	Lft casing	I	Metal	Tan	0.2	QM
474	B	Door	Ctr	L Ctr	I	Metal	Tan	0.0	QM
471	C	Wall	L Ctr		I	Drywall	OffWhite	0.0	QM
472	D	Wall	L Rgt		I	Drywall	OffWhite	-0.1	QM
Interior Room 108 Class E-32									
475	A	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
476	B	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
481	B	Door	Ctr	Header	I	Metal	Tan	-0.2	QM
482	B	Door	Ctr	U Ctr	I	Metal	Tan	0.0	QM
483	B	Ceill Louver	Rgt		I	Metal	White	-0.1	QM
477	C	Wall	L Rgt		I	Metal	OffWhite	-0.1	QM
487	C	Closet	Lft	Door	I	Metal	Tan	0.2	QM
486	C	Closet	Lft	Door Jamb	I	Metal	Tan	0.0	QM
484	C	Closet	Lft	Wall	I	Metal	Pink	-0.1	QM
485	C	Closet	Lft	Shelf	I	Wood	Natural	-0.1	QM
479	C	Column	Rgt		I	Metal	OffWhite	0.0	QM
478	D	Wall Panel	Lft		I	Metal	Beige	-0.1	QM
480	D	Shelf Unit	Lft		I	Metal	Tan	-0.1	QM
Interior Room 109 Toilet Room									
490	A	Baseboard	Ctr		I	Metal	Gray	0.4	QM
491	A	Floor			I	Concrete	Gray	0.0	QM
488	B	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM
489	D	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
492	D	Door	Rgt	Rgt casing	I	Metal	Tan	0.0	QM
Interior Room 110 Class E-31									
493	A	Wall	U Rgt		I	Metal	OffWhite	0.0	QM
494	B	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
501	B	Door	Ctr	Header	I	Metal	Tan	-0.1	QM
502	B	Door	Ctr	U Ctr	I	Metal	Tan	0.0	QM
504	B	Closet	Lft	Wall	I	Metal	OffWhite	0.0	QM
505	B	Closet	Lft	Shelf	I	Wood	Natural	-0.1	QM
506	B	Ceiling Vent	Lft		I	Metal	OffWhite	0.2	QM
495	C	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
499	C	Window	Rgt	Lft casing	I	Wood	OffWhite	0.0	QM
500	C	Door	Rgt	Rgt casing	I	Wood	OffWhite	0.2	QM
503	C	Cabinet	Lft		I	Wood	Natural	-0.1	QM
496	D	Window Panel	Ctr		I	Metal	Beige	0.0	QM
497	D	Column	Ctr		I	Metal	OffWhite	0.0	QM
498	D	Shelf Unit	Ctr		I	Metal	Tan	0.5	QM
Comment: Reading #506 taken inside Closet.									
Interior Room 111 Toilet Room									
507	A	Wall	L Ctr		I	Metal	OffWhite	-0.1	QM
513	B	Corner Mldg	Rgt		I	Metal	OffWhite	0.0	QM
508	C	Wall	U Ctr		I	Metal	OffWhite	-0.1	QM
509	C	Baseboard	Rgt		I	Metal	Gray	0.0	QM
510	C	Floor			I	Concrete	Gray	-0.2	QM
511	D	Door	Rgt	U Lft	I	Metal	Tan	0.2	QM
512	D	Ceiling Grid	Ctr		I	Metal	White	0.4	QM
Interior Room 112 Class E-30									
514	A	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
519	A	Window	Lft	Sill	I	Wood	OffWhite	0.0	QM
518	A	Door	Lft	Header	I	Wood	OffWhite	0.1	QM

DETAILED REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Reading No.	Wall	Structure	Location	Member	Paint Cond	Substrate	Color	Lead (mg/cm ²)	Mode
515	B	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
521	B	Door	Ctr	Rgt jamb	I	Metal	Tan	0.1	QM
522	B	Door	Ctr	L Rgt	I	Metal	Tan	0.0	QM
524	B	Closet	Lft	Door Jamb	I	Wood	Natural	0.0	QM
523	B	Closet	Lft	Wall	I	Metal	Yellow	-0.1	QM
516	C	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
520	D	Column	Ctr		I	Metal	OffWhite	-0.2	QM
517	D	Wall Panel	Rgt		I	Metal	Beige	0.1	QM

Interior Room 113 Toilet Room

525	B	Wall	U Ctr		I	Metal	OffWhite	0.0	QM
528	C	Baseboard	Rgt		I	Metal	Gray	0.4	QM
526	D	Wall	L Lft		I	Metal	OffWhite	0.0	QM
527	D	Door	Rgt	Header	I	Metal	Tan	0.0	QM
529	D	Door Louver	Rgt		I	Metal	Tan	0.1	QM

Interior Room 114 Class E-29

530	A	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
531	B	Wall	U Lft		I	Metal	OffWhite	-0.1	QM
536	B	Door	Ctr	Rgt jamb	I	Metal	Tan	-0.1	QM
537	B	Door	Ctr	U Ctr	I	Metal	Tan	-0.1	QM
539	B	Closet	Lft	Door	I	Wood	Natural	0.0	QM
538	B	Closet	Lft	Ceiling	I	Metal	Blue	0.2	QM
532	C	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
533	D	Window Panel	Lft		I	Metal	Beige	0.0	QM
534	D	Shelf Unit	Lft		I	Metal	Tan	-0.1	QM
535	D	Column	Ctr		I	Metal	OffWhite	0.0	QM

Interior Room 115 Toilet Room

542	A	Ceiling Grid	Ctr		I	Metal	White	0.0	QM
540	C	Wall	U Rgt		I	Metal	OffWhite	-0.1	QM
543	C	Baseboard	Rgt		I	Metal	Gray	0.3	QM
541	D	Wall	L Lft		I	Metal	OffWhite	-0.1	QM
544	D	Door	Rgt	L Ctr	I	Metal	Tan	0.0	QM

Calibration Readings

001								1.9	QM
002								2.1	QM
003								1.8	QM
004								0.0	QM
005								0.0	QM
006								0.0	QM
325								2.1	QM
326								1.8	QM
327								-0.1	QM
328								0.0	QM
545								1.7	QM
546								1.9	QM
547								1.8	QM
548								0.2	QM
549								0.0	QM
550								0.1	QM

----- End of Readings -----

DISTRIBUTION REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Inspection Date: 10/15/01
 Report Date: 10/22/2001
 Abatement Level: 1.0
 Report No. S#01133 - 10/15/01 15:13
 Total Reading Sets: 533
 Job Started: 10/15/01 15:13
 Job Finished: 10/15/01 21:56

Broadway Elementary School
 1000 Broadway
 Elmira, New York 14904

Structure	Total	Structure Distribution			
		Positive	Negative	Inconclusive	
Backboard	1	0	<0%>	1 <100%>	0 <0%>
BackboardSpt	1	0	<0%>	1 <100%>	0 <0%>
Bar Joist	6	0	<0%>	6 <100%>	0 <0%>
Baseboard	6	0	<0%>	6 <100%>	0 <0%>
Cabinet	3	0	<0%>	3 <100%>	0 <0%>
Ceiling	5	0	<0%>	5 <100%>	0 <0%>
Ceiling Grid	1	0	<0%>	1 <100%>	0 <0%>
Ceiling Vent	1	0	<0%>	1 <100%>	0 <0%>
CeilingGrill	4	0	<0%>	4 <100%>	0 <0%>
CeilingPanel	2	1	<50%>	1 <50%>	0 <0%>
Chair rail	1	0	<0%>	1 <100%>	0 <0%>
Clg Louver	2	0	<0%>	2 <100%>	0 <0%>
Closet Ceiling	3	0	<0%>	3 <100%>	0 <0%>
Closet Door	8	0	<0%>	8 <100%>	0 <0%>
Closet Door Casing	2	0	<0%>	2 <100%>	0 <0%>
Closet Door Jamb	2	0	<0%>	2 <100%>	0 <0%>
Closet Shelf	5	0	<0%>	5 <100%>	0 <0%>
Closet Wall	10	0	<0%>	10 <100%>	0 <0%>
Column L column	7	1	<14%>	6 <86%>	0 <0%>
Column U column	17	0	<0%>	17 <100%>	0 <0%>
Corrig Deck	6	0	<0%>	6 <100%>	0 <0%>
Door Header	26	0	<0%>	26 <100%>	0 <0%>
Door Lft casing	10	0	<0%>	10 <100%>	0 <0%>
Door Lft jamb	10	0	<0%>	10 <100%>	0 <0%>
Door Lintel	5	0	<0%>	5 <100%>	0 <0%>
Door Panel	5	5	<100%>	0 <0%>	0 <0%>
Door Rgt casing	13	0	<0%>	13 <100%>	0 <0%>
Door Rgt jamb	10	0	<0%>	10 <100%>	0 <0%>
Door U Ctr	25	0	<0%>	25 <100%>	0 <0%>
Door U Lft	19	0	<0%>	19 <100%>	0 <0%>
Door U Rgt	18	0	<0%>	18 <100%>	0 <0%>
ElectricPanel	3	0	<0%>	3 <100%>	0 <0%>
Fascia	5	0	<0%>	5 <100%>	0 <0%>
Fire Cabinet	4	0	<0%>	4 <100%>	0 <0%>
Floor	6	0	<0%>	6 <100%>	0 <0%>
Frame	1	0	<0%>	1 <100%>	0 <0%>
HVAC Unit	7	0	<0%>	7 <100%>	0 <0%>
I Beam	2	0	<0%>	2 <100%>	0 <0%>
LightFixture	1	0	<0%>	1 <100%>	0 <0%>
Locker	1	0	<0%>	1 <100%>	0 <0%>
Partition	5	0	<0%>	5 <100%>	0 <0%>
PipeCovering	1	0	<0%>	1 <100%>	0 <0%>
Shelf Unit	12	0	<0%>	12 <100%>	0 <0%>
SkyLightWall	1	0	<0%>	1 <100%>	0 <0%>
Soffit	4	2	<50%>	2 <50%>	0 <0%>
Stairs Railing cap	1	0	<0%>	1 <100%>	0 <0%>
Stairs Stringer	1	0	<0%>	1 <100%>	0 <0%>
Stairs Treads	1	0	<0%>	1 <100%>	0 <0%>
Univent	1	0	<0%>	1 <100%>	0 <0%>
Wall	208	13	<6%>	195 <94%>	0 <0%>
Wall Grill	3	0	<0%>	3 <100%>	0 <0%>
Wall Panel	6	3	<50%>	3 <50%>	0 <0%>

DISTRIBUTION REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Wall Vent	5	0	<0%>	5	<100%>	0	<0%>
Window Header	1	0	<0%>	1	<100%>	0	<0%>
Window Lft casing	3	0	<0%>	3	<100%>	0	<0%>
Window Lft jamb	1	0	<0%>	1	<100%>	0	<0%>
Window Rgt casing	2	0	<0%>	2	<100%>	0	<0%>
WindowPanel	13	3	<23%>	10	<77%>	0	<0%>

Inspection Totals:	<u>533</u>	<u>28</u>	<u>< 5%></u>	<u>505</u>	<u>< 95%></u>	<u>0</u>	<u>< 0%></u>
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DISTRIBUTION REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Inspection Date: 10/15/01
 Report Date: 10/25/01
 Abatement Level: 1.0
 Report No. S#01262 - 10/15/01 15:32
 Total Reading Sets: 534
 Job Started: 10/15/01 15:32
 Job Finished: 10/15/01 22:06

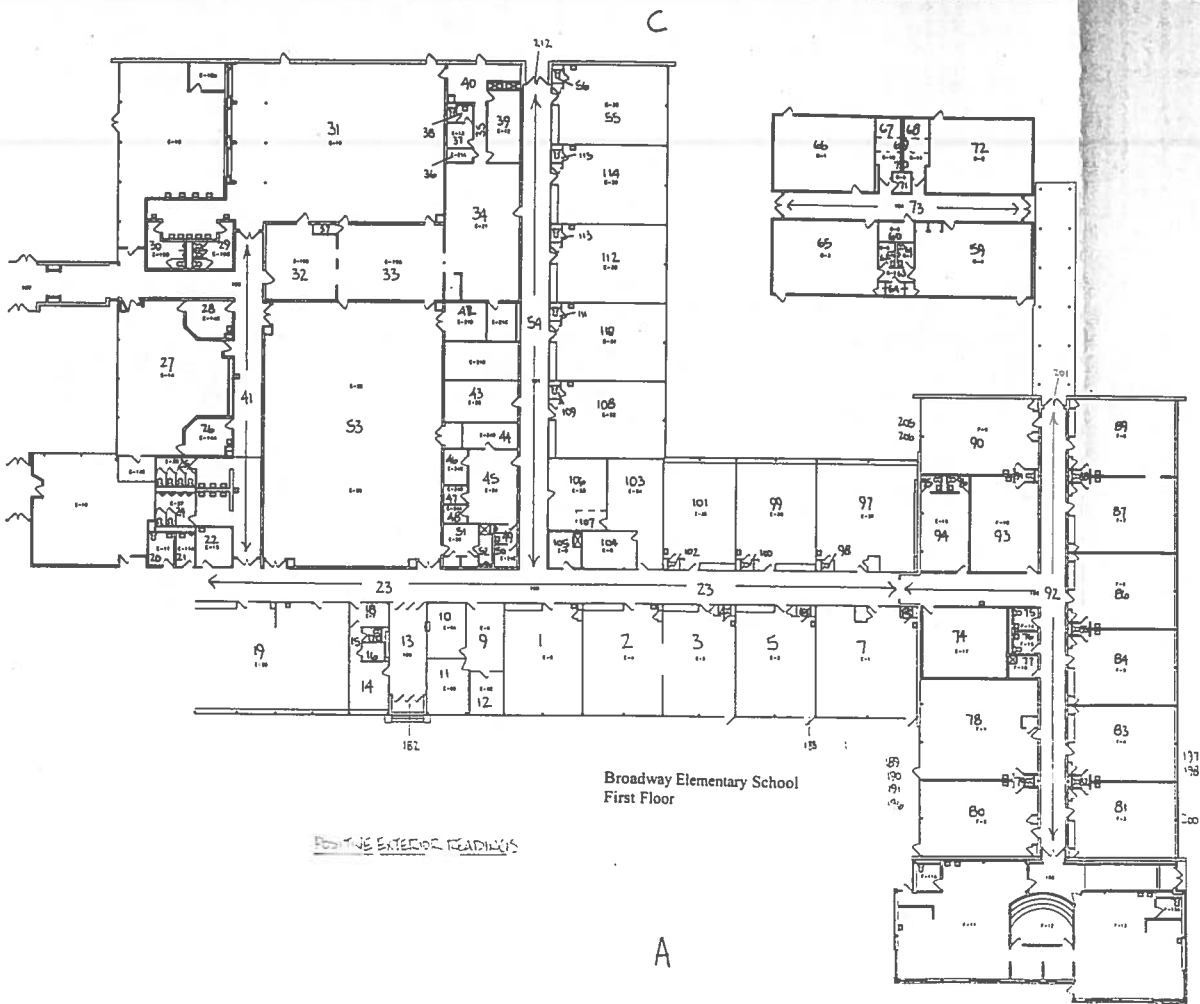
Broadway Elementary School
 1000 Broadway
 Elmira, New York 14904

Structure	Total	Structure Distribution				
		Positive		Negative		Inconclusive
Bar Joist	4	0	<0%>	4	<100%>	0 <0%>
Base Mldg	1	0	<0%>	1	<100%>	0 <0%>
Baseboard	8	0	<0%>	8	<100%>	0 <0%>
Cabinet	1	0	<0%>	1	<100%>	0 <0%>
Cabinet Door	2	0	<0%>	2	<100%>	0 <0%>
Ceill Louver	3	0	<0%>	3	<100%>	0 <0%>
Ceiling	3	0	<0%>	3	<100%>	0 <0%>
Ceiling Grid	9	0	<0%>	9	<100%>	0 <0%>
Ceiling Mldg	4	0	<0%>	4	<100%>	0 <0%>
Ceiling Vent	9	0	<0%>	9	<100%>	0 <0%>
Closet Ceiling	7	0	<0%>	7	<100%>	0 <0%>
Closet Door	4	0	<0%>	4	<100%>	0 <0%>
Closet Door Casing	2	0	<0%>	2	<100%>	0 <0%>
Closet Door Jamb	7	0	<0%>	7	<100%>	0 <0%>
Closet Shelf	6	0	<0%>	6	<100%>	0 <0%>
Closet Wall	14	0	<0%>	14	<100%>	0 <0%>
Coat Hanger	1	0	<0%>	1	<100%>	0 <0%>
Column	25	0	<0%>	25	<100%>	0 <0%>
Corner Guard	1	0	<0%>	1	<100%>	0 <0%>
Corner Mldg	2	0	<0%>	2	<100%>	0 <0%>
Corrug Deck	4	0	<0%>	4	<100%>	0 <0%>
Crown Mldg	3	0	<0%>	3	<100%>	0 <0%>
Door Header	15	0	<0%>	15	<100%>	0 <0%>
Door L Ctr	7	0	<0%>	7	<100%>	0 <0%>
Door L Lft	1	0	<0%>	1	<100%>	0 <0%>
Door L Rgt	5	0	<0%>	5	<100%>	0 <0%>
Door Lft casing	16	0	<0%>	16	<100%>	0 <0%>
Door Lft jamb	11	0	<0%>	11	<100%>	0 <0%>
Door Louver	6	0	<0%>	6	<100%>	0 <0%>
Door Panel	1	1	<100%>	0	<0%>	0 <0%>
Door Rgt casing	10	0	<0%>	10	<100%>	0 <0%>
Door Rgt jamb	19	0	<0%>	19	<100%>	0 <0%>
Door U Ctr	10	0	<0%>	10	<100%>	0 <0%>
Door U Lft	14	0	<0%>	14	<100%>	0 <0%>
Door U Rgt	16	0	<0%>	16	<100%>	0 <0%>
Dr Kickplate	1	0	<0%>	1	<100%>	0 <0%>
Elec Panel	3	0	<0%>	3	<100%>	0 <0%>
Fascia	2	0	<0%>	2	<100%>	0 <0%>
Fire Cabinet	2	0	<0%>	2	<100%>	0 <0%>
Floor	7	0	<0%>	7	<100%>	0 <0%>
HVAC Unit	5	0	<0%>	5	<100%>	0 <0%>
I Beam	3	0	<0%>	3	<100%>	0 <0%>
Light Fix	3	0	<0%>	3	<100%>	0 <0%>
Locker	1	0	<0%>	1	<100%>	0 <0%>
Partit Mldg	1	0	<0%>	1	<100%>	0 <0%>
Partition	2	0	<0%>	2	<100%>	0 <0%>
Ramp	1	0	<0%>	1	<100%>	0 <0%>
Shelf	6	0	<0%>	6	<100%>	0 <0%>
Shelf Unit	9	0	<0%>	9	<100%>	0 <0%>
Soffit	1	0	<0%>	1	<100%>	0 <0%>
Univent	5	0	<0%>	5	<100%>	0 <0%>
Wall	188	0	<0%>	188	<100%>	0 <0%>

DISTRIBUTION REPORT OF LEAD PAINT INSPECTION FOR: Elmira City School District

Wall Mldg	5	0	<0%>	5	<100%>	0	<0%>
Wall Panel	13	5	<38%>	8	<62%>	0	<0%>
Wall Vent	2	0	<0%>	2	<100%>	0	<0%>
Window Lft casing	5	0	<0%>	5	<100%>	0	<0%>
Window Panel	9	5	<56%>	4	<44%>	0	<0%>
Window Rgt casing	2	0	<0%>	2	<100%>	0	<0%>
Window Sill	7	0	<0%>	7	<100%>	0	<0%>

Inspection Totals:	534	11	< 2%>	523	< 98%>	0	< 0%>
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Broadway Elementary School
First Floor

FIVE EXTERIOR READING

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including equipment pads.
- F. Concrete curing.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- B. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.3 REFERENCE STANDARDS

- A. ACI PRC-213 - Guide for Structural Lightweight-Aggregate Concrete; 2014 (Reapproved 2023).
- B. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- C. ACI MNL-66 - ACI Detailing Manual; 2020.
- D. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- E. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- F. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- G. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- H. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- I. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- J. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- K. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- L. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- M. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
- N. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.

- O. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- P. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2025b.
- Q. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- R. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.
- S. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.
- T. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- U. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- V. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- W. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- X. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2025.
- Y. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.
- Z. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- AA. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- BB. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.
- CC. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2025.
- DD. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.
- EE. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2024.
- FF. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.
- GG. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- HH. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2023.
- II. ASTM D2103 - Standard Specification for Polyethylene Film; 2023a.
- JJ. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.
- KK. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.
- LL. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
- D. Design Data:
 - 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 - 2. Identify mix ingredients and proportions, including admixtures.
 - 3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
 - 4. Submit 28 day concrete strength test data for each mix design per ACI CODE-318 requirements.
 - a. Provide a minimum of 15 concrete strength tests, where a concrete strength test is the average strength of at least two 6x12 inch or three 4x8 inch cylinders.
 - b. If 15 concrete tests are unavailable, the average strength of the concrete tests must exceed the required strength by 1200psi for up to 5000 psi mix concrete.
- E. Samples: Submit samples of underslab vapor retarder to be used.
- F. Reinforcing Placement Drawings: Comply with requirements of ACI MNL-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices, supporting & spacing devices. Indicate quantities of reinforcing steel and welded wire fabric.
- G. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- H. Reports: Submit certified copies of mill test report of reinforcement materials analysis.
- I. Test Reports: Submit report for each test or series of tests specified.
- J. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

1.5 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements for requirements.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.6 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.1 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Steel.
 - 2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.2 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: As indicated on drawings.
- C. Fiber Reinforcement: Alkali-resistant polypropylene monofilament complying with ASTM C1116/C1116M, 24 ksi minimum tensile strength. Mixing rate per manufacturer's recommendations.
 - 1. Fiber Length: 0.75 inch, nominal.
 - 2. Products:
 - a. Fibermesh 150 by Propex Concrete Systems: www.fibermesh.com
 - b. FRC Mono 150 by FRC Industries: www.frcindustries.com
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Coarse Aggregate Maximum Size: In accordance with ACI CODE-318.
- C. Fly Ash: ASTM C618, Class F. Loss on ignition requirement waived if used in flowable fill concrete mix.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.

- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

2.5 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3. Products:
 - a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
 - b. Poly-America; Husky Yellow Guard Class A 15-mil Vapor Barrier: www.yellowguard.com/#sle.
 - c. Stego Industries, LLC; Stego Wrap 15-mil: www.stegoindustries.com/#sle.
 - d. Tex-Trude, LP; Xtreme Vapor Barrier (15-mil): www.tex-trude.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
 - 2. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
 - 3. Flowable Products:
 - a. Euclid Chemical Company; NS GROUT: www.euclidchemical.com/#sle.
 - b. Five Star Products, Inc; Five Star Fluid Grout 100: www.fivestarprouducts.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, nonmetallic aggregate, and activator.
 - 1. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch.

2.6 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Epoxy Bonding System:
 - 1. Complying with ASTM C881/C881M and of Type required for specific application.
 - 2. Products:
 - a. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
 - b. Kaufman Products Inc; SurePoxxy HM Class B: www.kaufmanproducts.net/#sle.
 - c. SpecChem, LLC; SpecPoxxy 1000, SpecPoxxy 2000, SpecPoxxy 3000, or SpecPoxxy 3000FS: www.specchemllc.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
- D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
 - 1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
 - 2. Height: To suit slab thickness.
- E. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient elastomeric filler strip with Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum cover plate, of longest manufactured length at each location, flush mounted; color as selected.

2.7 CURING MATERIALS

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- B. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
- C. Moisture-Retaining Sheet: ASTM C171.
 - 1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
 - 2. Non-staining cotton fabric, weighing not less than 8 oz/per square yd, bonded to prevent separation during handling and placing.
- D. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
- E. Water: Potable, not detrimental to concrete.

2.8 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Proportioning Structural Lightweight Concrete: Comply with ACI PRC-213 recommendations.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- E. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

2.9 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
 - 1. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.
- B. Transit Mixers: Comply with ASTM C94/C94M.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 EXAMINATION

- A. See Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Remove debris and ice from formwork, reinforcement, and concrete substrates.
- C. Remove water from areas receiving concrete before concrete is placed.
- D. Verify that forms are clean and free of rust before applying release agent.
- E. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- F. Wet sticking anchor rods shall not be permitted.
- G. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
- H. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- I. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour.
 - 2. Lap Vapor Barrier over footings and seal to foundation walls.
 - 3. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
 - 4. Seal all penetrations (including pipes) with pipe boot and tape.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Notify testing laboratory and Architect not less than 24 hours prior to commencement of placement operations.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.5 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for compliance with specified tolerances.
- B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 35; F(L) of 25, on-grade only.
 - 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
 - 3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
 - 4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.

CAST-IN-PLACE CONCRETE

- C. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155/E1155M, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value.
- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.6 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 - 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 2. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/4 inch per foot nominal.

3.7 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.8 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI CODE-318 and applicable code.
- C. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- D. Provide free access to concrete operations at project site and cooperate with appointed firm.
- E. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- F. Concrete Inspections:
 - 1. Continuous Placement Inspection: Inspect for proper installation procedures.
 - 2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.
- G. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172/C172M.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, field cured.
 - 3. Sample concrete and make one set of four cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
 - 4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.

5. Make one additional cylinder during cold weather concreting, and field cure.

H. Field Testing:

1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

I. Cylinder Compressive Strength Testing:

1. Test Method: ASTM C39/C39M.
2. Test Acceptance: In accordance with ACI CODE-318 and applicable code.
3. Test one cylinder at 7 days.
4. Test two cylinders at 28 days.
5. Retain one cylinder for 56 days for testing when requested by Architect.
6. Dispose remaining cylinders when testing is not required.

J. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.9 PATCHING

A. Allow Architect to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.

C. Patch imperfections as directed by Architect in accordance with ACI CODE-318.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

A. If cold weather provisions of ACI PRC-306 are required:

1. Protect fresh concrete from freezing by heating the ground and forms to minimum temperatures of ACI PRC-306.
2. Thermally protect the fresh concrete the following durations
 - a. Concrete footings/walls - 48 hours after placement
 - b. Concrete piers - 72 hours after placement.
 - c. Concrete slabs on grade - 72 hours after placement.

B. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

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SECTION 03 54 00
CAST UNDERLAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment.
 - 1. Use cementitious type at all locations.

1.2 RELATED REQUIREMENTS

- A. Section 01 35 17 - Alteration Project Procedures.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation.
- C. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCE STANDARDS

- A. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- B. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2021.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's data documenting physical characteristics and product limitations.
- C. Certificate: Certify products of this section meet or exceed specified requirements.
- D. Manufacturer's Instructions: Indicate information on surface preparation, mixing instructions, environmental limitations, and installation instructions.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this section with minimum three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.6 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Construct 6-by-6-foot mock-up indicating preparation techniques and application workmanship.
- C. Locate where directed by Architect.
- D. Mock-up may remain as part of work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Keep dry and protect from direct sun exposure, freezing, and ambient temperatures greater than 105 degrees F.

1.8 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during, and 72 hours after installation of underlayment.
- C. During curing process, ventilate spaces to remove excess moisture.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1-year manufacturer warranty for defective materials. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cementitious Underlayment:
 - 1. ARDEX Engineered Cements; ARDEX V 1200 with ARDEX P51 Primer: www.ardexamericas.com/#sle.
 - 2. CMP Specialty Products; Level-1 with AS-100 Primer: www.cmpsp.com
 - 3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - 4. Sika Corporation; Sikafloor Level 50: www.sikafloorusa.com/#sle.

2.2 MATERIALS

- A. Cast Underlayments, General:
 - 1. Comply with applicable code for combustibility or flame spread requirements.
- B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
 - 1. Compressive Strength: Minimum 4500 pounds per square inch after 28 days, tested per ASTM C109/C109M.
 - 2. Flexural Strength: Minimum 1,000 psi after 28 days, tested in accordance with ASTM C348.
 - 3. Density: 125 pcf, nominal.
 - 4. Final Set Time: 1-1/2 to 2 hours, maximum.
 - 5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inches.
 - 6. Surface Burning Characteristics: Flame spread index of 0 and smoke developed index of 0 when tested in accordance with ASTM E84.
- C. Aggregate: Dry, well-graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.
- E. Primer: Manufacturer's recommended type.

- F. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.

2.3 MIXING

- A. Site mix materials in accordance with manufacturer's instructions.
- B. Add aggregate for areas where thickness will exceed 1 inch or as required per product manufacturer. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.
- C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.1 EXAMINATION

- A. See Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces are clean, dry, unfrozen, and do not contain petroleum byproducts or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

- A. Concrete: Mechanically prepare steel troweled concrete to create surface to achieve bond; permitted methods include bead blasting and scarifying. Do not use acid etching.
- B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
- C. Vacuum clean surfaces.
- D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- E. See Section 09 05 61 for moisture vapor reducers.
- F. Close floor openings.

3.3 APPLICATION

- A. Apply underlayment in accordance with manufacturer's instructions.
- B. Pump or pour material onto substrate. Do not retemper or add water.
 - 1. Pump, move, and screed while material is still highly flowable.
 - 2. Be careful not to create cold joints.
 - 3. Wear spiked shoes while working in wet material to avoid leaving marks.
- C. Place to thickness indicated on Drawings or as required to achieve finished floor elevation, with top surface level to 1/16 inch in 10 ft.
- D. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to point where material loses evaporative moisture. Immediately prime and begin application of subsequent layer within 24 hours.
- E. Place underlayment before partition installation.
- F. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.
- G. If a fine, feathered edge is desired, initial preparation per manufacturers recommendations and steel trowel the edge after initial set, but before it is completely hard.

3.4 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set is reached.
- B. Air cure in accordance with manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. An independent testing agency will perform field inspection and testing, as specified in Section 01 40 00 - Quality Requirements.

3.6 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 01 00
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water and Chemical cleaning of Masonry surfaces.
- B. Replacement of architectural pre-cast stone units.
- C. Repointing mortar joints.
- D. Repair of damaged masonry.

1.2 RELATED REQUIREMENTS

- A. Section 04 05 11 - Masonry Mortaring and Grouting.
- B. Section 04 20 00 - Unit Masonry: Brick masonry units.
- C. Section 04 20 00 - Unit Masonry: Mortar and grout.

1.3 REFERENCE STANDARDS

- A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Samples: Submit Mortar illustrating matching color.

1.5 QUALITY ASSURANCE - MASONRY WORK

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
 - 1. Maintain one copy of each document on project site.
- B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.6 MOCK-UPS

- A. Restore and repoint an existing masonry wall area sized 4 feet long by 4 feet high; include in mock-up area instances of mortar.

1.7 FIELD CONDITIONS - MASONRY WORK

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Restoration and Cleaning Chemicals:
 - 1. Diedrich Technologies, Inc: www.diedrichtechnologies.com/#sle.
 - 2. HMK Stone Care System: www.hmkstonecare.com/#sle.
 - 3. PROSOCO: www.prosoco.com/#sle.

2.2 CLEANING MATERIALS

- A. Cleaning Agent: Detergent type.

2.3 MORTAR MATERIALS

- A. Comply with requirements of Section 04 05 11.

2.4 MASONRY MATERIALS

- A. Brick: Section 04 20 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces to be cleaned are ready for work of this section.

3.2 PREPARATION

- A. Protect surrounding elements from damage due to restoration procedures.
- B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
- C. Separate areas to be protected from restoration areas using means adequate to prevent damage.
- D. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

3.3 REBUILDING

- A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.
- B. Support structure as necessary in advance of cutting out units.
- C. Cut away loose or unsound adjoining masonry as directed.
- D. Build in new units following procedures for new work specified in other section(s).
- E. Mortar Mix: Colored and proportioned to match existing work.
- F. Ensure that anchors are correctly located and built in.
- G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.4 REPOINTING

- A. Perform repointing prior to cleaning masonry surfaces.

- B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.
- C. Do not damage masonry units.
- D. When cutting is complete, remove dust and loose material by brushing.

3.5 CLEANING EXISTING MASONRY

- A. Cleaning Detergent: Brush clean masonry surfaces at indicated locations with cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

3.6 CLEANING NEW MASONRY

- A. Verify mortar is fully set and cured.
- B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.

3.7 RESTORATION CLEANING

- A. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.

3.8 CLEANING

- A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.
- B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.
- C. Clean surrounding surfaces.

END OF SECTION

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SECTION 04 05 11
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mortar for masonry.
- B. Grout for masonry.

1.2 RELATED REQUIREMENTS

- A. Section 04 01 00 - Maintenance of Masonry: Bedding and pointing mortar for masonry restoration work.
- B. Section 04 20 00 - Unit Masonry: Installation of mortar and grout.

1.3 REFERENCE STANDARDS

- A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.
- B. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.
- C. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- D. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.
- E. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
- F. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- G. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- H. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- I. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- J. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2025.
- K. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.
- L. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2024.
- M. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- N. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry; 2022.
- O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

- C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- D. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C 270 and test and evaluation reports per ASTM C 780 for aggregate ratio and water content, air content, consistency, and compressive strength.
- E. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.7 FIELD CONDITIONS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT APPLICATIONS

- A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials or made from factory premixed dry materials with addition of water only.
- B. Mortar Mix Designs: ASTM C270, Property Specification.
 - 1. Masonry below grade and in contact with earth: Type S.
 - 2. Exterior, Loadbearing Masonry: Type S.
 - 3. Exterior, Non-loadbearing Masonry: Type N.
 - 4. Exterior Repointing Mortar: Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.
 - 5. Interior, Loadbearing Masonry: Type S.
 - 6. Interior, Non-loadbearing Masonry: Type N.
- C. Grout Mix Designs:
 - 1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; mix in accordance with ASTM C476.
 - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 2. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; mix in accordance with ASTM C476.
 - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.2 MATERIALS

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Color: Mineral pigments added as required to produce approved color sample.
 - 2. Manufacturers:
 - a. The QUIKCRETE Companies: www.quikrete.com/#sle..
 - b. Lehigh Portland Cement: www.lehighhanson.com.
 - c. Solomon Colors: www.solomoncolors.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, graded sand, and chemical admixtures complying with ASTM C91/C91M with the addition of water only.
 - 1. Color: To match adjacent mortar color.
- C. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
- D. Portland Cement: ASTM C150/C150M.
 - 1. Type: Type I - Normal; ASTM C150/C150M.
 - 2. Color: Color as required to produce approved color sample.
- E. Masonry Cement: ASTM C91/C91M.
 - 1. Type: Type N; ASTM C91/C91M.
- F. Hydrated Lime: ASTM C207, Type S.
- G. Mortar Aggregate: ASTM C144, standard masonry type.
- H. Grout Aggregate: ASTM C404, coarse.
- I. Water: Clean and potable.
- J. Bonding Agent: Latex type.

2.3 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, re-temper only within two hours of mixing.
- E. Use mortar within two hours after mixing at temperatures of 90 degrees F or two-and-one-half hours at temperatures under 50 degrees F.

2.4 GROUT MIXING

- A. Mix grout in accordance with ASTM C94/C94M.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
- C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.1 PREPARATION

- A. Apply bonding agent to existing concrete surfaces.
- B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.2 INSTALLATION

- A. Install mortar and grout to requirements of section(s) in which masonry is specified.
- B. Install grout in accordance with TMS 402/602 and ASTM C476.
- C. Work grout into masonry cores and cavities to eliminate voids.
- D. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.
- E. Do not displace reinforcement while placing grout.
- F. Remove excess mortar from grout spaces.

3.3 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 40 00 - Quality Requirements.
- B. Test and evaluate mortar mix in accordance with ASTM C780 procedures.
- C. Test and evaluate grout mix in accordance with ASTM C1019 procedures.
- D. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C1314, and for flexural bond strength in accordance with ASTM C1072 or ASTM E518/E518M; perform tests and evaluate results as specified in individual masonry sections.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Clay facing brick.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements.
- B. Section 04 05 11 - Masonry Mortaring and Grouting.
- C. Section 05 50 00 - Metal Fabrications: Loose steel lintels.
- D. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.
- E. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.
- F. Section 07 25 00 - Weather Barriers: Water-resistive barriers applied to exterior face of backing sheathing or unit masonry substrate.
- G. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
- H. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- E. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.
- F. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
- G. ASTM C129 - Standard Specification for Dry-Cast Nonloadbearing Concrete Masonry Units; 2025.
- H. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2025.

- I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2024.
- J. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- K. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- L. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- M. BIA Technical Notes No. 18A - Accommodating Expansion of Brickwork; 2019.
- N. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls; 2025.
- O. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- P. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit two samples of facing brick units to illustrate color, texture, and extremes of color range. Brick must match the range of color and texture of the existing brick or as selected by Architect.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized 4 feet long by 4 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Mock-up may remain as part of work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Manufacturers:

1. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - a. Southern Tier Concrete Products.
 - b. Dagostino Building Blocks.
 - c. York Building Products, Inc.
 - d. Substitutions: Section 01 60 00 - Product Requirements.
- B. Concrete Block: Comply with referenced standards and as follows:
 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 2. Special Shapes: Provide nonstandard blocks configured for corners and other detailed conditions.
 3. Load-Bearing Units: ASTM C90, normal weight.
 4. Nonloadbearing Units: ASTM C129.

2.2 BRICK UNITS

- A. Manufacturers:
 1. Belden Brick: www.beldenbrick.com/#sle.
 2. Glen-Gery Brick: www.glengery.com.
- B. Facing Brick: ASTM C216, Type FBX, Grade SW.
 1. Color and texture: Dolomite Grey Smooth Ironspot as manufactured by Glen-Gery.
 2. Color and texture to match Architect's sample.
 3. Nominal size: As indicated on drawings.
 4. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
 5. Provide solid brick units at lintels. ASTM C62, Grade SW

2.3 MORTAR AND GROUT MATERIALS

- A. Mortar and Grout: As specified in Section 04 05 11.

2.4 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 1. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 2. WIRE-BOND www.wirebond.com/#sle.
 3. Duro-O-Wal: www.dur-o-wal.com
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Reinforcing Steel: Type specified in Section 03 30 00; size as indicated on drawings; uncoated finish.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 1. Type: Truss or ladder.
 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- D. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
 1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
 3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
 4. Vertical adjustment: Not more than 1 1/4 inches.
 5. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

- E. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
- G. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches.

2.5 FLASHINGS

- A. Membrane Non-Asphaltic Flashing Materials:
 - 1. Composite Polymer Flashings - Self-Adhering: Composite PVC with Elvaloy KEE; 40 mil thick with pressure-sensitive adhesive and release paper.
 - a. Physical Properties:
 - 1) Elongation: 225% (ASTM D412)
 - 2) Tensile Strength: 875 psi (ASTM D412)
 - 3) Tear Strength: 270 psi (ASTM D624)
 - 4) Low Temperature Flexibility: -25°F Pass (ASTM D146)
 - 5) Water Absorption: Less than 0.1% (ASTM D471)
 - 6) Color as selected by Architect from manufacturer's full range.
 - 7) Compatability with Urethan and Silicone sealant
 - 8) UV Stable
 - (a) Manufacturers:
 - (1) Hyload, Inc: www.hyload.com/#sle.
 - (2) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Factory-Fabricated Flashing Corners and End Dams: PVC with Elvaloy KEE.
- C. Termination Bars: Stainless steel; compatible with membrane and adhesives.
- D. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
- E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.6 ACCESSORIES

- A. Control Joints: Closed-cell Neoprene sponge material, 3/8 inch wide by maximum lengths available. Provide with corner and tee accessories, fused joints.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - b. WIRE-BOND: www.wirebond.com/#sle.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - b. WIRE-BOND: www.wirebond.com/#sle.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

- D. Weeps:
 - 1. Type: Molded PVC grilles, insect resistant.
- E. Cavity Vents:
 - 1. Type: Molded PVC grilles, insect resistant.
- F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials. All material cleaning shall be done as recommended by material supplier.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running, unless shown otherwise in contract documents.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running, unless shown otherwise in contract documents.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.4 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

- H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.5 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.
- B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.6 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor retarder adhesive.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.
- D. Install cavity wall vents in veneer at 16 inch o.c. horizontally at top of exterior walls and below windowsills.

3.7 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.8 LINTELS

- A. Install loose steel lintels over openings.
- B. Maintain minimum 6 inch bearing on each side of opening.

3.9 GROUTED COMPONENTS

- A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web unless noted otherwise on contract documents.
- B. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.10 CONTROL AND EXPANSION JOINTS

- A. Locate control and expansion joints as indicated on drawings and in accordance with recommendations of BIA Technical Notes No. 18A.
 - 1. Where joint locations are not indicated, or discrepancy exists between indicated joints and BIA recommendations, notify Architect for approval prior to proceeding.
- B. Do not continue horizontal joint reinforcement through control or expansion joints.

- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. Form expansion joint as detailed on drawings.

3.11 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.12 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.13 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, grounds, and ductwork. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
 - 1. The agency shall monitor the proportioning, mixing, and consistency of mortar and grout; the placement of mortar, grout and masonry units; and the placement or reinforcing steel for compliance with the contract documents.
- B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.
- C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.
- E. The agency shall prepare one set of prisms for testing at 7 days and one set for testing at 28 days. Tests are to be conducted by the agency for each 3,000 square feet of wall installed, but not less than two tests.

3.15 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- B. Protect base of walls from mud and mortar splatter.
- C. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.
- D. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural steel framing members, support members.
- B. Base plates, anchors.
- C. Grouting under base plates.

1.2 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Coordination and Project Conditions
- B. Section 05 21 00 - Steel Joist Framing.
- C. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

1.3 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2025).
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- G. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2022.
- H. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.
- I. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.
- J. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel; 2021.
- K. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2024.
- L. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.
- M. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.
- N. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2024.
- O. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.

- P. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.
- Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- T. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- U. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- V. SSPC-SP 3 - Power Tool Cleaning; 2024.
- W. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

1.5 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Maintain one copy of each document on site.
- C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience with current AISC Quality Management Systems (QMS) Certification, Certified Building Fabricator, BU.
 - 1. Non AISC certified companies are acceptable with the following requirements:
 - a. A special inspector hired by the owner will be required to observe all fabrication of the structural steel for this project.
 - b. The cost for the special inspection fees incurred during fabrication shall be reimbursed to the owner by the contractor.
- D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- F. Shop Painter: Company specializing in performing Work of this section with minimum 3 years documented experience with the following current AISC Certification:
 - 1. Sophisticated Paint Endorsement - Enclosed (P1)
 - 2. Sophisticated Paint Endorsement - Covered (P2)
 - 3. Sophisticated Paint Endorsement - Outside (P3)

- G. Welders and Welding Procedures: AWS D1.1 Structural Welding Code - Steel, qualified within previous 12 months.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.
- E. Steel Plate: ASTM A514/A514M.
- F. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.
- G. Headed Anchor Rods: ASTM F1554 Grade 36, plain.
- H. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- J. Sliding Bearing Plates: Teflon coated.
- K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
- C. Fabricate connections for bolt, nut, and washer connectors.

2.3 FINISH

- A. Prepare structural component surfaces in accordance with SSPC-SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
 - 1. Color: Gray
- C. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating. Galvanize after fabrication.
- D. All exterior exposed steel to be galvanized.
- E. Galvanizing for Fasteners, connectors and Anchors
 - 1. Hot-dipped Galvanizing: ASTM A153/A153M.
 - 2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.4 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Shop test bolted and welded connections as specified for field quality control tests.
- C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.
 - 1. Verify bearing surfaces are at correct elevation.
 - 2. Verify anchor rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components indicated on shop drawings.
- D. Field connect members with threaded fasteners; torque to required resistance. Tighten to snug tight for bearing type connections.
- E. Do not field cut or alter structural members without approval of Architect.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.3 TOLERANCES

- A. See Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- C. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing, and 01 45 33 - Code-Required Special Inspections and Procedures.
- B. Bolted Connections: Inspect in accordance with AISC specifications.
 - 1. Visually inspect all bolted connections.
 - 2. For Direct Tension Indicators, comply with requirements of ASTM F959/F959M. Verify that gaps are less than specified in Table 2.

- C. Welded Connections: Inspect welds in accordance with AWS D1.1/D1.1M.
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Visually inspect all welds.
 - 3. Radiographic testing performed in accordance with ASTM E94/E94M. Performed when directed by Architect/Engineer.
 - 4. Ultrasonic testing performed in accordance with ASTM E164. Perform on all full penetration welds.
 - 5. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 6. Magnetic particle inspection performed in accordance with ASTM E709. Performed when directed by Architect/Engineer.
- D. Correct defective bolted connections and welds.

END OF SECTION

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SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Open web steel joists, with bridging, attached seats and anchors.
- B. Supplementary framing for floor and roof openings greater than 18 inches.

1.2 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel Framing: Superstructure framing.
- B. Section 05 31 00 - Steel Decking: Support framing for openings less than 18 inches in decking.
- C. Section 05 50 00 - Metal Fabrications: Non-framing steel fabrications attached to joists.
- D. Section 03 30 00: Placement of anchors for casting into concrete.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- D. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- E. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- F. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Provide shop drawings consisting of a framing plan and details developed by the steel joist manufacturer indicating standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
 - 1. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design calculations for each special joist designation (indicated as "SP" on the drawings) shall be submitted with shop drawings.
 - a. The special joists shop drawings and design calculations shall be designed and detailed by a professional engineer licensed to practice in the State of New York. Submittals shall bear their seal and signature.
 - b. Standard SJI designations shall be designed to the SJI specified design loads and need not be submitted.
- C. Joist Manufacturer's SJI Accreditation Certificate.

1.5 QUALITY ASSURANCE

- A. Design Responsibility: The design of the steel joist and associated connections shall be in accordance with applicable codes, regulations, and performance requirements herein provided, and shall be the sole responsibility of the steel joist manufacturer.
- B. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of New York.
 - 1. Comply with applicable codes for submission of design calculations, shop drawings, and erection drawings as required for acquiring permits.
 - 2. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.
- C. The Joist Manufacturer shall be certified by the Steel Joist Institute to engage in the design, manufacturing and distribution of steel joists and accessories.
 - 1. Joists manufactured by a non-certified shop may be provided. During production these joists require special inspections. The special inspections shall be provided at the cost of the contractor.
- D. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 (five) years documented experience.
- E. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 (five) years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Steel Joists:
 - 1. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
 - 2. New Columbia Joist Co.

2.2 MATERIALS

- A. Open Web Joists: SJI Type K Joists:
 - 1. Provide bottom and top chord extensions as indicated.
 - 2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standard.
 - 3. Minimum End Bearing on Concrete or Masonry Supports: Comply with referenced SJI standard.
 - 4. Finish: Shop primed.
- B. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, Type 1, Red Oxide.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

- A. Furnish bottom and top chord extensions as indicated on drawings.
- B. Fabricate to achieve end bearing requirements.

- C. If joist splice is required:
 - 1. Provide field welded splice connection at exposed conditions.
 - 2. Provide bolted splice connection where ceilings are to be installed.

2.4 FINISH

- A. Shop prime joists and supplementary framing members.
 - 1. Do not prime surfaces that will be fireproofed, field welded, or in contact with concrete.
 - 2. Galvanize steel ledge angles, galvanize after fabrication.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.
- C. Galvanizing: Provide minimum 2.0 oz/sq ft galvanized coating to ASTM A123/A123M requirements.
- D. Galvanizing for Fasteners, Connectors and Anchors:
 - 1. Hot-Dipped Galvanizing: ASTM A153/A153M
 - 2. Mechanical Galvanizing: ASTM B695; Class 50 minimum

2.5 SOURCE QUALITY CONTROL

- A. Provide shop testing and analysis of steel components.
- B. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions
- B. Verify existing conditions prior to beginning work.

3.2 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- D. Position and field weld joist chord extensions and wall attachments as detailed.
- E. Install supplementary framing for floor and roof openings greater than 18 inches.
- F. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- G. Do not field cut or alter structural members without approval of Architect/Engineer and joist manufacturer.
- H. After erection, prime welds, damaged shop primer, damaged galvanizing, and surfaces not shop primed, except surfaces specified not to be primed or in contact with concrete.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances

- B. Maximum Variation From Plumb: 1/4 inch.
- C. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting and balancing
- B. Field inspect members, connections, welds and tightening of high strength bolts in slip-critical connections.

END OF SECTION

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof deck.
- B. Metal form deck.
- C. Supplementary framing for openings up to and including 18 inches.
- D. Bearing plates and angles.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete topping over metal deck; placement of anchors for bearing plates in precast concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of anchors for bearing plates embedded in unit masonry assemblies.
- C. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.
- D. Section 05 21 00 - Steel Joist Framing: Support framing for openings larger than 18 inches and shear stud connectors.
- E. Section 05 50 00 - Metal Fabrications: Steel angle concrete stops at deck edges.

1.3 REFERENCE STANDARDS

- A. ASCE 3 - Standard Practice for the Construction and Inspection of Composite Slabs.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.
- F. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2022a.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- H. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).
- I. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.
- J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Certificates: Certify that products furnished meet or exceed specified requirements.
- D. Submit manufacturer's installation instructions.

1.5 PERFORMANCE REQUIREMENTS

- A. Design metal deck in accordance with SDI 29 Design Manual.

1.6 QUALITY ASSURANCE

- A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Cut plastic wrap to encourage ventilation.
- C. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Deck Manufacturers:
 - 1. United Steel Deck: www.unitedsteel.com
 - 2. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
 - 3. Epic Metals Corporation: www.epicmetals.com
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
 - 1. Calculate to structural working stress design and structural properties specified.
 - 2. Maximum Vertical Deflection of Roof Deck: 1/240 of span.
 - 3. Maximum Vertical Deflection of Form Deck: 1/360 of span.
- B. Acoustical Roof Deck: Sheet steel configured as shown on plans and as follows:
 - 1. Epic Metals Corporation - Type ER2A or equal
 - 2. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating conforming to ASTM A924/A924M.
 - 3. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
- C. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating conforming to ASTM A924/A924M.
 - 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.

3. Structural Properties:
 - a. Section Modulus: As indicated on drawings.
 - b. Span Design: Multiple.
 4. Minimum Base Metal Thickness: 20 gauge, 0.0359 inch unless noted otherwise on drawings.
 5. Nominal Height: 1-1/2 inch.
 6. Profile: Fluted; SDI WR.
 7. Formed Sheet Width: 36 inch.
 8. Side Joints: Lapped.
 9. Flute Sides: plain vertical face
- D. Metal Form Deck: Corrugated sheet steel:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating conforming to ASTM A924/A 924M.
 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
 3. Minimum Metal Thickness, Excluding Finish: 22 gage unless noted otherwise on drawings.
 4. Section Modulus: As indicated on drawings.
 5. Span Design: Multiple
 6. Nominal Height: As indicated on drawings. 9/16 inch
 7. Formed Sheet Width: 32 inch.
 8. Side Joints: Lapped.
 9. Flute Sides: Plain vertical face

2.3 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel unfinished.
- B. Welding Materials: AWS D1.1/D1.1M.
- C. Fasteners: Galvanized hardened steel, self tapping.
- D. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- F. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.
- G. Sheet Steel: ASTM A653, Grade 33 Structural Quality; with G90 galvanized coating conforming to ASTM A924

2.4 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 20 gage thick sheet steel; of profile and size as indicated on drawings; finished same as deck.
- B. Cant Strips: Formed sheet steel, 20 gage, .0359 inch minimum thickness, 45 degree slope, 3-1/2 inch nominal width and height, flange for attachment.
- C. Roof Sump Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.
- D. Floor Drain Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On concrete and masonry surfaces provide minimum 4 inch bearing.
- C. On steel supports provide minimum 1-1/2 inch bearing.
- D. Fasten deck to steel support members at ends and intermediate supports as indicated on drawings.
- E. Mechanically fasten or weld male/female side laps as indicated on drawings.
- F. Weld deck in accordance with AWS D1.3/D1.3M.
- G. At deck openings from 6 inches to 18 inches in size, provide 2 by 2 by 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- H. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- I. At floor edges, install wet concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
- J. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- K. Close openings above walls and partitions perpendicular to deck flutes with double row of foam cell closures.
- L. Seal deck joints, laps, ends and penetrations with sealant to achieve permanent air seal consistent with air barrier system specified in Section 07 25 00.
- M. Place metal cant strips in position and fusion weld.
- N. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- O. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- P. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.3 FIELD QUALITY CONTROL

- A. Welding: Inspect welds in accordance with AWS D1.1

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Formed steel stud exterior wall and interior wall framing.
- B. Formed steel joist and purlin framing and bridging.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking and miscellaneous framing.
- B. Section 07 21 00 - Thermal Insulation: Insulation within framing members.
- C. Section 07 92 00 - Joint Sealants.
- D. Section 09 21 16 - Gypsum Board Assemblies: Cold-formed steel nonstructural framing.
- E. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.3 REFERENCE STANDARDS

- A. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- D. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- E. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.
- C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
 - 1. Indicate stud layout.
 - 2. Describe method for securing studs to tracks and for bolted framing connections.
 - 3. Design data:
 - a. Shop drawings signed and sealed by a professional structural engineer.

- 4. Calculations for loadings and stresses of specially fabricated framing, signed and sealed by a professional structural engineer registered in the State of New York
- D. Manufacturer's Installation Instructions: For lateral-force resisting systems, indicate welding procedure specifications.
- E. Manufacturer's Qualification statement.
- F. Mill Certifications: Submit mill certifications for steel delivered to site. Certify steel bare metal thickness in 0.001 inch, yield strength, tensile strength, total elongation in 2 inch or 8 inch gage length, chemical analysis and galvanized coating thickness.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State of New York.
- B. Manufacturer Qualifications:
 - 1. Company specializing in manufacturing the types of products specified in this section, and with minimum 3 years of documented experience.
 - 2. Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Structural Framing:
 - 1. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Connectors:
 - 1. Same manufacturer as metal framing.

2.2 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Design Requirements: Provide completed framing system having the following characteristics:
 - 1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100.
 - 2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
 - 3. Design Loads: In accordance with applicable codes.
 - a. Vertical Assembly: calculated positive and negative loads.
 - b. Horizontal Assembly: live and dead loads as indicated on the drawings.
 - c. Interior stud framing to be designed to resist minimum 5 psf uniform load and maximum 1/360 deflection
 - 4. Maximum Allowable Deflection: 1/600 of span or 0.3 inches, whichever is less
 - 5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - 6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - 7. Design and size components to withstand seismic loads and sway displacement as calculated in accordance with the applicable codes.

COLD-FORMED METAL FRAMING

- C. Deliver to project site in largest practical sections.

2.3 STRUCTURAL FRAMING COMPONENTS

- A. Wall Studs and Track Sections: ASTM C955; C or or Sigma-shaped studs with punched web u-shaped track sections in stud-matching nominal width and compatible height.
 - 1. Depth: As indicated on drawings.
 - 2. Gage: Determined from load requirements, 18 gage/.043 inch minimum.
 - 3. Stud Spacing: 16" o.c. maximum
 - 4. Provide components fabricated from ASTM A1011/A1011M Designation SS (structural steel).
- B. Jamb Studs: Engineered, c-shaped with wide flanges, designed to replace conventional double-stud framing at openings.
- C. Headers: Engineered one-member or two-member assemblies, with wide flanges, designed to replace conventional box or nested header framing at openings.
 - 1. Jamb Mounting Clips: Manufacturer's standard.

2.4 MISCELLANEOUS CONNECTIONS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.
- B. Anchorage Devices: Powder actuated.
- C. Welding: Comply with AWS D1.1/D1.1M.

2.5 SHEATHING

- A. Gypsum Board Wall Sheathing: See Section 09 21 16.

2.6 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.
- C. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements; Coordination and project conditions.
- B. Verify that substrate surfaces and building framing components are ready to receive work.
- C. Verify rough-in utilities are in proper location.

3.2 INSTALLATION - GENERAL

- A. Install structural members and connections in compliance with ASTM C1007.

3.3 INSTALLATION OF STUDS

- A. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
- B. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using clip and tie or fastener method
- C. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- D. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.
- E. Install load-bearing studs; brace, and reinforce to develop full strength and achieve design requirements.
- F. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- G. Install intermediate studs above and below openings to align with wall stud spacing.
- H. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.
- I. Attach cross studs or furring channels to studs for attachment of fixtures anchored to walls.
- J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- K. Touch-up field welds and damaged corrosion protected surfaces with primer to match shop coating.

3.4 INSTALLATION OF WALL SHEATHING

- A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
 - 1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.

3.5 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricated steel, metal, and metal items including:
 - 1. Lintels
 - 2. Structural supports for miscellaneous attachments

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.
- D. Section 05 21 00 - Steel Joist Framing: Structural joist bearing plates, including anchorage.
- E. Section 05 31 00 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.
- F. Section 05 51 33 - Metal Ladders.
- G. Section 05 52 13 - Pipe and Tube Railings.
- H. Section 09 91 13 - Exterior Painting: Paint finish.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).
- J. NOMMA Guideline 1 - Joint Finishes
- K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

M. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:
 - 1) Design criteria.
 - 2) Engineering analysis depicting stresses and deflections.
 - 3) Member sizes and gauges.
 - 4) Details of connections.
 - 5) Support reactions.
 - 6) Bracing requirements.
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.5 QUALITY ASSURANCE

- A. Design fabricated items under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- B. Finish joints in accordance with NOMMA Guideline 1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- C. Protect metal fabrications from damage by exposure to weather.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Steel Plates: ASTM A 36/A 36M.
- D. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A 653, Grade 33 Structural quality with galvanized coating.
- F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

- G. Bolts, Nuts, and Washers:
 - 1. Bolts: ASTM F3125; Type 1
 - 2. Nuts: ASTM A 563 heavy hex type
 - 3. Washers: ASTM F 436; Type 1
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, Type 1, complying with VOC limitations of authorities having jurisdiction.
 - 1. Color: Gray
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATED ITEMS

- A. Lintels: Steel sections, size and configuration as detailed on drawings, length to allow 8 inches minimum bearing on both sides of opening.
 - 1. Galvanized and Prime paint, one coat
- B. Other Structural Supports: Steel sections, shape and size as indicated on drawings required to support applied loads with maximum deflection of 1/240 of the span; prime paint, one coat.
- C. Anchor bolts: ASTM F 1554; Grade 36, weldable, straight shape, Furnish with nut and washer; unfinished.
- D. Exterior Stair Nosings: 4 inch Wide Cast aluminum with intergrate abrasive treads. Model #801 (Poured Concrete stairs) Model 801SP (Poured concrete-filled steel pan stairs) as manufactured by American Safety Tread Company Inc. Color: Natural Metal Finish.

2.4 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items as specified in drawings.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.

- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M requirements; minimum 2.0 oz/sq ft coating thickness.
- G. Galvanizing for Fasteners, Connectors and Anchors: Hot-Dipped Galvanizing to ASTM A 153/A 153M.

2.5 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story or for every 12 ft in height whichever is greater, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

3.5 FIELD QUALITY CONTROL

- A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

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SECTION 05 51 33
METAL LADDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Prefabricated ladders.

1.2 RELATED REQUIREMENTS

- A. Section 05 52 13 - Pipe and Tube Railings.
- B. Section 09 91 23 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders; Current Edition.
- B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- M. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 3. Drawings to be signed and sealed by a Professional Engineer registered in the State of New York
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.5 QUALITY ASSURANCE

- A. Design fabricated ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.
- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- F. Bolts, Nuts, and Washers: ASTM A307, plain.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 PREFABRICATED LADDERS

- A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
 - 1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 - 2. Materials: Carbon steel; Grade 36, minimum.
 - 3. Finish: Powder coat; color to be selected by Architect from manufacturer's standard range.
 - 4. Manufacturers:
 - a. Alaco Ladder Company; 560 Series Fixed Wall Ladder: www.alacoladder.com/#sle.
 - b. O'Keeffe's Inc; Model 501: www.okeeffes.com/#sle.
 - c. Precision Ladders, LLC; Fixed Aluminum Wall Ladder: www.precisionladders.com/#sle.
- B. Ladder Security Enclosure: Sheet steel minimum 16 gage, formed to enclose ladder side rails and rungs when closed and to swing free of ladder rungs and side rails with minimum 1-1/2 inches clear to side rails in open position.
 - 1. Provide continuous steel hinge full height of enclosure.
 - 2. Provide steel hasp for padlocking in closed and open position.
 - 3. Finish: Match ladder finish.

2.4 FINISHES - STEEL

- A. Prime paint steel items.
- B. Prime Painting: One coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 09 91 13 - Exterior Painting: Paint finish.
- C. Section 09 91 23 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- D. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- F. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011 (Reapproved 2021).
- G. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- H. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.
- I. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- J. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.
- K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- L. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Delegated Design Data: As required by authorities having jurisdiction.
 - 1. Calculations shall take into account all vertical and lateral loads required by applicable building codes. Calculations shall show all reactions for connection to structural members and shall be designed so that no eccentric or torsional forces are induced in the structural members.
 - 2. Calculations shall be prepared by and signed and sealed by a structural Engineer licensed in the State of New York.
- D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.5 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of New York, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Handrails and Railings:
 - 1. Blumcraft of Pittsburgh
 - 2. Hollaender Manufacturing Co
 - 3. Superior Aluminum Products, Inc
- B. Accessibility-Compliant Handrail Brackets:
 - 1. Rakks/Rangine Corporation; ADA Compliant HR-202: www.rakks.com/#sle.

2.2 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.

- E. Dimensions: See drawings for configurations and heights.
- F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.
- H. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - 1. Ease exposed edges to a small uniform radius.
 - 2. Welded Joints:
 - a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2.3 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M, Grade C cold formed structural tubing.
- B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- C. Exposed Fasteners: No exposed bolts or screws.
- D. Straight Splice Connectors: Steel welding collars.
- E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
 - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.4 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections, and abraded areas.
 - 4. Touch up shop primer and factory-applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
- F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/8 inch.
- C. Maximum Out-of-Position: 1/8 inch.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rough opening framing for doors, windows, and roof openings.
- B. Roofing nailers.
- C. Roofing cant strips.
- D. Concealed wood blocking, nailers, and supports.
- E. Miscellaneous wood nailers, furring, and grounds.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.
- C. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- D. Section 07 53 00 - Elastomeric Membrane Roofing: Roof perimeter to receive blocking.
- E. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.
- F. Section 07 72 00 - Roof Accessories: Prefabricated roof curbs.
- G. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.
- H. Section 10 11 00 - Visual Display Units.
- I. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.
- J. Division 22 and 26 – All products requiring blocking or backboards.

1.3 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- D. AWP A M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.
- E. AWP A U1 - Use Category System: User Specification for Treated Wood; 2025.
- F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. ITS (DIR) - Directory of Listed Products; Current Edition.
- H. PS 1 - Structural Plywood; 2023.

- I. PS 20 - American Softwood Lumber Standard; 2025.
- J. SPIB (GR) - Standard Grading Rules; 2021.
- K. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit technical data on wood treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
 - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.3 EXPOSED DIMENSION LUMBER

- A. Sizes: Nominal sizes as indicated on drawings.
- B. Surfacing: S4S.
- C. Moisture Content: S-dry or MC19.

2.4 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.5 FIRE-RETARDANT TREATMENT (FRT)

- A. Products:
 - 1. Hoover Treated Wood Products, Inc: www.frtw.com/#sle.
 - 2. T2EARTH, LLC: www.t2earth.com/#sle.

- B. Factory-treat wood members in accordance with AWP A U1 and use category indicated.
- C. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (LT), Low-Temperature (low hygroscopic).
 - 1. Treat blocking and other wood members concealed in noncombustible construction.
 - 2. Treat electrical and communications panel backer boards.
 - 3. Treat wood in locations indicated on drawings.
- D. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (HT), High Temperature.
 - 1. Treat wood and plywood used in roof framing and attic spaces.
- E. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.
- F. Fabrication of FRT Wood:
 - 1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
 - 2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
 - 3. Field cutting and drilling of holes in plywood are permitted.
- G. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke developed index, method of drying after treatment, and treating standard.

2.6 PRESSURE-PRESERVATIVE TREATMENT (PPT)

- A. Manufacturers:
 - 1. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com/#sle.
 - 2. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.
- C. Factory-treat wood members in accordance with AWP A U1 and use category indicated.
- D. Kiln-dry wood after treatment with waterborne preservative to maximum moisture content of 19 percent for lumber and 15 percent for plywood.
- E. Fabricate to maximum extent possible before treatment.
- F. Label preservative-treated wood with marking as required by AWP A U1 and ICC (IBC). Unless otherwise permitted by standard U1 and building code, include the following markings: AWP A U1, accredited inspection agency mark, treating plant identification, type of preservative, preservative retention, and permitted end use.
- G. Field Treatment for Cuts and Holes in Preservative-Treated Wood: Comply with AWP A M4.

2.7 ACCESSORIES

- A. Metal and Finish of Fasteners:
 - 1. Fire-Retardant-Treated Wood:
 - a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
 - 2. Preservative-Treated Wood:
 - a. Nails, timber rivets, wood screws, and lag screws - general use: Type 304 stainless steel.
 - 3. High Humidity Wood Locations: Hot-dip galvanized steel complying with ASTM A153/A153M.
 - 4. Untreated Wood: Unfinished steel.
 - 5. Masonry Anchors: Toggle bolt type for anchorage to hollow masonry.

6. Fasteners for roof replacements must be included in the Singly-Ply Roofing membrane manufacturer's warranty to meet uplift pressures determined in accordance with the Applicable Code using a basic wind speed of 120 MPH.
- B. Anchors: Toggle bolt type for anchorage to hollow masonry.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.3 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide nonstructural framing and blocking to support the following:
 1. Cabinets and shelf supports.
 2. Wall brackets.
 3. Handrails.
 4. Grab bars.
 5. Towel and bath accessories.
 6. Wall-mounted door stops.
 7. Chalkboards and marker boards.
 8. Wall paneling and trim.
 9. Joints of rigid wall coverings that occur between studs.
 10. Other wall- or ceiling-mounted items indicated on drawings.

3.4 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.

3.5 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.6 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.7 CLEANING

- A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
1. Comply with applicable regulations.
 2. Do not burn scrap on project site.
 3. Do not burn scraps that have been pressure treated.
 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

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SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood Casings and moldings
- C. Hardware and attachment accessories
- D. Shop finishing.

1.2 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- D. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.
- F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on wood treatment.
 - 2. Provide instructions for attachment hardware and finish hardware.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 2. Include certification program label.
- D. Samples: Submit two samples of wood trim 6 inch long.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

- B. Quality Certification:
 - 1. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.
- B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- C. Protect from moisture damage.
- D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.2 LUMBER MATERIALS

- A. Hardwood Lumber: Solid Maple species, Plain/Flat sliced sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.

2.3 FASTENINGS

- A. Fasteners: Of size and type to suit application; no finish in concealed locations and Hot dipped galvanized steel for high humidity finish in exposed locations.
- B. Concealed Joint Fasteners: Threaded steel.
- C. Metal Z-Shaped Support Clips: Paired, cleated, structural anchorage components applied to back of finish carpentry items and walls for mounting.
 - 1. Material: Extruded aluminum.

2.4 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Veneer Edge Band: Standard wood veneer edge band matching face veneer.
- C. Primer: Alkyd primer sealer.
- D. Wood Filler: Solvent base, tinted to match surface finish color.
- E. Grommets: Plastic material for cut-outs. Provide 2" diameter grommet and grommet cover at maximum spacing of 5'-0"O.C. Exact location to be verified by the Owner.

2.5 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.
- C. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- D. Shop prepare and identify components for book match grain matching during site erection.
- E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- F. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.6 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
- E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. Install components with nails, screws and bolts as indicated . Where not indicated provide fastener type to suit application and with least visibility.
- E. Install prefinished paneling with full bed contact adhesive applied to substrate.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances
- B. Maximum Variation from True Position: 1/16 inch.
- C. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Hardware.
- C. Factory finishing.
- D. Preparation for installing utilities.
- E. Custom designed millwork and other items as detailed on drawings.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 09 65 00 - Resilient Flooring: Vinyl Base.
- D. Section 12 36 00 - Countertops.
- E. Division 22 - Plumbing utilities and fixtures.
- F. Division 26 and 27 - Power, signal and data wiring.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. BHMA A156.9 - Cabinet Hardware; 2020.
- F. GSA CID A-A-1936 - Adhesives, Contact, Neoprene Rubber; 1996a (Validated 2013).
- G. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.
- H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- I. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- K. WI (MAN) - Manual of Millwork; Woodwork Institute; 2003.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.
 - 1. Mock-up to be presented to Architect for approval during or just prior to this meeting.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum ten years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.

1.7 MOCK-UPS

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. See Section 01 40 00 - Quality Requirements for additional requirements.
- C. Mock-up may remain as part of the work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect units from moisture damage.

1.9 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.
- B. Do not install cabinets until all mortar, moisture and dust producing work is completed.
- C. Provide portable fans and ventilate rooms receiving new casework for minimum of one week after installation of new cabinets. Continue operation of fans and ventilation of rooms until owner determines that all fumes related to cabinets have been dissipated.
- D. Verify field measurements prior to fabrication.

1.10 REGULATORY REQUIREMENTS

- A. Cabinets and cabinet finish system are to meet Class "C" rating or better for flame spread (200 or less) and shall have a smoke developed rating of less than 450.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. CiF Lab Solutions: www.cifsolutions.com.
- B. Campbell Rhea Division Mohon International, Inc; Heritage Oak Series
- C. EM Pfaff & Son; (607) 739-3691.
- D. Institutional Casework Inc: www.iciscientific.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Single Source Responsibility: Provide this work from single fabricator.

2.2 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Species of Veneer: Red Oak.
- C. Cut or Slicing of Veneer: Plain / Flat Sliced.
- D. Matching of Individual Leaves to Each Other: Book matching.
- E. Matching Across the Panel Face: Pair matching.
- F. Matching of Panels to Each Other: Sequence matched uniform size sets.
- G. Cabinet Frame: Solid hardwood lumber with pinned mortise and tenon joints.
- H. Stiles and Rails: Solid Oak lumber.
- I. Wood Drawer Fronts: 3/4" thick solid Oak core with Red Oak veneer; Interior rabbeted edges with 3/8" exterior radiused edge.
- J. Drawer Boxes: Solid hardwood lumber (1/2" thick) with dovetailed joints.
- K. Drawer Bottoms: 1/4" hardwood plywood.
- L. Cabinet Back: 1/4" hardwood plywood.
- M. Cabinet Sides: 3/4" 7-ply hardwood plywood with Red Oak veneer on all exposed surfaces.
 - 1. Tall cabinets with 3/4" sides shall be constructed with a fixed center shelf rigidly attached to either side of the cabinet to prevent bowing of the sides.
- N. Cabinet Tops: 1" hardwood plywood for all cabinet tops.
- O. Cabinet Bottoms: 1" hardwood plywood for all wall cabinets.
- P. Shelves: 1" hardwood plywood, full depth, for all shelves, interior or exposed.
 - 1. Maple plywood where exposed.
 - 2. Exposed plywood edge is to be covered with a factory applied one-piece 3/8" thick solid Red Oak nosing.
- Q. Wood Doors:

1. Maple veneer over 3/4 inch x 1 1/8 inch wide solid Red Oak frame. Red Oak veneer to be on front and back of door. Interior rabbeted edges with 3/8" exterior radiused edge.
2. Tall cabinets to be 1 inch thick lipped reveal overlay style.
 - a. Core Construction: particleboard.
- R. Exposed Edges: All exposed plywood edges are to be covered with a factory applied one-piece 3/8" thick solid Maple nosing.
- S. Cabinet Baseboard: 3/4" hardwood plywood.
- T. Finished Baseboard: 4" vinyl base. See finish schedule for color.
- U. Wood Trim: Solid Red Oak lumber. Size as indicated on drawings.

2.3 PANEL MATERIALS

- A. Veneer Faced Plywood Finish: HPVA HP-1; graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, core of veneer (wood plies); type of glue recommended for specific application; thickness as required; face veneer as follows:
 1. Exposed Surfaces: Grade AA, Red Oak, plain sliced, book-matched.
 2. Semi-Exposed Surfaces: Grade A, Red Oak, rotary cut, random-matched.
 3. Concealed Surfaces: Grade B, Red Oak, rotary cut, random-matched.
- B. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, composed of wood chips bonded with moisture resistant adhesive under heat and pressure; sanded faces; thickness as required; use for components indicated on drawings.
- C. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.4 LAMINATE MATERIALS

- A. Refer to Finish Key & Schedule for placement and colors.
- B. Manufacturers:
 1. Formica Corporation: www.formica.com.
 2. Panolam Industries International, Inc: www.panolam.com/#sle.
 3. Wilsonart: www.wilsonart.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- D. Provide specific types as indicated.
 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as indicated, finish as indicated.
 2. Vertical Surfaces: VGS / GP28, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
 3. Post-Formed Surfaces: PF42, 0.042 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
 4. Cabinet Liner: CLS / CL20, 0.020 inch nominal thickness, through color, color as selected, finish as scheduled.
 5. Laminate Backer: BKL / BK20, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.5 COUNTERTOPS

- A. Countertops: See Section 12 36 00.

2.6 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface. Provide 2" diameter grommet and cover at each computer work station and printer stations. Exact location to be verified in the field.
- F. Tack Board and Fabric: Fiber Board: ASTM C208, cellulosic, dry type, 3/8 inch thick with 1/8 inch thick layer cork for a total thickness of 1/2 inch, Class A rated material.
 - 1. Provide at all casework wall cabinets. Refer to drawings for additional information.
 - 2. Tack board covering: Vinyl coated fabric roll stock, conforming to the following;
 - a. Total Thickness: 9 mil.
 - b. Total Weight: 14 oz/sq yd.
 - c. Vinyl Finish Weight 18 oz/sq yd.
 - d. Roll Width: 54 inches
 - e. Pattern: Linen
 - f. Over-coating Stain resistant Polyvinyl fluoride, .0005 inch thick.

2.7 HARDWARE

- A. Cabinet Hardware: Comply with BHMA A156.9 for hardware types and grades indicated below:
 - 1. Hardware Types: As indicated on drawings.
 - 2. Product Grade: Grade 2.
- B. Bumper Pads: All moving items, including but not limited to, doors and drawers shall be provided with manufacturer's standard bumper pads to ensure quiet closure.
- C. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for clip supports and coordinated shelf rests, for nominal 1-1/4" inch spacing adjustments.
 - 1. Shelf clip supports shall be dual peg, plastic, with minimum length of 2-1/4".
 - a. Clips shall have integral hold down tabs to secure 3/4 and 1 inch shelves.
 - b. Capacity: 300 pounds per clip.
- D. Vanity Brackets: Cantilevered support legs with wall header, face-of-wall mounting.
 - 1. Materials: Steel angles.
 - 2. Finish: Manufacturer's standard, factory-applied, powder coat.
 - 3. Color: Black.
 - 4. Products:
 - a. A&M Hardware, Inc; Floating Vanity Brackets: www.aandmhardware.com/#sle.
 - b. A&M Hardware, Inc; Hidden Brackets: www.aandmhardware.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Drawer and Door Pulls: Die cast aluminum pull, Brushed aluminum finish, 4" centers.
- F. Cabinet Locks: Keyed cylinder, master keyed, steel with satin finish.
 - 1. All locks within each room keyed the same. Each room keyed differently.
 - 2. Provide four (4) keys per room.
 - 3. Equip each lock with removable core, similar to Compx National locks.
 - 4. Provide locks at all doors and drawers, unless noted otherwise in Contract Drawings.
 - 5. Tall Hinged Doors: Three-point latching system.
- G. Cabinet Catches:

1. Type: Nylon roller type. Tall cabinets to have heavy duty rubber rollers.
- H. Drawer Slides:
 1. Type: Full extension.
 2. Static Load Capacity: Heavy Duty grade; 200 lb, minimum.
 3. Mounting: Side mounted.
 4. Action to be progressive movement on precision ball bearings.
 5. Stops: Integral type.
 6. Manufacturers:
 - a. Fuller USA; FR 5210: www.fullerusa.com.
- I. Hinges: Butt, five knuckle disappearing type, 2-3/4 inch and .090 inch thick with hospital tips, steel with polished finish.
- J. Sliding Door Track Assemblies: Upper and lower track of galvanized steel construction, ball bearing carriers fitted within tracks, multiple pendant suspension attachments for door .
- K. Hooks: Double hooks, back mounted. Brushed Chrome finish.

2.8 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with 3/8" thick solid Maple nosing. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- E. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal cut edges.

2.9 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.
- C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
- D. Seal surfaces in contact with cementitious materials.
- E. Topcoats are to be baked on.
- F. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 1. Transparent:
 - a. System - 1, Lacquer, Nitrocellulose.
 - b. Stain: As selected by Architect.
 - c. Sheen: Satin.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify adequacy of backing and support framing.
- C. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinets and counter bases to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- G. Provide and install all trim and filler panels required to fill in all gaps between casework, lockers and adjacent wall or ceiling surfaces or to provide closure of mechanical items. Provide a complete seamless installation. (Filler panels must also be installed in gaps on top of casework).
 - 1. Trim and filler panels to match material and finish of cabinets. Filler panels shall be of equivalent length at each side of each run of casework.

3.3 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting and balancing.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean casework, counters, shelves, hardware, fittings, and fixtures.
- C. Ensure finished work is free of all markings made during fabrication.

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SECTION 07 05 53
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping

1.3 REFERENCE STANDARDS

- A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- C. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.
- D. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6 FIELD CONDITIONS

- A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.
- B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Partition Identification Labels:
 - 1. Fire Wall Signs, Inc: www.firewallsigns.com/#sle.
 - 2. Safety Supply Warehouse, Inc: www.safetysupplywarehouse.com/#sle.
 - 3. Stencil Ease: www.stencilease.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).
- B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl sign with factory applied adhesive backing.
- C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint or permanent ink and a code compliant stencil.
- D. Location: On fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions; within concealed space where there is an accessible concealed floor, floor-ceiling, or attic space.
- E. Languages: Provide sign markings in English.
- F. Format: Whether adhered or applied, identification shall include, at a minimum:
 - 1. Lettering: Not less than three inches in height with a minimum 3/8 inch stroke, in contrasting color.
 - 2. Wording shall include, as applicable:
 - a. Wall Type, i.e FIRE BARRIER or SMOKE BARRIER, or similar.
 - b. Fire Resistance Rating, i.e. ONE HOUR, TWO HOUR, or similar.
 - c. PROTECT ALL OPENINGS.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

- A. Locate markings as required by ICC (IBC).
 - 1. No more than fifteen feet from end of each rated wall.
 - 2. No more than thirty feet interval measured horizontally along the rated wall or partition.
 - 3. Rated walls shall be identified on each side.
- B. Install adhered markings in accordance with manufacturer's instructions.
 - 1. Where adhered markings are used, a suitable Class A backer, permanently attached to the wall, may be used when wall surface would preclude adhesion.
- C. Install applied markings in accordance with manufacturer's instructions.
- D. Install neatly, with horizontal edges level.
- E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Board insulation and integral vapor retarder at cavity wall construction, over roof deck, over roof sheathing, and exterior wall behind brick wall finish.
- B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2 RELATED REQUIREMENTS

- A. Section 07 53 00 - Elastomeric Membrane Roofing: Installation requirements for board insulation over low slope roof deck.

1.3 REFERENCE STANDARDS

- A. ASTM C240 - Standard Test Methods for Testing Cellular Glass Insulation Block; 2021.
- B. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- I. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024c.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.5 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

- A. Insulation Inside Masonry Cavity Walls: Polyisocyanurate Polyisocyanurate board.
- B. Insulation Over Metal Stud Framed Walls, Continuous: Polyisocyanurate board.
- C. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- D. Insulation over Roof Deck: Polyisocyanurate board.

2.2 FOAM BOARD INSULATION MATERIALS

- A. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board with Facers Both Sides and Providing Interior Finish System: Complying with ASTM C1289.
 - 1. Classification: Type I - Faced with aluminum foil on both major surfaces of the core foam, and Class 1 - Glass fiber reinforced or non-reinforced core foam.
 - 2. Compressive Strength: 16 psi, minimum.
 - 3. Thermal Resistance, R-value: Type I, Class 2, at 1-1/2 inch thick; 9.0, minimum, at 75 degrees F.
 - 4. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 5. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 6. Water Vapor Permeance: 1.2 perm, maximum, at 1 inch thickness, and when tested in accordance with ASTM E96/E96M, desiccant method.
 - 7. Board Size: 48 inch by 96 inch.
 - 8. Board Thickness: As noted on drawings.
 - 9. Thermal Resistance, R-value: At 1 1/2 inch thick, 9.0 minimum at 75 degree
 - 10. Board Edges: Square.

2.3 BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Formaldehyde Content: Zero.
 - 5. Thickness: As indicated on drawings.
 - 6. Facing: Aluminum foil, flame spread 25 rated; one side.
 - 7. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation: www.owenscorning.com/en-us/#sle.
 - d. Knauf Insulation: www.knaufinsulation.com.
 - 8. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Thickness: As indicated on drawings.

2.4 ACCESSORIES

- A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
 - 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
 - 2. Width: Are required for application.
- B. Flashing Tape: Special reinforced film with high performance adhesive.
 - 1. Application: Window and door opening flashing tape.
 - 2. Width: As required for application.
- C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Apply adhesive to back of boards:
 - 1. Full bed 1/8 inch thick.
- B. Install boards horizontally on walls.
 - 1. Place boards to maximize adhesive contact.
 - 2. Install in running bond pattern.
 - 3. Butt edges and ends tightly to adjacent boards and protrusions.
- C. Extend boards over expansion joints, unbonded to wall on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- E. Place 6 inches wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.3 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure insulation fasteners to substrate at following frequency:
 - 1. Six (6) per insulation board.
- B. Adhere a 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
 - 1. Extend sheet full height of joint.
- C. Apply adhesive to back of boards:
- D. Install boards to fit snugly between wall ties.
 - 1. Place membrane surface facing out, and tape seal board joints.
- E. Install boards horizontally on walls.

- F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- G. Place 6 inches wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.4 BOARD INSTALLATION UNDER CONCRETE SLABS

- A. Place insulation under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.5 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

- A. Installation of board insulation over low slope roof deck, see Section 07 53 00.

3.6 BATT INSTALLATION

- A. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- D. Metal Framing: Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- E. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- F. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member
- G. Tape seal tears or cuts in vapor retarder.
- H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.
- I. Coordinate work of this section with requirements for vapor retarder, see Section 07 26 00.
- J. Coordinate work of this section with construction of air barrier seal, see Section 07 27 00.

3.7 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water-resistive barriers.

1.2 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Weather barrier installed in conjunction with batt insulation.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.3 DEFINITIONS

- A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.
- B. Water-Resistive Barriers: Materials or assemblies installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly.

1.4 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.
- B. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2025.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- F. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015, with Editorial Revision (2020).

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.6 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.1 WATER-RESISTIVE BARRIERS

- A. Description: Materials installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly. Primary materials include fluid-applied coatings; accessory materials include flashings and seam tapes.
- B. Water-Resistive Barrier Coating: Fluid-applied air and water-resistive coating for various exterior substrates; vapor permeable.
 - 1. Dry Film Thickness (DFT): 30 mils, 0.030 inch, minimum.
 - 2. Air Permeance, Building Assembly Air Leakage Rate: Not greater than 0.04 cfm/sq ft when tested at 1.57 psf in accordance with ASTM E2357.
 - 3. Air Permeance, Building Material Air Leakage Rate: 0.004 cfm/sq ft maximum leakage when tested at 1.57 psf pressure difference in accordance with ASTM E2178.
 - 4. Water-Resistive Barrier over Sheathing Compliance: Complying with ICC-ES AC212.
 - 5. Water Vapor Permeance: Tested in accordance with ASTM E96/E96M.
 - a. Procedure A: Greater than 5 perms.
 - b. Procedure B: Greater than 14 perms.
 - 6. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.
 - 7. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
 - 8. System Accessory Products: As recommended by coating manufacturer.
 - 9. Products:
 - a. LATICRETE International, Inc; MVIS Air & Water Barrier: www.laticrete.com/#sle.
 - b. Carlisle Coatings and Waterproofing, Inc; Bariseal: www.carlisleccw.com/#sle
 - c. WR Meadows, Inc; Air-Shield LSR: www.wrmeadows.com/#sle

2.2 ACCESSORIES

- A. Seal and Perimeter Tapes: As recommended by water-resistive barrier manufacturer.
- B. Flashings and Sealants: As recommended by water-resistive barrier manufacturer for application.
- C. Building Insulation: See Section 07 21 00.
- D. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch nominal thickness.
- E. Flexible Flashing: Self-adhering sheet flashing complying with ASTM D1970/D1970M; waive slip resistance requirement if not installed on roof.
 - 1. Width: 3 inches.
- F. Liquid Flashing: One part, fast curing, nonsag, elastomeric, gun grade, trowelable liquid flashing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions comply with requirements of this section.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Apply sealants within recommended temperature range in accordance with manufacturer's installation instructions.
- C. Self-Adhered Sheets:
 - 1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
 - 2. Lap sheets shingle-fashion to shed water and seal laps airtight.
 - 3. Upon placement of sheets, firmly press onto substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
 - 4. Use same material, or other material approved by sheet manufacturer, to seal sheets to adjacent substrates, and as flashing.
 - 5. At expansion joints, provide transition to joint assemblies approved by sheet manufacturer.
- D. Fluid-Applied Sheets:
 - 1. Prepare substrate in accordance with coating manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
 - 2. Apply flashing to seal with adjacent construction and to bridge joints in coating substrate.
- E. Openings and Penetrations in Exterior Water-Resistive Barriers:
 - 1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - 3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
 - 4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches beyond face of jambs; seal water-resistive barrier to flashing.
 - 5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
 - 1. Allow access to work areas and staging.
 - 2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
 - 3. Do not cover work of this section until testing and inspection is accepted.
- C. Do not cover installed water-resistive barriers until required inspections have been completed.
- D. Obtain approval of installation procedures from water-resistive barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.5 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Elastomeric roofing membrane, adhered conventional application.
- B. Insulation, flat and tapered.
- C. Vapor retarder.
- D. Deck sheathing.
- E. Cover boards.
- F. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.2 RELATED REQUIREMENTS

- A. Section 05 31 00 - Steel Decking: Placement of acoustical insulation for deck flutes.
- B. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.
- C. Section 07 25 00 - Weather Barriers
- D. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets.

1.3 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- C. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- D. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- E. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.
- F. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2020).
- G. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2024.
- H. ASTM D751 - Standard Test Methods for Coated Fabrics; 2019.
- I. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015, with Editorial Revision (2022).
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

- L. FM (AG) - FM Approval Guide; Current Edition.
- M. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).
- N. UL 1256 - Standard for Fire Test of Roof Deck Constructions; 2018.
- O. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of associated counterflashings installed under other sections.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for tapered insulation.
- D. Samples for Verification: Submit two samples 6 by 6 inches in size illustrating insulation.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Manufacturer's qualification statement.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- B. All products including substrate boards, vapor retarders, insulation, fasteners, fastening plates and edgings must be manufactured and/or supplied by the roofing system manufacturer and covered by the warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.8 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.

- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two year period after Date of Substantial Completion.
- C. Provide 30 year manufacturer's material and labor warranty to cover failure to prevent penetration of water.
 - 1. Warranty shall be a non-prorated, full system warranty with no dollar limit and shall include, but not limited to the following:
 - a. Wind warranty coverage up to 90 MPH, three second gust at 33 feet above ground level.
 - 1) Certification is required with submittals indicating the manufacturer has reviewed and agreed to such wind coverage.
 - b. Membrane material warranty on the field membrane.
 - c. Puncture resistance.
 - d. Signed by Manufacturer of primary roof materials and their authorized installer.
 - 2. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's approval.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. EPDM Membrane Materials:
 - 1. Carlisle SynTec Systems; Sure-Tough EPDM: www.carlisle-syntec.com/#sle.
 - 2. Elevate: www.holcimelevate.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation:
 - 1. Carlisle SynTec: www.carlisle-syntec.com.
 - 2. Firestone Building Products, LLC: www.firestonebpco.com
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ROOFING - UNBALLASTED APPLICATIONS

- A. Elastomeric Membrane Roofing: Single ply membrane, fully adhered, over vapor retarder and insulation.
- B. Roofing Assembly Requirements:
 - 1. Roof Covering External Fire Resistance Classification: UL (DIR) certified Class A.
 - 2. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.
 - 3. The specified roofing assembly must have been successfully tested by a qualified testing agency to resist the design uplift pressures calculated according to:
 - a. ANSI/SPRI WD-1 "Wind Design Standard Practice for Roofing Assemblies"
 - b. American Society of Civil Engineers (ASCE 7)

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- c. Applicable Building Code
- 4. Insulation Thermal Resistance (R-Value): 5.7 per inch, minimum LTTR; provide insulation of thickness required to attain a minimum R-Value of 33.
- C. Acceptable Insulation Types - Constant Thickness Application:
 - 1. Minimum 2 layers of polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application:
 - 1. Tapered polyisocyanurate board.

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637/D4637M.
 - 1. Thickness: 0.090 inch (90 mil).
 - 2. Sheet Width: 120 inches, maximum.
 - a. Adhered Application: Limit width to 120 inches, maximum, when ambient temperatures are less than 40 degrees F for extended period of time during installation.
 - 3. Color: Black.
 - 4. Tensile Strength: 1415 psi, minimum, measured in accordance with ASTM D412.
 - 5. Ultimate Elongation: 500 percent, minimum, measured in accordance with ASTM D412.
 - 6. Tear Strength: 150 lbf per inch, measured in accordance with ASTM D624.
 - 7. Tear Strength: 10 lbf maximum, measured in accordance with ASTM D751.
 - 8. Water Absorption: 2 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
 - 9. Brittleness Temperature: -49 degrees F, measured in accordance with ASTM D746.
- B. Seaming Materials: Minimum 6 inch seam tape.
- C. Vapor Retarder: Vapor retarder is a minimum 40 mil composite sheet consisting of a self-adhering rubberized asphalt membrane. The underlayment board shall be primed with Low VOC CCW-702 Primer or CCW Cav-Grip in accordance with manufacturer's specifications. Vapor retarder must have a perm rating of 0.05 or less as per ASTM E96/E96M. Vapor retarder must be rated by the manufacturer as a temporary roof with an allowable exposure to the elements for 90 days.
- D. Flexible Flashing Material: Same material as membrane.
 - 1. Thickness: 90 mil.
 - 2. Tensile Strength: 1,415 psi.
 - 3. Elasticity: 50 percent with full recovery without set.
 - 4. Color: Black.

2.4 DECK SHEATHING AND COVERBOARD

- A. Deck Sheathing: Gypsum sheathing, ASTM C1396/C1396M, Type X special fire resistant type, paper face, 1/2 inch thick.
 - 1. Products:
 - a. Georgia-Pacific; DensDeck Prime with EONIC technology www.densdeck.com/sle
 - b. USG Corporation; Securock Ultralight Glass-Mat Roof Board: www.usg.com/#sle

2.5 COVER BOARDS

- A. Cover Boards: Faced and with high compressive strength polyisocyanurate (ISO) insulation complying with ASTM C1289.
 - 1. Classifications:
 - a. Type II - Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 2 - faced with coated glass-fiber-mat facers on both major surfaces of core foam.
 - (a) Compressive Strength: Grade 3, 25 psi, minimum.
 - (b) Thickness: 1 inch, maximum.

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2. Board Size: 48 by 48 inches.
3. Board Thickness: 1/2 inch.
4. Products:
 - a. Carlisle InsulBase Poluiso

2.6 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289, and meeting UL 1256, component of a Class A Roof System.
 1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
 2. Board Size: 48 by 48 inches.
 3. Board Thickness: 2.0 inch (flat).
 4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
 5. Board Edges: Square.
 6. Flame Spread: Less than 75 per ASTM E84
 7. Products: Insulation to be provided by membrane manufacturer.

2.7 ACCESSORIES

- A. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed-cell foam backing seamed to galvanized steel flanges.
- B. Roofing Expansion Joint Flashing: ormed EPDM, provided by membrane manufacturer.
- C. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- D. Membrane Adhesive: As recommended by membrane manufacturer.
- E. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- F. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- G. Insulation Adhesive: Two part low rise foam.
- H. Sealants: As recommended by membrane manufacturer.
- I. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 1. Composition: Roofing membrane manufacturer's standard.
 2. Surface Color: White.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.

- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 PREPARATION - METAL DECK

- A. Install preformed acoustical glass fiber insulation strips in roof deck flutes in accordance with manufacturer's instructions; see Section 05 31 00.
- B. Install deck sheathing on metal deck.
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Tape joints.
- C. Mechanically fasten sheathing to roof deck, 1 fastener every 2 sq. ft. in field & perimeter & 1 per 1 sq. ft in the corners..
 - 1. Surfaces to receive vapor barrier must be clean and dry.
 - 2. Prime all surfaces to receive vapor retarder. Prime in accordance with manufacturer's specifications.
 - 3. Prime only areas receiving vapor barrier on the same day. Reprime if area becomes dirty.

3.3 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

- A. Apply rubberized asphalt self adhering vapor retarder to sheathed deck surface with adhesive in accordance with manufacturer's instructions.
 - 1. Apply vapor barrier from low point to high point, in a single fashion, so that laps will shed water.
 - 2. Overlap all edges 2 1/2 inches minimum. End laps shall be staggered.
 - 3. Place membrane carefully so as to avoid wrinkles and fishmouths.
 - 4. Immediately after installation, roll with a 100-150 pound weighted steel roller.
 - 5. Extend vapor retarder under cant strips and blocking to deck edge.
 - 6. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
 - a. Coordinate with Section 07 25 00.
- B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- C. Attachment of Insulation:
 - 1. Embed first layer of insulation in adhesive beads 4" on center in accordance with roofing and insulation manufacturers' instructions.
 - 2. Place constant thickness first layer and tapered thickness insulation second layer to required slope pattern. Minimum total thickness to average R-Value of 30 for tapered insulation.
 - 3. Secure all insulation, staggering all joints, to the vapor retarder with adhesive in accordance with the manufacturer's specifications and application procedures for a full spray application.
 - 4. Insulation adhesive must have a nominal free rise core density of 2.2 pounds per cubic foot and be a 2 part low rise foam adhesive with 100% adhesion.
 - 5. Ribbon method adhesives are acceptable; however beads are to be installed at a maximum of 4 inches on center in the field, the perimeter and corners for the insulation and overlayment boards.
 - 6. Attachment method shall meet Factory Mutual I-120 Standards.
- D. Cover Boards: Apply cover boards with same adhesive requirements and in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
- E. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

- F. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- G. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes for support.
- H. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- I. Secure all insulation, staggering all joints, to the vapor retarder with adhesive in accordance with the manufacturer's specifications in beads 4" on center.
- J. Insulation adhesive must have a nominal free-rise core density of 2.2 pounds per cubic foot, and be a 2 part low rise foam adhesive with 100% adhesion.
- K. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
- L. Do not apply more insulation than can be covered with membrane in same day.

3.4 INSTALLATION - MEMBRANE

- A. Roll out membrane, free from wrinkles, air pockets or tears. Place sheet into place without stretching.
- B. Allow the membrane to relax for approximately 1/2 hour before bonding.
- C. Fold the sheet back onto itself so half of the underside of the membrane is exposed.
- D. Shingle joints on sloped substrate in direction of drainage.
- E. Fully Adhered Application: Apply adhesive to substrate at rate of manufacturer's published instructions gal/square Fully embed membrane and substrate in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- F. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.
- G. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.
- H. Membrane Splicing: 6 inch pre-applied splice tape is required. All details and splice procedures shall be performed to meet or exceed the specified warranty requirements.
 - 1. Overlap adjacent sheets and mark a line 1/2 inch out from the top sheet.
 - 2. Fold the top sheet back and clean the dry splice area (minimum 6 inches wide) of the membrane with primer as required by the membrane manufacturer.
 - 3. Apply primer to the EPDM sheet. Press membrane and tape onto the sheet using hand pressure.
 - 4. Remove the release film and press the top sheet onto the tape using hand pressure.
 - 5. Roll the seam toward the splice edge with a 2 inch wide steel roller.
 - 6. Splice intersections are to be overlaid with 6" x 6" and 12"x12" T joint cover plates.
- I. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 6 inches onto vertical surfaces. Install expansion joints at locations where structures as separate
 - 2. Fully adhere flexible flashing over membrane and up to termination bars. Install counterflashings and seal.
 - 3. Do not extend membrane or membrane flashing over existing masonry weep holes or through wall flashing.
- J. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.
- K. Around roof penetrations, seal flanges and flashings with flexible flashing.
- L. Install roofing expansion joints where indicated. Make joints watertight.
 - 1. Install prefabricated joint components in accordance with manufacturer's instructions.
- M. Coordinate installation of roof drains and sumps and related flashings.

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3.5 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing in accordance with requirements.
- C. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

3.6 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.7 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings and counterflashings.
- B. Sealants for joints within sheet metal fabrications.

1.2 REFERENCE STANDARDS

- A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement; 2025.
- F. CDA A4050 - Copper in Architecture - Handbook; Current Edition.
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Perform work in accordance with ANSI/SPRI/FM 4435/ES-1 requirements for pull-off resistance to design wind pressure as defined by applicable local building code.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 3 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B209/B209M; 0.032 inch thick; plain shop pre-coated with silicone modified polyester coating.
 - 1. Silicone Modified Polyester Coating: Pigmented organic powder coating, AAMA 2603; baked enamel finish system.
 - 2. Color: As selected by Architect from manufacturers standard colors.

2.2 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing membrane. Return and brake edges.

2.3 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.
- C. Primer Type: Zinc chromate.
- D. Protective Backing Paint: Zinc molybdate alkyd.
- E. Concealed Sealants: Non-curing butyl sealant.
- F. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- G. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.3 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

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SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured roof specialties, including copings, fascias, and gravel stops.
- B. Roof control and expansion joint covers.

1.2 RELATED REQUIREMENTS

- A. Section 07 53 00 - Elastomeric Membrane Roofing – Fully Adhered

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- C. NRCA (RM) - The NRCA Roofing Manual; 2025.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two samples, 6 by 6 inches, illustrating component shape, finish, and color.
- E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.5 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish manufacturer's material and labor warranty to cover degradation of material finish.
 - 1. Term: Ten years after Date of Substantial Completion.
 - 2. Coverage: include color fading due to exposure to weather.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Roof Edge Flashings and Copings:

1. Carlisle Syntec Systems: www.carlislesyntec.com.
2. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
3. Metal-Era Inc: www.metalera.com/#sle.

B. Control and Expansion Joint Covers:

1. GAF: www.gaf.com/#sle.
2. Johns Manville: www.jm.com/#sle.
3. MM Systems Corp: www.mmsystemscorp.com/#sle.

2.2 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.

1. Configuration: Fascia, and edge securement for roof membrane. Concealed continuous heavy duty extruded aluminum cleat with snap-on aluminum fascia; internal splice piece at joints of same material, thickness and finish as fascia; concealed stainless steel fasteners.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
4. Finish: 70 percent polyvinylidene fluoride (PVDF).
5. Color: As selected by Architect from manufacturer's standard range.
6. Products:
 - a. Carlisle Syntec Systems; Securedge 2000HG: www.carlislesyntec.com.
 - b. Hickman Edge Systems; Terminedge HG: www.hickmanedgesystems.com/#sle.
 - c. Metal-Era Inc; Anchor-Tite HG: www.metalera.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.

1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners. Include special supports spaced at 32 inches on center.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
4. Finish: 70 percent polyvinylidene fluoride.
5. Color: As selected by Architect from manufacturer's standard range.
6. Products:
 - a. Carlisle Syntec Systems; Securedge 400 Coping: www.carlislesyntec.com.
 - b. Metal-Era Inc; Leak Tite: www.metalera.com.

C. Control and Expansion Joint Covers: Composite construction of 1 1/2-inch wide flexible EPDM flashing of white color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch. Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.

D. Reglet and Counterflashings:

1. .040 extruded aluminum reglet with .032 formed aluminum counter flashing with stainless steel spring clips at 16" o.c. and stainless steel wind clips at 32" o.c.
 - a. Finish of both reglet and counterflashing to be kynar paint.

E. Pipe Boots: Provide boot of material compatible with new roof system.

1. Provide retrofit boot for existing pipes.
2. Products: Pipe boot (new roof system) and retrofit pipe seals (existing roof system)

F. Multi-Pipe Portal System: Provide curb or base flange with rubber cap which will accept the size and number of pipes and/or conduit required. Materials are to be compatible with new roof system.

1. Product: Provide boot similar to Quadraseal by Portals Plus, Inc.

2.3 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.4 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Fasteners: Stainless Steel with same finish as flashing metal & soft neoprene washers (no exposed fasteners). Fasteners for roof replacements must be included in the Singly-Ply Roofing membrane manufacturer's warranty to meet uplift pressures determined in accordance with the applicable Building Code.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
- B. Field verify dimensions of metal fascia and coping. Verify adequate coverage of existing blocking and wall surface. Minimum of 2 inch lap required.

3.2 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Conform to SMACNA Architectural Sheet Metal Manual drawing details.
- E. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- F. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
- G. Coordinate installation of flashing flanges into reglets.

END OF SECTION

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SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof curbs.
- B. Equipment rails.
- C. Rooftop mounted guardrails.

1.2 RELATED REQUIREMENTS

- A. Section 07 71 00 - Roof Specialties: Other manufactured roof specialty items.

1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
 - 1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 ROOF CURBS

- A. Roof Curbs Manufacturers:
 - 1. Roof Products & Systems (RPS): www.rpscurbs.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 - 1. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
 - 2. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gauge, 0.048 inch thick.
 - 3. Fabricate curb bottom and mounting flanges for installation directly on metal roof deck, not on insulation; match slope and configuration of system.
 - 4. Provide layouts and configurations indicated on drawings.
- C. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
 - 1. Provide preservative treated wood nailers along top of rails.
 - 2. Height Above Finished Roof Surface: 8 inches, minimum.
- D. Multi-Pipe Portal Systems: Provide a curb or base flange with rubber cap which will accept the size and number of pipes and/or conduit required. Materials are to be compatible with new roof system.
 - 1. Basis of Design: Quadraseal by Portals Plus, Inc.

2.2 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

- A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
 - 1. Design Loadings and Configurations: As required by applicable codes.
 - 2. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - 4. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

2.3 NON-PENETRATING ROOF EDGE SAFETY RAILING

- A. Manufacturers:
 - 1. Kee Safety, Inc.; KeeGaurd Roof Fall Protection Railing: www.simplifiedsafety.com
- B. SYSTEM - Roof Edge Protection: Provide freestanding roof edge railing system, including pipe railings, uprights, integrated toe boards, bases, counterweights, anti-skid rubber pads and fittings.
 - 1. Freestanding counterweighted guardrail system with 42 inch minimum height to provide a pedestrian egress barrier in the roof to withstand a minimum load of 200 lbs in any direction.
 - 2. Rails and Posts: Galvanized tubes; 12 gauge; 1-1/2 inch dia.
 - 3. Fittings: Galvanized, malleable cast iron.
 - 4. Counterweights: Weighted, molded recycled PVC with one fixing collar per counterbalance.

5. Fasteners: Stainless steel or galvanized.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.4 CLEANING

- A. Clean installed work to like-new condition.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

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SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 RELATED REQUIREMENTS

- A. Section 01 35 17 - Alteration Project Procedures: Cutting and patching.
- B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- C. Section 07 05 53 - Fire and Smoke Assembly Identification.
- D. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.3 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.
- D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a, with Editorial Revision (2024).
- E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- F. ITS (DIR) - Directory of Listed Products; Current Edition.
- G. FM (AG) - FM Approval Guide; Current Edition.
- H. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- I. UL (DIR) - Online Certifications Directory; Current Edition.
- J. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. With minimum ten years documented experience installing work of this type.

1.6 MOCK-UPS

- A. Install one firestopping assembly representative of each fire rating design required on project.
 - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
- B. If accepted, mock-up will represent minimum standard for this work.
- C. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.7 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop.
 - 2. A/D Fire Protection Systems Inc: www.adfire.com.
 - 3. Hilti, Inc: www.us.hilti.com.
 - 4. RectorSeal, a CSW Industrials Company: www.rectorseal.com/firestop-solutions/#sle.
 - 5. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 6. United States Gypsum Co.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- C. Fire Ratings: Refer to drawings for required systems and ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: In addition, provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.4 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

- A. Concrete and Concrete Masonry Walls and Floors:
 - 1. Head-of-Wall Joints at Concrete/Concrete Masonry Wall to Concrete Over Metal Deck Floor:
 - a. 2 Hour Construction: UL System HW-D-0755; 3M Co.; FireDam Spray 200.
- B. Gypsum Board Walls:
 - 1. Head-of-Wall Joints at Concrete Over Metal Deck:
 - a. 1 Hour Construction: UL System HW-D-0101, 3M Co.; FireDam Spray 200.
 - 2. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
 - a. 1 Hour Construction: UL System HW-D-0184; Hilti CP 606 Flexible Firestop Sealant.

2.5 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

- A. Blank Openings:
 - 1. In Floors or Walls:
 - a. 2 Hour Construction: UL System C-AJ-0032; USG Inc.; Firecode Compound.
- B. Penetrations Through Floors or Walls By:
 - 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System C-AJ-1081; USG Inc.; Firecode Compound.
 - 2. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System C-AJ-22015; Rectorseal Sealant.
 - 3. Electrical Cables Not In Conduit:
 - a. 3 Hour Construction: UL System C-AJ-3231; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - b. 2 Hour Construction: UL System C-AJ-3045; USG Inc.; Firecode Compound.
 - 4. Insulated Pipes:
 - a. 2 Hour Construction: UL System C-AJ-5002; 3M Company FS-195+ / CP 25WB+
 - 5. HVAC Ducts, Uninsulated:
 - a. 2 Hour Construction: UL System C-AJ-7036; Rectorseal Sealant

FIRESTOPPING

2.6 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Blank Openings:
 - 1. 1 Hour Construction: UL System W-L-0031; 3M Company CP 25WB+
- B. Penetrations By:
 - 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-L-1001; 3M Company CP 25WB+
 - 2. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 1 Hour Construction: UL System W-L-2088; 3M Company CP 25WB+ / FB-3000 WT
 - 3. Electrical Cables Not In Conduit:
 - a. 2 Hour Construction: UL System W-L-3218; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - b. 1 Hour Construction: UL System W-L-3218; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - c. 1 Hour Construction: UL System W-L-3195; 3M Company CP 25WB+
 - 4. Insulated Pipes:
 - a. 1 Hour Construction: UL System W-L-5039; 3M Company CP 25WB+
 - 5. HVAC Ducts, Insulated:
 - a. 1 Hour Construction: UL System W-L-7082; Rectorseal Sealants.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements.
- B. See Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- C. Inspect installed firestopping for compliance with specifications and submitted schedule.
- D. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.5 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
- B. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- C. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.3 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
- C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2024.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.

5. Substrates the product should not be used on.
 6. Substrates for which use of primer is required.
 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 8. Sample product warranty.
 9. Certification by manufacturer indicating that product complies with specification requirements.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.
- J. Executed warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
1. Adhesion Testing: In accordance with ASTM C794.
 2. Compatibility Testing: In accordance with ASTM C1087.
 3. Allow sufficient time for testing to avoid delaying the work.
 4. Deliver sufficient samples to manufacturer for testing.
 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- E. Field Quality Control Plan:
1. Visual inspection of entire length of sealant joints.
 2. Field testing agency's qualifications.
 3. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Nonsag Sealants:
 - 1. Dow: www.dow.com/#sle.
 - 2. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
 - 3. Pecora Corporation: www.pecora.com/#sle.
 - 4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
- B. Self-Leveling Sealants:
 - 1. Dow: www.dow.com/#sle.
 - 2. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
 - 3. Pecora Corporation: www.pecora.com/#sle.
 - 4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.2 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints:
 - a. Seal the following joints:
 - 1) Wall expansion and control joints.
 - 2) Joints between doors, windows, and other frames or adjacent construction.
 - 3) Joints between different exposed materials.
 - 2. Interior Joints:
 - a. Do not seal interior joints indicated on drawings as not sealed.
 - b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - c. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.
 - 2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
 - 3) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.
 - 3. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
 - d. Joints where sealant installation is specified in other sections.
 - e. Joints between suspended ceilings and walls.
- B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
 - 1. Type 1 - General Purpose Exterior (non-traffic)
 - 2. Type 2 - Lap Joints in Sheet Metal Fabrications
 - 3. Type 3 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
 - 1. Type 4 - Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.

2. Type 3 - Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 3. Type 5 - In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
 4. Type 6 - Other Floor Joints: Self-leveling polyurethane traffic-grade sealant.
- D. Interior Wet Areas: Bathrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.3 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 61 16.
- B. Colors: As selected by Architect.

2.4 NONSAG JOINT SEALANTS

- A. Type 1 - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
 2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Color: Match adjacent finished surfaces. Submit colors to Architect for Approval
 5. Cure Type: Single-component, neutral moisture curing.
 6. Products:
 - a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type 2 - Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: Match adjacent finished surfaces. Colors to be submitted to Architect for approval.
 4. Cure Type: Single component, neutral moisture curing.
 5. Products:
 - a. Dow; DOWSIL 758 Silicone Weather Barrier Sealant: www.dow.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Type 3 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White. unless noted otherwise
 2. Products:
 - a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Type 6 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: Match adjacent finished surfaces.
- E. Type 4 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
 2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
 3. Products:

- a. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
- b. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 SELF-LEVELING JOINT SEALANTS

- A. Type 6 - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's standard range.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.
 - 4. Provide slope grade sealant at all sloped pavement up to 12%.
 - 5. Products:
 - a. Master Builders Solutions by BASF; MasterSeal SL-2
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type 7 - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's standard range.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.
 - 4. Provide slope grade sealant at all sloped pavement up to 12%.
 - 5. Products:
 - a. Master Builders Solutions by BASF; MasterSeal SI-2

2.6 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Sealant Backing Rod, Open-Cell Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type O.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
- C. Sealant Backing Rod, Bi-Cellular Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type B.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
- D. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- E. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- F. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.

- C. Verify that backer rods are of the correct size.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.5 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Expansion joint cover assemblies for floor, wall, ceiling, and soffit surfaces.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of joint cover assembly frames in formwork.
- B. Section 04 20 00 - Unit Masonry: Placement of joint cover assembly frames in masonry.
- C. Section 05 50 00 - Metal Fabrications: Custom fabricated metal expansion and control joint devices.
- D. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof expansion and control joint covers.

1.3 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- D. Samples: Submit two samples 4 inch long, illustrating profile, dimension, color, and finish selected.
- E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

1.5 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements are as instructed by manufacturer.

1.7 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Provide 20 ft of resilient joint filler and one set of special tools required for accessing and servicing components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Expansion Joint Cover Assemblies:
 - 1. Balco, Inc: www.balcousa.com/#sle.
 - 2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 3. MM Systems Corp: www.mmsystemscorp.com/#sle.

2.2 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

- A. Interior Floor Joints Subject to Thermal Movement:
 - 1. Manufacturers:
 - a. MM Systems; Flushline System; FS-100: www.mmsystemscorp.com.
- B. Interior Concrete or Block Wall/Ceiling Joints Subject to Thermal Movement:
 - 1. Manufacturers:
 - a. Construction Specialties, Inc; Allway Standard Wall and Ceiling Covers: www.c-sgroup.com/#sle.
 - b. MM Systems; Flushline System; FSA-100: www.mmsystemscorp.com.
- C. Interior Gypsum Wall/Ceiling Joints Subject to Thermal Movement:
- D. Interior Fire-Rated Wall/Ceiling/Floor Joints Subject to Thermal Movement:
 - 1. Manufacturers:
 - a. Construction Specialties, Inc; Fire Barriers: www.c-sgroup.com/#sle.
- E. Exterior Wall Joints Subject to Thermal Movement:
 - 1. Manufacturers:
 - a. Balco, Inc; Exterior Wall, Elastomeric Face Seal System (FCWW): www.balcousa.com/#sle.

2.3 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 - 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- B. Floor Joint Covers: Coordinate with indicated floor coverings.
- C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.
- D. Covers in Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.
- E. Covers in Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
- B. Resilient Seals:
 - 1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
- C. Threaded Fasteners: Aluminum.
- D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.2 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

3.3 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit traffic over unprotected floor joint surfaces.
- C. Provide strippable coating to protect finish surface.

END OF SECTION

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SECTION 08 06 71
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preliminary schedule of door hardware sets for swinging and other door types as indicated on drawings.

1.2 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Requirements to comply with in coordination with this section.

1.3 REFERENCE STANDARDS

- A. BHMA (CPD) - Certified Products Directory; Current Edition.
- B. BHMA A156.18 - Standard for Materials and Finishes; 2020.
- C. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Only manufacturers listed in Door Hardware Schedule or Section 08 71 00 are considered acceptable, unless noted otherwise.
- B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.
- C. Products are listed and certified compliant with specified standards by BHMA (CPD).
- D. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 08 71 00.

2.2 DESCRIPTION

- A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.
 - 1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.
 - 2. Necessary items that are not included in a Hardware Set should be added and have the appropriate additional hardware as required for proper application and functionality.
 - 3. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.
 - 4. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.

2.3 FINISHES

- A. Finishes: Complying with BHMA A156.18.

PART 3 EXECUTION

3.1 DOOR HARDWARE SCHEDULE

- A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.

Hardware Sets

SET: 1.0

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
4	Hinge, Full Mortise, Hvy Wt	T4A3786	MK	US26D	
2	Hinge, Full Mortise, Hvy Wt	TA786 FT QC12	MK	US26D	X
1	Surface Vertical Rod Exit Device, Exit Only	12 43 55 NB8710 EO	SA	US32D	
1	Access Control SVR	1112 72 NB 43 SN200-8773 306 x ETL	SA	US32D	X
1	Core	As required	BE	626	
2	Surface Closer	281 O10 / P10 (as required)	SA	EN	
2	Electromagnetic Holders	997M (Extensions as required)	RF	689	X
1	Gasketing	S773BL	PE	BL	
1	Meeting Stile	S772BL	PE	BL	
2	ElectroLynx Harness, Frame	QC-C1500	MK		
2	ElectroLynx Harness, Door	QC-Cxxx (size as required)	MK		
1	Wiring Diagram	Elevation and point to point as specified	OT		
1	Power Supply	3267	SA		X

Notes.:

Door normally closed and locked.

Authorized entry by valid card reader at active leaf.

Opening the door from the outside by mechanical key override will activate the concealed switch (alarm).

Depressing push bar in the path of egress either leaf will activate the request to exit switch.

Free egress at all times.

Fail secure.

Electromechanical holder to release at activation of fire alarm.

SET: 2.0

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
6	Hinge, Full Mortise, Hvy Wt	T4A3786	MK	US26D	
1	Removable Mullion (Steel)	12-L980S	SA	Paint	
1	Access Control Rim Exit Device	12 19 72 IN100-8877 BIPS ETNJ	SA	US32D	X

DOOR HARDWARE SCHEDULE

1	Rim Exit Device	12 19 72 8843 ETNJ	SA	US32D	
1	Cylinder	72 980C1	SA	US26D	
2	Core	As required	BE	626	
2	Surface Closer	281 O10 / P10 (as required)	SA	EN	
2	Electromagnetic Holders	997M (extensions as required)	RF	689	X
2	Kickplate	K1050 12" high CSK BEV	RO	US32D	
2	Gasketing	5110BL 120"	PE	BL	
1	Gasketing	S88	PE	BL	
1	Wiring Diagram	Elevation and Point to Point as Specified	OT		

Notes:

Door normally closed and locked.

Presentation of valid credential at card reader retracts unlocks electric exit device trim allowing ingress.

Integrated door position switch to monitor and report open / closed status of opening to buildings access control system.

Electric exit device equipped with request to exit switch at rail to shunt door monitoring upon egress.

Free egress at all times.

Fail-secure.

Wall / door mounted electromagnetic holders to release at activation of fire alarm.

SET: 3.0

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
3	Hinge, Full Mortise, Hvy Wt	T4A3786	MK	US26D	
1	Access Control Mort Lock	72 IN100-82278-BIPS B LNNJ	SA	US32D	X
1	Core	As required	BE	626	
1	Surface Closer	281 O10 / P10	SA	EN	
1	Kickplate	K1050 12" high CSK BEV	RO	US32D	
2	Electromagnetic Holders	997M (Extensions as required)	RF	689	X
3	Silencer	608/609	RO		
1	Card Reader	Provided by Controls Contract	OT		X
1	Wiring Diagram	Elevation and Point to Point as specified	OT		

Notes:

Door normally closed and locked.

DOOR HARDWARE SCHEDULE

Presentation of valid credential at card reader retracts unlocks electric exit device trim allowing ingress.
Integrated door position switch to monitor and report open / closed status of opening to buildings access control system.
Electric lock equipped with request to exit switch at interior lever to shunt door monitoring upon egress.
Free egress at all times.
Fail secure
Electromechanical holder to release at activation of fire alarm.

SET: 3.1

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
3	Hinge, Full Mortise, Hvy Wt	T4A3786	MK	US26D	
1	Access Control Mort Lock	72 IN100-82278-BIPS B LNNJ	SA	US32D	X
1	Core	As required	BE	626	
1	Surface Closer	281 O10 / P10	SA	EN	
1	Kickplate	K1050 12" high CSK BEV	RO	US32D	
3	Silencer	608/609	RO		
1	Card Reader	Provided by Controls Contract	OT		X
1	Wiring Diagram	Elevation and Point to Point as specified	OT		

Notes:

Door normally closed and locked.

Presentation of valid credential at card reader retracts unlocks electric exit device trim allowing ingress.
Integrated door position switch to monitor and report open / closed status of opening to buildings access control system.
Electric lock equipped with request to exit switch at interior lever to shunt door monitoring upon egress.
Free egress at all times.
Fail secure

SET: 4.0

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
1	Access Control Mortise Lock	72 IN100-82278-BIPS B LNNJ	SA	US32D	X
1	Core	Reuse Existing	BE	626	
1	Electromagnetic Holder	997M (extensions as required)	RF	689	X
1	Wiring Diagram	Elevation and Point to Point as Specified	OT		

Notes:

DOOR HARDWARE SCHEDULE

Door normally closed and locked.

Presentation of valid credential at card reader retracts unlocks electric exit device trim allowing ingress.
Integrated door position switch to monitor and report open / closed status of opening to buildings access control system.

Electric exit device equipped with request to exit switch at rail to shunt door monitoring upon egress.

Free egress at all times.

Fail-secure.

Wall / door mounted electromagnetic holders to release at activation of fire alarm.

All other existing hardware shall remain.

SET: 4.1

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
1	Access Control Mortise Lock	72 IN100-82278-BIPS B LNNJ	SA	US32D	X
1	Core	Reuse Existing	BE	626	
1	Wiring Diagram	Elevation and Point to Point as Specified	OT		

Notes:

Door normally closed and locked.

Presentation of valid credential at card reader retracts unlocks electric exit device trim allowing ingress.
Integrated door position switch to monitor and report open / closed status of opening to buildings access control system.

Electric exit device equipped with request to exit switch at rail to shunt door monitoring upon egress.

Free egress at all times.

Fail-secure.

All other existing hardware shall remain.

SET: 5.0 – NOT USED

SET: 6.0 – NOT USED

SET: 7.0

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
6	Hinge, Full Mortise, Hvy Wt	T4A3786	MK	US26D	
1	Storeroom Lock	70 8204 LNL	SA	US32D	

DOOR HARDWARE SCHEDULE

2	Flushbolt	557	RO	US26D	
1	Dustproof Strike	570	RO	US26D	
1	Core	As required	BE	626	
1	Surface Closer	281 O10 / P10 (as required)	SA	EN	
2	Kickplate	K1050 12" high CSK BEV	RO	US32D	
2	Wall Stop	406	RO	US26D	
1	Gasketing	S773BL	PE	BL	
1	Metal Astragal	306-AST UL 84" CUTOUT-1	RO	US32D	
1	Astragal	S771BL	PE	BL	

SET: 7.1

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
3	Hinge, Full Mortise, Hvy Wt	T4A3786	MK	US26D	
1	Storeroom / Closet Lock	1172 8204 LNL	SA	US26D	
1	Core	As required	BE	626	
1	Surface Closer	281 O10 / P10 (as required)	SA	EN	
1	Kickplate	K1050 12" high CSK BEV	RO	US32D	
3	Silencer	608/609	RO		

SET: 8.0

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
3	Hinge, Full Mortise, Hvy Wt	T4A3786	MK	US26D	
1	Privacy Lock, Institutional	70-V21-LB-8257 x LNNJ	SA	US26D	
1	Core	As required	BE	626	
1	Surface Closer	281 O10 / P10 (as required)	SA	EN	
1	Kickplate	K1050 12" high CSK BEV	RO	US32D	
3	Silencer	608/609	RO		
1	Coat Hook	796	RO	US26D	

SET: 9.0

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
3	Hinge, Full Mortise,	T4A3786	MK	US26D	

DOOR HARDWARE SCHEDULE

	Hvy Wt				
1	Office / Entry Lock	1172 V04 8205 LNL	SA	US26D	
1	Core	As required	BE	626	
1	Wall Stop	400	RO	US26D	
3	Silencer	608/609	RO		

SET: 9.1

QTY	ITEM	DESCRIPTION	MFR	FINISH	ELECTRIC
1	Storeroom / Closet Lock	1172 8204 LNL	SA	US26D	
1	Core	Reuse Existing	BE	626	
1	Wall Stop	400	RO	US26D	
3	Silencer	608/609	RO		

Notes:

All other existing hardware shall remain.

SECTION 08 11 16
ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum frames.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between door frames and adjacent construction.
- B. Section 08 71 00 - Door Hardware: Hardware for aluminum doors.
- C. Section 08 80 00 - Glazing: Glazing materials for aluminum doors and frames.

1.3 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- B. AAMA 701/702 - Performance Specification for Pile Weatherstrips (AAMA 701) and Polymer Weatherseals (AAMA 702); 2023.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- I. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.
- J. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.
- K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.
- L. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.
- M. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

- O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for each type of frame; include information on fabrication methods, finishing, hardware preparation, installation, and maintenance instructions.
- C. Shop Drawings: Include elevations of each opening type, details at each wall type, and schedule of openings.
 - 1. Verify dimensions by field measurements before fabrication and indicate on shop drawings.
- D. Selection Samples: Complete set of color and finish options, using actual materials, for Architect's selection.
- E. Test Report: Certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than ten years of documented experience.
- B. The manufacturer or his representative shall be available for consultation to all parties engaged in the project including instruction to installation personnel.
- C. Unless otherwise indicated, obtain doors and frames from a single company specializing in the type of construction required so that there will be undivided responsibility for the specified performance of all component parts including glazing for doors and factory installation of door hardware.
- D. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum components in manufacturer's standard protective packaging, palletted, crated, or banded together.
- B. Inspect delivered components for damage and replace. Repaired components will not be accepted.
- C. Store components in clean, dry, indoor area, under cover in manufacturer's packaging until installation.
- D. Protect materials and finish from damage during handling and installation.

1.7 FIELD CONDITIONS

- A. Do not begin installation of interior aluminum components until space has been enclosed and ambient thermal conditions are being maintained at levels consistent with final project requirements.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Provide written warranty signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the Owner, any doors, frames or factory hardware installation against failure in materials or workmanship within the warranty period. Failure of materials or workmanship includes: excessive deflection, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering and defects in hardware installation. The minimum time period of warranty is ten years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum Frames:
 - 1. Special-Lite, Inc; SL-450TB: www.special-lite.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 DOORS AND FRAMES

- A. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Aluminum Frames for Non-rated Doors, Sidelights, or Transoms: Extruded aluminum, thermally broken hollow sections; no steel components; open back framing shall not be accepted.
 - 1. Frame Depth: 4-1/2 inches.
 - 2. Finish: High performance organic coating.
 - 3. Weatherstripping: Replaceable pile type; at jambs and head.
- C. Dimensions and Shapes: As indicated on drawings; dimensions indicated are nominal.
 - 1. Provide vision lites as indicated on drawings.
 - 2. Provide the following clearances:
 - a. Hinge and Lock Stiles: 1/8 inch.
 - b. Between Meeting Stiles: 1/4 inch.
 - c. At Top Rail and Bottom Rail: 1/8 inch.

2.3 COMPONENTS

- A. Frames: Extruded aluminum shapes, not less than 0.125 inch thick, reinforced at hinge and strike locations.
 - 1. Corner Brackets: Extruded aluminum, fastened with stainless steel screws.
 - 2. Applied Door Stops: Extruded aluminum, not less than 0.125 inch thick, 0.625 high removable screw-in type with exposed fasteners.
 - a. Counterpunch fastener holes in door stop to preserve full metal thickness under fastener head.
 - b. At closer arm location, reinforce with solid bar stock for secure hardware attachment.
 - 3. Caulk joints before assembling frame members. Secure joints with fasteners and provide a hairline butt joint appearance. Prefit doors to frame assembly at factory prior to shipment. Field fabrication of framing using "stick" materials is not acceptable.
 - 4. Factory preassemble sidelights to greatest extent possible and mark frame assemblies according to location.
- B. Vision Lites: Extruded aluminum framed, gasket glazed.
 - 1. Glazing: See Section 08 80 00.
- C. Provide manufacturers standard concealed adjustable door bottom with dual brushes for up to 5/8-inch adjustment.
 - 1. Special-Lite SL-301 or equal.
- D. Additional Door Hardware: See Section 08 71 00.

1. All hardware with the exception of door closer, threshold and weatherstripping to be shipped to door manufacturer. Door manufacturer shall install hardware on doors and warranty attachment for ten years. Complete fabrication, assembly, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

E. Replaceable Weatherstripping: AAMA 701/702 wool pile.

2.4 PERFORMANCE REQUIREMENTS

- A. Provide door assemblies that have been designed and fabricated in compliance with specified performance requirements.
- B. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 7.5 psf.
- C. Air Leakage: Maximum of 0.1 cu ft/min/sq ft at 6.27 psf differential pressure, when tested in accordance with ASTM E283/E283M.
- D. Overall U-value, Including Glazing: 0.35, minimum, measured on exterior door size required for this project.
- E. Fiberglass Reinforced Plastic (FRP) Face Sheet Properties; Class A:
 1. Izod Impact Resistance: ASTM D256, 4.0 ft lbf/inch of width, minimum, with notched izod.
 2. Tensile Strength at Break: ASTM D638, 7,000 psi, minimum.
 3. Water Absorption: ASTM D570, 0.16 percent, maximum, after 24 hours at 74 degrees F.
 4. Flexural Strength: ASTM D790, 14,000 psi, minimum.

2.5 MATERIALS

- A. Aluminum Sheet: ASTM B209/B209M, alloy 5005, temper H14, stretcher leveled.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), alloy 6063, temper T5, or alloy 6463, temper T5.

2.6 FINISHES

- A. High Performance Organic Coatings: Multiple coats, thermally cured fluoropolymer system with minimum dry film thickness (DFT) of 1.2 mils, 0.0012 inch over aluminum extrusions and panels; AAMA 2604.
- B. Color: As selected by Architect from manufacturer's standard line.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.7 ACCESSORIES

- A. Fasteners: Aluminum, non-magnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.
- B. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, non-magnetic stainless steel or steel hot-dip galvanized in compliance with ASTM A123/A123M.
- C. Bituminous Coating: Cold-applied asphaltic mastic, compounded for 30-mil thickness per coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.
- B. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions.
- B. Replace components with damage to exposed finishes.
- C. Separate dissimilar metals to prevent electrolytic action between metals.

3.3 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings.
 - 1. Provide thermal isolation where components penetrate or disrupt building insulation. Coordinate attachment and seal of perimeter air and vapor retarder materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- B. Set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with manufacturer's recommendations and within specified tolerances.
 - 1. Install with anchors appropriate for wall conditions to anchor framing to wall materials.
 - 2. Secure head and sill members of transom, sidelights and similar conditions.
 - 3. Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints with hairline fit at contacting members.
- C. Set thresholds in bed of mastic and backseal.
- D. Where aluminum surfaces contact metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by painting dissimilar metal with heavy coating of bituminous paint.
- E. Hang doors and adjust hardware to achieve specified clearances and proper door operation.
- F. Comply with glazing installation requirements. See Section 08 80 00.

3.4 CLEANING

- A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609 & 610.
- B. Do not use abrasive, caustic, or acid cleaning agents.

3.5 PROTECTION

- A. Protect products of this section from damage caused by subsequent construction until Date of Substantial Completion.
- B. Replace damaged or defective components that cannot be repaired to a condition indistinguishable from undamaged components.

END OF SECTION

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SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated hollow metal frames for non-hollow metal doors.
- B. Fire-rated hollow metal frames for non-hollow metal doors.

1.2 RELATED REQUIREMENTS

- A. Section 08 14 16 - Flush Wood Doors: Non-hollow metal door for hollow metal frames.
- B. Section 08 71 00 - Door Hardware: Hardware, silencers, and weatherstripping.
- C. Section 08 80 00 - Glazing: Glazed borrowed lites.
- D. Section 09 91 23 - Interior Painting: Field painting.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.
- H. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.
- L. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- M. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- O. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

- P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hollow Metal Frames with Integral Casings:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

- A. Refer to Door and Frame Schedule on drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.
- B. Door Frame Type: Provide hollow metal door frames with integral casings.
 - 1. See drawings for locations of each type of frame.
- C. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.

- D. Accessibility: Comply with ICC A117.1 and ADA Standards.
- E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.
- F. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - 1. Fabricate frames with hardware reinforcement plates welded in place.
 - a. Hinge: Minimum 7 gauge x 1 5/8 x 10 inches.
 - b. Lock Strike: Minimum 14 gauge x template requirements.
- G. Zinc Coating for Typical Interior and/or Exterior Locations: Components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise.
- H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- I. Transom Bars: Fixed, of profile same as jamb and head.
- J. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- K. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into head of frame, and flush with top.

2.3 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

- A. Frame Finish: Factory primed and field finished.
- B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 14 gauge, 0.067 inch, minimum.
 - 2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inches above floor at 45 degree angle.
- C. Fire-Rated Door Frames: Full profile/continuously welded type.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
 - 2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
 - 3. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.

2.4 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 - 1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.5 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Anchors:
 - 1. Stud Wall: Steel stud anchor.
 - 2. New Masonry: Adjustable masonry strap anchor.
 - 3. Existing Masonry: Counter sunk screw with sleeve.
 - a. Counter sunk fasteners shall be covered with a suitable hard setting filling compound, sanded and finished to match frame.

2.6 EXISTING DOOR AND/OR FRAME ASSEMBLY FIRE INSPECTIONS

- A. Independent testing agency requirements for fire rating inspections at existing doors and/or frames:
 - 1. Acceptable Testing Agencies: Guardian Testing Lab, 399 Prospect Avenue Buffalo, NY 14201-1139; www.firetesting.com.
 - 2. Doors and/or frames to be field tested in accordance with NFPA 101 and ASTM E-119.
 - 3. Provide labels on doors and frames to state the acceptable fire rating requirement.
 - 4. See schedule on drawings for required locations.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 08 71 00.
- E. Coordinate installation of electrical connections to electrical hardware items.

3.4 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

3.5 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

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SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flush wood doors; flush configuration; fire rated, non-rated, and acoustical.

1.2 RELATED REQUIREMENTS

- A. Section 08 12 13 - Hollow Metal Frames.
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing.
- D. Section 09 93 00 - Staining and Transparent Finishing: Field finishing of doors.

1.3 REFERENCE STANDARDS

- A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- B. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- F. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- D. Samples: Submit two samples of door veneer, 4 by 4 inches in size illustrating wood grain, stain color, and sheen.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- F. Test Reports: Show compliance with specified requirements for the following:
 - 1. Sound-retardant doors and frames; sealed panel tests are not acceptable.
- G. Full size door sample: Contractor to furnish one complete door unit at each project location to be randomly core sampled. Door to be selected by Architect in field. Door to be sampled would have similar hardware type to other doors to be provided.
- H. Manufacturer's Installation Instructions: Indicate special installation instructions.

- I. Warranty, executed in Owner's name.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Woodwork Quality Assurance Program:
 - 1. Provide labels indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by quality assurance program.
 - 3. Provide designated labels on installed products as required by quality assurance program.
 - 4. Submit documentation upon completion of installation that verifies this work is in compliance with specified requirements.
- D. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Forte Opening Solutions: www.forteopenings.com/#sle.
 - 2. VT Industries, Inc: www.vtindustries.com/#sle.

2.2 DOORS AND PANELS

- A. Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.

2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
3. Sound-Rated Doors: Minimum STC of 37, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
4. Wood veneer facing for field transparent finish.

2.3 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
- C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.4 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 1. Vertical Edges: Same species as face veneer.
 2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.
 3. Veneer to be hot press applied to core.

2.5 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Glazed Openings - Fire-Rated Doors: Glazing and vision lites in fire-rated wood doors shall be factory installed by the door manufacturer in accordance with NFPA 80 requirements.
- E. Fit door edge trim to edge of stiles after applying veneer facing. No exposed cross banding.
- F. Bond edge banding to cores.
- G. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- H. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- I. Provide edge clearances in accordance with the quality standard specified.

2.6 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 1. Transparent:
 - a. System - TR-8, UV Cured Acrylated Polyester/Urethane.

- b. Sheen: Satin.
- B. Factory finish doors in accordance with approved sample.
- C. Seal door top edge with same sealer to match door facing.

2.7 ACCESSORIES

- A. Hollow Metal Door Frames: See Section 08 11 13.
- B. Glazing Stops for non-rated doors: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.
- C. Glazing Stops for secured non-rated doors: Rolled steel channel shape, 18 gauge, 0.047 inch; no exposed fasteners on non-secure side.
- D. Glazing Stops for Fire Rated Doors: Metal as required by manufacturer to achieve fire rating.
- E. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements and to requirements for fire rating label by UL or WH. Follow manufacturer's installation instructions for positive pressure doors.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.3 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

3.5 SCHEDULE - SEE DRAWINGS

END OF SECTION

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SECTION 08 16 13
FIBERGLASS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass doors.
- B. Fiberglass door frames.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants.
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing.
- D. Section 09 91 13 - Exterior Painting: Field painting.
- E. Section 09 91 23 - Interior Painting: Field painting.

1.3 REFERENCE STANDARDS

- A. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.
- E. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.
- F. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- G. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- L. IBC 2603.4.1.7 - Standard for Plastic Foam Insulation in Non-Rated Swinging Doors.

- M. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.
 - 1. Provide details of core, stile and rail construction, trim for lites and all other components.
 - 2. Include details of finish hardware mounting.
- C. Shop Drawings: Indicate layout and profiles; include assembly methods.
 - 1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
 - 2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.
- D. FRP Face Sheet Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.
- E. Door Corner Sample: Submit corner cross sections, 10 inch by 10 inch in size, illustrating face sheets, core, framing, finish, joints, fasteners, accessory items (lites, integral hardware) and quality of workmanship for approval prior to fabrication.
- F. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- G. Maintenance Data: Include instructions for repair of minor scratches and damage.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than 10 years of documented experience. Provide comprehensive list of completed projects of similar building type and size as this project with submittal package.
- B. The manufacturer or his representative shall be available for consultation to all parties engaged in the project including instruction to installation personnel.
- C. Unless otherwise indicated, obtain FRP doors and frames from a single company specializing in the type of construction required so that there will be undivided responsibility for the specified performance of all component parts including glazing for FRP doors and factory installation of door hardware.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
 - 1. Store at temperature and humidity conditions recommended by manufacturer.
 - 2. Do not use non-vented plastic or canvas shelters.
 - 3. Immediately remove wet wrappers.
- C. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inch space between doors.

1.8 FIELD CONDITIONS

- A. Do not install doors until structure is enclosed.
- B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide written warranty signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the Owner, any doors, frames or factory hardware installation against failure in materials or workmanship within the warranty period. Failure of materials or workmanship includes: excessive deflection, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering and defects in hardware installation. The minimum time period of warranty is fifteen (15) years from Date of Substantial Completion .

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fiberglass Composite Doors:
 - 1. Special-Lite, Inc; AF-220 Sandstone: www.special-lite.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 DOOR AND FRAME ASSEMBLIES

- A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
 - 1. Physical Endurance: Swinging door cycle test to ANSI/SDI A250.4, Level A (1,000,000 cycles) minimum; tested with hardware and fasteners intended for use on project.
 - 2. Screw-Holding Capacity: Tested to 890 pounds, minimum.
 - 3. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
 - 4. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
 - 5. Chemical Resistance: Resist degradation due to exposure to tap water and distilled water.
 - 6. Sizes: As indicated on drawings.
 - 7. Clearance Between Door and Frame: 1/8 inch, maximum.
 - 8. Clearance Between Meeting Stiles of Pairs of Doors: 1/8 inch, maximum.
 - 9. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.
 - 10. Provide frame anchors that allow for variation in rough opening size; field cutting of doors or frames to fit is not permitted.

2.3 COMPONENTS

- A. Doors: Fiberglass construction with reinforced core.
 - 1. Type: As indicated on drawings, including swinging doors.
 - 2. Thickness: 1-3/4 inch, nominal.
 - 3. Core Material: Expanded polystyrene foam (EPS).
 - 4. Construction:
 - a. Molded fiberglass shells with color gel coating, bonded into seamless unit; manufacturer's standard subframe and hardware reinforcements.
 - b. Fiberglass ultraviolet resistant mylar coated, with 1/8 inch thick through color face sheets laminated to core.
 - 5. Face Sheet Texture: Sandstone.

6. Door Panel Configuration: As indicated on drawings.
7. Subframe and Reinforcements: Fiberglass pultrusions; no metal or wood.
8. Waterproof Integrity: Provide factory fabricated edges, cut-outs, and hardware preparations of fiberglass reinforced plastic (FRP); provide cut-outs with joints sealed independently of glazing, louver inserts, or trim.
9. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.

2.4 PERFORMANCE REQUIREMENTS

- A. Provide door assemblies that have been designed and fabricated in compliance with specified performance requirements.
- B. Design Pressure: In accordance with ASCE 7.
- C. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 7.5 psf.
- D. Air Leakage: Maximum 0.1 cfm/sf, when tested in accordance with ASTM E283/E283M at differential pressure of 6.24 psf across assembly.
- E. Structural Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
- F. Thermal Transmittance, Exterior Doors: AAMA 1503, U-value of 0.18, maximum, measured on exterior door in size required for this project.
- G. Fiberglass Reinforced Plastic (FRP) Face Sheet Properties:
 1. Izod Impact Resistance: ASTM D256, 7 foot-pound force per inch of width, minimum, with notched izod.
 2. Water Absorption: ASTM D570, 0.16 percent, maximum, after 24 hours at 74 degrees F.
 3. Flexural Strength: ASTM D790, 27,000 psi, minimum.

2.5 FINISHES

- A. Abuse resistant engineered surface with protective coating and through-molded color.
 1. Panel Texture: Sandstone.
 2. Color: As selected by Architect from manufacturer's full line of colors.
- B. Primer: Aliphatic urethane for field finishing.

2.6 HARDWARE

- A. Door Hardware: See Section 08 71 00.
 1. Pre-machine doors in accordance with templates from specified hardware supplier.

2.7 ACCESSORIES

- A. Stops for Glazing and Louver: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.
 1. Exterior Doors: Provide non-removable stops on exterior side with continuous compression gasket weatherseal.
 2. Glazed Openings: Provide removable stops on interior side.
 3. Opening Sizes and Shapes: As indicated on drawings.
- B. Glazing: See Section 08 80 00.
 1. Allow for thermal expansion on exterior units.

2. Glazing shall be factory glazed into doors.

- C. Louvers: Same materials, construction, finish, and color as door; fixed vanes, inverted "V" vanes.
- D. Louvers for Fire-Rated Doors: UL (DIR) listed and labeled self-closing fire damper louvers actuated with fusible link; galvanized steel with overlapping trim frame both sides of door.

2.8 FABRICATION

- A. Field measure before fabrication and show recorded measurements on final shop drawings.
- B. Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints with hairline fit at contacting members.
- C. All hardware with the exception of door closer, threshold and weatherstripping to be shipped to door manufacturer. Door manufacturer shall install hardware on doors and warranty attachment for ten years. Complete fabrication, assembly, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Remove existing doors and frames, and dispose of all removed materials in accordance with local authorities having jurisdiction.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean and prepare substrate in accordance with manufacturer's directions.
- D. Protect adjacent work and finish surfaces from damage during installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.
- B. Install door hardware as specified in Section 08 71 00.
- C. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.
- D. Set thresholds in continuous bed of sealant and backseal.
- E. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.
- F. In stud walls, install frames prior to building walls; anchor frames to studs using concealed anchors.

- G. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.
- H. Provide thermal isolation where components penetrate or disrupt building insulation. Coordinate attachment and seal of perimeter air and vapor retarder materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Repair or replace damaged installed products.

3.4 ADJUSTING

- A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.
- C. Adjust doors to fit snugly and close without sticking or binding.

3.5 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall- and ceiling-mounted access units.

1.2 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Openings in masonry.
- B. Section 09 21 16 - Gypsum Board Assemblies: Openings in partitions.
- C. Section 09 91 23 - Interior Painting: Field paint finish.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.
- C. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.
- D. ITS (DIR) - Directory of Listed Products; Current Edition.
- E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- F. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, fire resistance listings, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.
- E. Project Record Documents: Record actual locations of each access unit.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Access door and frame units, fire-rated and non-fire-rated, in wall and ceiling locations.
 - 1. Provide for access to controls, valves, traps, dampers, cleanouts, and similar items requiring operation behind inaccessible finished surfaces.
 - 2. Coordinate exact locations with various trades to assure proper placement of access doors and panels.
- B. Wall-Mounted Units:
 - 1. Location: As indicated on drawings, and additional locations as required.
 - 2. Panel Material: Steel.
 - 3. Size: As required to provide adequate access.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
 - 6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- C. Fire-Rated Wall-Mounted Units:
 - 1. Location: As indicated on drawings, and additional locations as required.
 - 2. Wall Fire-Rating: To match rating of assembly in which unit is installed .
 - 3. Panel Material: Steel.
 - 4. Size: As required to provide adequate access.
 - 5. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.
- D. Ceiling-Mounted Units:
 - 1. Location: As indicated on drawings, and additional locations as required.
 - 2. Panel Material: Steel.
 - 3. Size : As required to provide adequate access.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.2 WALL- AND CEILING-MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc; FW-5050-ACF: www.acudor.com/#sle.
 - 2. Cendrex, Inc: www.cendrex.com/#sle.
 - a. Wall- and Ceiling-Mounted Units: Cendrex AHD, flush door, face frame, hinged.
 - b. Fire-Rated Ceiling-Mounted Units: Cendrex PFI-00 Fire-Rated Insulated Access Door with Exposed Flange.
 - 3. Karp Associates, Inc: www.karpinc.com/#sle.
 - 4. Milcor, Inc: www.milcorinc.com.
 - 5. Nystrom, Inc: www.nystrom.com/#sle.
- B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Style: Exposed frame with door surface flush with frame surface.
 - a. Gypsum Board Ceiling Mounting Criteria: Use drywall bead type frame.
 - 2. Door Style Non-rated: Single thickness with rolled or turned in edges.
 - 3. Door Style Fire-Rated: Double-skinned hollow panel, insulated.
 - a. Insulation: Non-combustible mineral wool.
 - 4. Frames: 16-gauge, 0.0598-inch minimum thickness.
 - 5. Single Steel Sheet Door Panels: 16 gage, minimum thickness.
 - 6. Double-Skinned Hollow Steel Sheet Door Panels: 20 gage, .0359 inch, minimum thickness, on both sides and along each edge.

7. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
 - b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
8. Steel Finish: Primed.
9. Factory Primed: Polyester powder coat.
10. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Continuous piano hinge.
 - c. Latch/Lock: Screw driver slot for quarter turn cam latch.
 - d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings with plane of door and panel face aligned with adjacent finished surfaces. Secure rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.
- D. Install fire rated units in accordance with NFPA 80 and requirements for fire listing.

END OF SECTION

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SECTION 08 44 35
FIRE-RATED FRAMED GLAZED ASSEMBLIES - SAFTI

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire-resistive-rated framing.
- B. Fire-resistive-rated glazing.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.
- I. ITS (DIR) - Directory of Listed Products; Current Edition.
- J. UL (DIR) - Online Certifications Directory; Current Edition.
- K. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's published product data on framing, glazing, anchorage, fasteners, doors, and hardware. Show compliance with fire performance and other criteria.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit samples illustrating each exposed metal finish of interior and exterior project-specific applications.
- E. Manufacturer's qualification statement.
- F. Executed warranty.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide glass products listed and manufactured under follow-up program of inspections conducted by ITS (DIR) or UL (DIR).
 - 1. Company specializing in manufacturing products specified in this section, with at least ten years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.6 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F, and maintain above minimum temperature during and for 48 hours after installation.

1.7 WARRANTY

- A. Manufacturer Warranty: Provide 5-year manufacturer warranty from date of shipping against product defects . Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. SAFTI FIRST, a division of O'Keeffe's Inc: www.safti.com/#sle.
- B. Furnish framing, glazing, and doors from single manufacturer and obtained from a single supplier.
- C. Provide glazed assembly manufacturer's recommended door hardware by approved hardware manufacturers.

2.2 FIRE-RATED ASSEMBLIES

- A. Type FRRA-1 - Fire-Resistance-Rated Assembly: Comprised of glazing and transom and wall framing.
 - 1. Application: At openings indicated on drawings.
 - 2. Rating: As indicated on drawings.
 - 3. Framing: GPX Architectural Series Fire Resistive Framing.
 - 4. Glazing: 90-minute fire-resistive tempered units; SuperLite II-XL 90.

2.3 PERFORMANCE REQUIREMENTS

- A. Provide factory-fabricated, factory-finished framing members with glazing and related anchorage and attachment devices.
- B. Fire Performance Certification: Listed by UL (DIR) or ITS (DIR).
- C. Fire-Resistive Wall Assemblies: Provide hourly fire ratings as indicated in contract documents, tested as assembly including glazing complying with ASTM E119 or UL 263 and requirements of authorities having jurisdiction.
- D. Impact Resistance of Glazing in Hazardous Locations: Comply with ANSI Z97.1 - Class A and 16 CFR 1201 - Category II impact test requirements.
- E. Structural Performance: Design and size components to withstand imposed loads without damage or permanent set.

1. Design Loads: As indicated on drawings.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of length or 3/4 inch, whichever is less, under specified design load.

2.4 COMPONENTS

- A. Framing Members: Formed steel structural members with aluminum cladding and noncombustible, thermally resistive material as required for fire rating.
 1. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 2. Glazing Stops: Flush.
 3. Cross Section: As indicated on drawings.

2.5 MATERIALS

- A. Aluminum Sheet: ASTM B209/B209M.
- B. Internal Framing: ASTM A501/A501M, with galvanized cladding retainers.
- C. Sealants within Fire-Rated Assembly: As required by fire rating and manufacturer's assembly.
- D. Glazing Gaskets: Type to suit application to achieve fire-rating, weather, moisture, and air infiltration requirements.

2.6 FINISHES

- A. Finishing: Apply factory finish to surfaces that will be exposed in completed assemblies.
 1. Touch up surfaces cut during fabrication so no natural metal surfaces are visible in completed assemblies, including joint edges.
- B. Apply factory finish to surfaces that will be exposed in completed assemblies.
- C. Aluminum Finish: AAMA 2605 multiple coat, thermally cured, polyvinylidene fluoride system.
- D. Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and attachment method with other work.
- B. Verify wall openings and adjoining water-resistive barrier materials are ready to receive work of this section.
- C. Verify anchorage devices are correctly installed and located.

3.2 INSTALLATION

- A. Install wall system in accordance with limitations of fire rating and with manufacturer's instructions.
- B. Attach to structure to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.

- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form watertight dam.
- G. Touch up minor damage to factory-applied finish; replace components that cannot be repaired to as-new condition.

3.3 TOLERANCES

- A. Sealant Space between Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.4 CLEANING

- A. Remove protective material from prefinished surfaces.
- B. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.5 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hardware for wood and aluminum doors.
- B. Hardware for fire-rated doors.
- C. Electrically operated and controlled hardware.
- D. Lock cylinders for doors that hardware is specified in other sections.
- E. Thresholds.
- F. Weatherstripping and gasketing.

1.2 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework: Cabinet hardware.
- B. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.
- C. Section 08 06 71 - Door Hardware Schedule: Schedule of door hardware sets.
- D. Section 08 12 13 - Hollow Metal Frames.
- E. Section 08 14 16 - Flush Wood Doors.
- F. Section 28 10 00 - Access Control: Electronic access control devices.
- G. Section 28 15 00 - Integrated Access Control Hardware Devices.
- H. Section 28 46 21 16 - Existing Fire Alarm Systems: Electrical connection to activate door closers and release magnetic holders.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA (CPD) - Certified Products Directory; Current Edition.
- C. BHMA A156.1 - Standard for Butts and Hinges; 2021.
- D. BHMA A156.3 - Exit Devices; 2025.
- E. BHMA A156.4 - Door Closers and Pivots; 2024.
- F. BHMA A156.6 - Standard for Architectural Door Trim; 2021.
- G. BHMA A156.7 - Template Hinge Dimensions; 2022.
- H. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.
- I. BHMA A156.13 - Mortise Locks and Latches; 2022.
- J. BHMA A156.15 - Release Devices - Closer Holder, Electromagnetic and Electromechanical; 2021.
- K. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.

- L. BHMA A156.21 - Thresholds; 2025.
- M. BHMA A156.22 - Standard for Gasketing; 2021.
- N. BHMA A156.26 - Standard for Continuous Hinges; 2021.
- O. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2024.
- P. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- Q. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.
- R. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.
- S. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- T. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- U. ITS (DIR) - Directory of Listed Products; Current Edition.
- V. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- W. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- X. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Y. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- Z. UL (DIR) - Online Certifications Directory; Current Edition.
- AA. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
- D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:
 - a. Installer's Architectural Hardware Consultant (AHC).
 - 3. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - 4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:

- a. Access control requirements.
 - b. Key control system requirements.
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule
- C. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- D. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 3. List groups and suffixes in proper sequence.
 - a. Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission
 4. Provide complete description for each door listed.
 5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 6. Include account of abbreviations and symbols used in schedule.
 7. Mounting locations for door hardware.
 8. Door and frame sizes and materials.
 9. Warranty information for each product
- E. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
 4. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- F. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

- H. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- I. Keying Schedule:
 - 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
 - 2. After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- J. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.6 QUALITY ASSURANCE

- A. Furnish hardware marked and listed in BHMA Directory of Certified Products.
- B. Manufacturer: Obtain each type of hardware (ie., lock sets) from a single manufacturer, although several may be indicated as offering products complying with requirements.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- E. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.
 - 1. Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project.
 - 2. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity
 - 3. Supplier is responsible for proper coordination of all finished hardware with related sections to insure compatibility of products.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels.
 - 1. Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.
 - 1. Include necessary fasteners, installation instructions and templates with each item or package.

- B. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- C. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.
- D. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference."

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods, from Date of Substantial Completion: against defects in material and workmanship for period indicated, from Date of Substantial Completion.
 - 1. Mortise Locks and Latches: Ten years, minimum.
 - 2. Heavy duty Cylindrical (bored) locks and latches: Seven years, minimum.
 - 3. Motorized electric latch retraction exit devices: Five years, minimum.
 - 4. Electromechanical Door Hardware: Two years, minimum.

PART 2 PRODUCTS

2.1 MANUFACTURERS - BASIS OF DESIGN

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of manufacturers on Basis of Design standard:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.

- C. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1.
 - 3. Applicable provisions of NFPA 101.
 - 4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - 5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
 - 6. Listed and certified compliant with specified standards by BHMA (CPD).
 - 7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 - 8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.
- D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
 - 1. See Section 28 10 00 for additional access control system requirements.
- E. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 - 2. Fire-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
 - 3. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.3 HINGES

- A. Manufacturers:
 - 1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Hager Companies: www.hagerco.com/#sle.
 - 3. Ives; an Allegion brand: www.allegion.com.
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 - 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - a. Provide hinge width required to clear surrounding trim.
 - 2. Continuous Hinges: Comply with BHMA A156.26.
 - 3. Provide hinges on every swinging door.
 - 4. Provide non-removable pins on outswinging doors.
 - 5. Provide following quantity of butt hinges for each door:
 - a. Doors up to 60 inches High: Two hinges.
 - b. Doors From 60 inches High up to 90 inches High: Three hinges.
 - c. Doors 90 inches High up to 120 inches High: Four hinges.
 - d. Doors over 120 inches High: One additional hinge per each additional 30 inches in height.
- C. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - 1. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - 2. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
- D. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - 1. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

2. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- E. Hinge Options: Comply with the following:
 1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
- F. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 1. Acceptable Manufacturers:
 - a. Basis of Design: Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
 - b. Hager Companies (HA).
 - c. Select Products; (SEL).
 - d. Ives; an Allegion brand; (IVE); www.allegion.com/us.
- G. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 certified pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed teflon coated stainless pin, and twin self lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 1. Acceptable Manufacturers:
 - a. Basis of Design: Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
 - b. Select Products; (SEL).
 - c. Ives; an Allegion brand; (IVE); www.allegion.com/us.

2.4 FLUSH BOLTS

- A. Manufacturers:
 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 2. Trimco: www.trimcohardware.com/#sle.
- B. Flush Bolts: Comply with BHMA A156.16, Grade 1.
 1. Flush Bolt Throw: 3/4 inch, minimum.
 2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
 - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
 3. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
 4. Self-Latching Flush Bolts: Automatically latch upon closing of door; manually retracted; located on inactive leaf of pair of doors.

2.5 EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
 6. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets
 8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets
- B. Manufacturers:
1. Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. Precision, dormakaba Group: www.precisionhardware.com/#sle.
 3. Von Duprin, an Allegion brand: www.allegion.com/us/#sle.
- C. Exit Devices: Comply with BHMA A156.3, Grade 1.
1. Lever design to match lockset trim.
 2. Provide cylinder with cylinder dogging or locking trim.
 3. Provide exit devices properly sized for door width and height.
 4. Provide strike as recommended by manufacturer for application indicated.
 5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
 6. For electrical options, provide quick connect plug-in pre-wired connectors.

2.6 ELECTRIC STRIKES

- A. Manufacturers:
1. HES; an Assa Abloy Group company: www.assaabloydss.com/#sle.
- B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
 2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
 3. Provide Fail Secure unless otherwise indicated.
 4. Provide transformer and rectifier as necessary for complete installation.
 5. Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.

2.7 LOCK CYLINDERS & KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide cylinders from same manufacturer as locking device.
 2. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.

3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 5. Keyway: Match Facility Standard.
 6. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.
 7. Provide cams and/or tailpieces as required for locking devices.
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Key locks to Owner's existing system
- E. Key Quantity: Provide the following minimum number of keys:
1. Master Keys (per Master Key Level/Group): Five (5).
- F. Construction Keying: Provide construction master keyed cylinders.
- G. Construction Keying: Provide temporary keyed construction cores.
- H. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.8 MORTISE LOCKS

- A. Manufacturers:
1. Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.
- B. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
1. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
 2. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.
 3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 10 million cycles.

2.9 AUXILIARY LOCKS (DEADLOCKS)

- A. Manufacturers:
- B. Mortise Deadlocks, Small Case: Comply with BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless-steel bolts with a 1 inch throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

2.10 DOOR PULLS AND PUSH PLATES

- A. Manufacturers:
1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.

2. Hiawatha, Inc, division of Activar Construction Products Group, Inc:
www.activarcpg.com/hiawatha/#sle.
 3. Trimco: www.trimcohardware.com/#sle.
- B. Door Pulls and Push Plates: Comply with BHMA A156.6; certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

2.11 CLOSERS

- A. Manufacturers; Surface Mounted:
1. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
 2. Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 3. LCN, an Allegion brand: www.allegion.com/us/#sle.
- B. Closers (Large Body Cast Iron): Comply with BHMA A156.4, Grade 1.
1. Type: Surface mounted to door.
 - a. Closers that incorporate Pressure Relief Valve (PRV) technology will not be accepted.
 - b. Fully operational adjustable according to door size, frequency of use, and opening force.
 - c. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
 2. All door closers specified herein shall meet or exceed the following criteria:
 - a. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 - b. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - c. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 - d. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 - e. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - f. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 - g. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
 3. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.
 - a. Provide keyed removable feature where specified in the Hardware Sets.
 - b. Provide stabilizers and mounting brackets as required.
 - c. Provide electrical quick connection wiring options as specified in the hardware sets.
 - d. Acceptable Manufacturers:
 - 1) Corbin Russwin Hardware.
 - 2) Sargent Manufacturing.
 - 3) Von Duprin.

2.12 OVERHEAD STOPS AND HOLDERS

- A. Manufacturers:
 - 1. Rixson; an Assa Abloy Group company: www.assaabloydss.com/#sle.
- B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
 - 1. Provide stop for every swinging door, unless otherwise indicated.
 - 2. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

2.13 PROTECTION PLATES

- A. Manufacturers:
 - 1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Hiawatha, Inc, an Activar Construction Products Group company: www.activarcpg.com/hiawatha/#sle.
 - 3. Ives, an Allegion brand: www.allegion.com/us/#sle.
 - 4. Trimco: www.trimcohardware.com/#sle.
- B. Protection Plates: Comply with BHMA A156.6.
- C. Metal Properties: Stainless steel material.
 - 1. Metal, Heavy Duty: Thickness 0.062 inch, minimum.
- D. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
- E. Edges: Beveled, on four sides unless otherwise indicated.
- F. Fasteners: Countersunk screw fasteners.
- G. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.

2.14 ELECTROMAGNETIC DOOR HOLDERS

- A. Manufacturers:
 - 1. Rixson; an Assa Abloy Group company: www.assaabloydss.com/#sle.
- B. Electromagnetic Door Holders: Comply with BHMA A156.15.
 - 1. Type: Wall mounted, single unit, standard duty, with strike plate attached to door.
 - 2. Holding Force, Heavy Duty: 300 lbs-force, minimum.
 - 3. Voltage: 24 VAC, and provide power supplies by same manufacturer as holders.
 - 4. Provide interface with fire detectors and fire-alarm system for fire-rated door assemblies.

2.15 WALL STOPS

- A. Manufacturers:
 - 1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Hiawatha, Inc, division of Activar Construction Products Group, Inc: www.activarcpg.com/hiawatha/#sle.
 - 3. Trimco: www.trimcohardware.com/#sle.
- B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Bumper, concave, wall stop.

2. Material: Aluminum housing with rubber insert.
3. Provide floor stop when wall surface is not available; be cautious not to create tripping hazard.
4. Where wall or floor stops are not appropriate, provide overhead type stops and holders

2.16 ASTRAGALS

- A. Manufacturers:
 1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. National Guard Products, Inc: www.ngpinc.com/#sle.
 3. Zero International, Inc: www.zerointernational.com/#sle.
- B. Astragals: Comply with BHMA A156.22.
 1. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
 2. Provide non-corroding fasteners at exterior locations.

2.17 THRESHOLDS

- A. Manufacturers:
 1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. National Guard Products, Inc: www.ngpinc.com/#sle.
 3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
- B. Thresholds: Comply with BHMA A156.21.
 1. Provide threshold at each exterior door, unless otherwise indicated.
 2. Material: Aluminum.
 3. Provide thresholds that are 1 inch wider than depth of frame.
 4. Provide non-corroding fasteners at exterior locations.

2.18 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. National Guard Products, Inc: www.ngpinc.com/#sle.
 3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
- B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
 1. Head and Jamb Type: Adjustable.
 2. Door Sweep Type: Encased in retainer.
 3. Material: Aluminum, with brush weatherstripping.
 4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
 5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.19 SILENCERS

- A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 1. Single Door: Provide three on strike jamb of frame.
 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 3. Material: Rubber, gray color.

2.20 ELECTRONIC ACCESSORIES

- A. Power Supply
 1. Manufacturers:
 - a. Basis of Design: Securitron; an Assa Abloy Group company: www.assaabloydss.com.

2. Switching Power Supplies: Provide UL listed or recognized filtered and regulated power supplies. Provide single, dual, or multi-voltage units as shown in the hardware sets. Units must be expandable up to eight Class 2 power limited outputs. Units must include the capability to incorporate a battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
- B. Power Transfer Devices:
1. Manufacturers:
 - a. Basis of Design: Securitron; an Assa Abloy Group company: www.assaabloydss.com/#sle
 - b. Von Duprin; an Allegion brand; EPT-10 Series.
 2. Provide concealed wiring pathway housing mortised into the door and frame for low /voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
- C. Electric Door Wire Harnesses:
1. Manufacturers:
 - a. Basis of Design: McKinney Products; an Assa Abloy Group company: www.assaabloydss.com/#sle
 2. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories Electrical Connecting Kit: QC-R001.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories Connector Hand Tool: QC-R003
 3. Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable.
 4. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

2.21 FINISHES

- A. Finishes: Identified in Section 08 0671 - Door Hardware Schedule.
- B. Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
1. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
 2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 3. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
 4. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
 5. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
 6. Hardware for Aluminum Storefront Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of correct characteristics.
- C. Notify Architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- C. Use templates provided by hardware item manufacturer.
- D. Do not install surface mounted items until application of finishes to substrate are fully completed.
- E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 3. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch.
 - b. Push Plates/Pull Bars: 42 inch.
 - c. Deadlocks (Deadbolts): 48 inch.
 - d. Exit Devices: 40-5/16 inch.
- F. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.3 ADJUSTING

- A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.4 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
- D. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

3.5 PROTECTION

- A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

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SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.2 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers.
- B. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.
- C. Section 08 12 13 - Hollow Metal Frames: Glazed borrowed lites.
- D. Section 08 14 16 - Flush Wood Doors: Glazed lites in non-rated doors.
- E. Section 08 16 13 - Fiberglass Doors: Glazed lites in non-rated doors.
- F. Section 08 88 13 - Fire-Rated Glazing.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- K. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2021.
- L. GANA (SM) - GANA Sealant Manual; 2008.
- M. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

- N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
- O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.
- P. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 10 by 10 inch in size of glass units, showing coloration and design.
- E. Certificate: Certify that sealed insulated glazing units meet or exceed specified requirements.
 - 1. Submit NFRC 100- CMA Bid Report for the project showing compliance with the project thermal requirements at time of initial submission. Bid report shall be based on NFRC test sizes utilizing project specific glazing.
- F. Installer's Certificate: Certify that glass furnished without identification label is installed in accordance with Construction documents and applicable code.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.7 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

- C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Guardian Industries Corp: www.sunguardglass.com.
 - 2. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 3. Saint Gobain North America: www.saint-gobain.com/#sle.
 - 4. Vitro Architectural Glass: www.vitroglazings.com
- B. Laminated Glass Manufacturers:
 - 1. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
 - 2. Oldcastle Building Envelope: www.obe.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: In accordance with ASCE 7.
 - a. Positive Design Pressure: 20 psf.
 - b. Negative Design Pressure: 20 psf.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7
 - 4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 5. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
 - a. Water-Resistive Barriers: See Section 07 25 00.
 - 2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
 - 3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Heat-Strengthened float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
 2. Laminated Glass which is also specified as Security Glass shall comply with UL 972 and ASTM F1233, Class 1.3.
 - a. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum, or as required to meet specified standards.

2.4 INSULATING GLASS UNITS

- A. Manufacturers:
1. Glass: Any of the manufacturers specified for float glass.
- B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 3. Spacer Color: Black.
 4. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Black.
 5. Purge interpane space with dry air, hermetically sealed.
- D. Type IG-A - Insulating Glass Units: Vision glass, double glazed.
1. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, Solarban 90 Low-E film on #2 surface.
 - a. Tint: Clear.
 2. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Solarban 70 Low-E film, on #3 surface.
 3. Total Thickness: 1 inch.
 4. Visible Light Transmittance (VLT): 60 percent, nominal.
 5. Solar Heat Gain Coefficient (SHGC): 0.38 percent, nominal.
 6. Glazing Method: Dry glazing method, tape and gasket spline.
- E. IG-B Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, Solarban 90 Low-E film on #2 surface.
 - a. Tint: Clear.
 - b. Coating: Same as on vision units, on #2 surface.
 4. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Elastomeric coating, on #4 surface, color to match existing.
 - 1) Opacifier Color #1: Provide custom color to match existing similar to Benjamin Moore Almond.
 - 2) Opacifier Color #2: Viracon Ceramic Enamel color VBC2111 - Subdued Bronze
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.24, nominal.

GLAZING

2.5 GLAZING UNITS

- A. Type G-1 - Monolithic Safety Glazing: Non-fire-rated.
 - 1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 - 2. Glass Type: Fully tempered safety glass as specified.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch, nominal.

2.6 GLAZING COMPOUNDS

- A. Type GC-1 - Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- B. Type GC-2 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
- C. Manufacturers:
 - 1. Dow Corning Corporation: www.dowcorning.com/construction.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.7 ACCESSORIES

- A. Setting Blocks: Neoprene, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color to match frame.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.4 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.6 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

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SECTION 08 88 13
FIRE-RATED GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire-rated glazing units.
- B. Glazing compounds.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.
- B. Section 08 12 13 - Hollow Metal Frames: Glazed borrowed lites.
- C. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.
- D. Section 08 44 35 - Protective Framed Glazing Assemblies: Glazing tested and provided as part of the wall assembly.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- F. GANA (GM) - GANA Glazing Manual; 2022.
- G. GANA (SM) - GANA Sealant Manual; 2008.
- H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).
- J. ITS (DIR) - Directory of Listed Products; Current Edition.
- K. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- L. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.
- M. UL (DIR) - Online Certifications Directory; Current Edition.
- N. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- P. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each of affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: One sample 12 by 12 inch in size of each type of glass units.
- E. Shop Drawings: Show dimensioned plans, elevations and details for doors, frames, and hardware components as shown on drawings and schedules. Provide templates for the location of embedment and anchor locations required any adjoining work.
- F. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- G. Certificate: Certify that products of this section meet or exceed specified requirements.
 - 1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.
- J. Specimen warranty.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with GANA (GM), GANA (SM), IGMA TM-3000, and NGA (LGRM) for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
 - 1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Safety Glazing Certification Council (SGCC).
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
 - 1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
 - a. North American Contractor Certification (NACC) for glazing contractors.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.7 DELIVER, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original packaging, complete with installation instructions.

- B. Store off ground, under cover, and protected from weather and construction activities.
 - 1. Store glazing units vertically. Do not lean.
- C. Maintain temperatures between 40 and 120 degrees F during transportation and storage.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty for Laminated Glass: Provide 5-year manufacturer warranty coverage for delamination, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
- C. Manufacturer Warranty for Heat Soaked Tempered Glass: Provide 5-year manufacturer warranty coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. McGrory Glass, Inc[<>]: www.mcgrory.com/#sle

2.2 FIRE-RATED GLAZING UNITS

- A. Type FRG-1 Fire-Resistance-Rated Glazing; Type, thickness and configuration of glazing that contains flames, smoke and blocks radiant heat, as required to achieve indicated fire rating period exceeding 20 minutes
 - 1. Fire rating period: As scheduled
- B. FRG-2 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flames, smoke, and blocks radiant heat, as required to achieve indicated fire rating period exceeding 45 minutes.
 - 1. See Section 08 44 35 for glazing in fire-rated framing assemblies.
 - 2. Applications:
 - a. Glazing in fire-rated door assembly.
 - b. Glazing in fire-rated window assembly.
 - c. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
 - d. Other locations as indicated on drawings.
 - 3. Glass Type: Tempered glass outer layers filled with semi-solid fire retardant.
 - 4. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
 - 5. Safety Glazing Certification: 16 CFR 1201 Category II.
 - 6. Glazing Method: As required for fire rating.
 - 7. Fire Rating Period: As scheduled.
 - 8. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
 - a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
 - b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
 - d. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
 - e. "XXX" - placeholder that represents fire rating period, in minutes.
 - 9. Glass Type FRG-3: 90-minute fire-resistive units, tempered.

- a. Thickness 1-1/2 inch.
- b. Product: SAFTIFIRST; SuperLite II-XL 90: www.safti.com.

2.3 GLAZING COMPOUNDS

- A. Type GC-1 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
 - 1. Manufacturers:
 - a. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 - b. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 ACCESSORIES

- A. Setting Blocks: Calcium silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Flexible tape made from spun calcium-magnesium-silica fibers in binder; designed to remain stable at temperatures up to 2,012 degrees F.
 - 1. Thickness: As recommended by framing manufacturer for glazing application.
- D. Glazing Gaskets: Flexible intumescent seals.

2.5 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that minimum required face and edge clearances are provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION - GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.4 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

- A. Application - Interior Glazed: Set glazing infills from interior of building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sightline.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

3.5 INSTALLATION - WET/DRY GLAZING METHOD (TAPE AND SEALANT)

- A. Application - Interior Glazed: Set glazing infills from interior of building.
- B. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sightline.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- D. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- E. Install removable stops, spacer shims inserted between glazing and applied stops at 24-inch intervals, 1/4 inch below sight line.
- F. Fill gaps between pane and applied stop with recommended type sealant to depth equal to bite on glazing, to uniform and level line.
- G. Carefully trim protruding tape with knife.

3.6 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7 PROTECTION

- A. After installation, mark pane with 'X' by using removable plastic tape or paste; do not mark heat-absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile.
 - 2. Carpet tile.
 - 3. Thin-set ceramic tile and stone tile.
 - 4. Resinous Matrix Terrazzo.
 - 5. Fluid Applied Flooring.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall include, in base bid, specified remediation work of all interior concrete floor slabs receiving floor coverings outlined below. If such remediation is indicated as not necessary following testing agency's report, a contract modification will be issued.
 - 2. Remedial Floor Coating to include in base bid at:
 - a. Existing concrete slabs receiving adhesively applied flooring.
 - b. Existing concrete slabs receiving Resinous Matrix Terrazzo.
 - c. New concrete slabs receiving Resinous Matrix Terrazzo.
 - d. Existing concrete slabs receiving Wood athletic flooring.
 - 3. Remedial Floor Coating not included in base bid at:
 - a. New concrete slabs receiving adhesively applied flooring where Moisture Vapor Reduction Admixture (MVRA) is integral in the new slab.
 - b. Existing concrete slabs receiving thin-set applied flooring, including but not limited to ceramic, quarry, and stone tile.
 - c. New concrete slabs receiving thin-set applied flooring, including but not limited to ceramic, quarry, and stone tile.
- F. Patching compound.
- G. Remedial floor coatings.

1.2 RELATED REQUIREMENTS

- A. Section 01 22 00 - Unit Prices: Bid pricing for remediation treatments not required.
- B. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.
- D. Section 03 30 00 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.
- E. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

- F. Section 03 54 00 - Cast Underlayment: Self-leveling underlayment applied as remediation treatment.

1.3 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices: See Section 01 22 00 - Unit Prices.
- B. Unit Price for Remedial Floor Coating: Include the cost of the floor coating in the base bid; state on the bid form the unit price deduct per square foot for the floor coating, in the event such remediation is not required.

1.4 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- C. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020 (Reapproved 2025).
- D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2024.
- E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- F. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- H. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- I. ASTM F3010 - Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings; 2018.
- J. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.6 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Visual Observation Report: For existing floor coverings to be removed.
- C. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
1. Moisture and alkalinity (pH) limits and test methods.
 2. Manufacturer's required bond/compatibility test procedure.
- D. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
1. Manufacturer's qualification statement.
 2. Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.

3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 4. Manufacturer's installation instructions.
 5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.
- E. Testing Agency's Report:
1. Description of areas tested; include marked up floor finish plans and photographs if helpful.
 2. Summary of conditions encountered.
 3. Moisture and alkalinity (pH) test reports.
 4. Copies of specified test methods.
 5. Recommendations for remediation of unsatisfactory surfaces.
 6. Product data for recommended remedial coating.
 7. Submit report to Architect.
 8. Submit report not more than two business days after conclusion of testing.
- F. Adhesive Bond and Compatibility Test Report.
- G. Copy of RFCI (RWP).

1.7 PERFORMANCE REQUIREMENTS

- A. Manufacturer must provide Independent lab test reports documenting performance per the following:
1. ASTM E96/E96M, Water Vapor Transmission (wet method) Performance shall be documented by an independent testing laboratory at a minimum of 97% water vapor transmission reduction compared to untreated concrete.
 2. ASTM E96/E96M - Perm Rating - Standard Test Method for Water Vapor Transmission of Materials – Perm Rate results must not exceed 0.1 Perms.
 3. ASTM D1308; Insensitivity to alkaline environment up to, and including, pH 14. A 14 day test is required with no degradation of sample reported.
 4. Certify acceptance and exposure to continuous topical water exposure after final cure.

1.8 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
 2. Confirm date of start of testing at least 10 days prior to actual start.
 3. Allow at least 4 business days on site for testing agency activities.
 4. Achieve and maintain specified ambient conditions.
 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.

- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.10 FIELD CONDITIONS

- A. Only conduct calcium chloride tests at the same temperature and humidity expected during normal use, maintained 48 hours prior to and during testing. If this is not possible, use the following guidelines:
- B. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- C. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 - 3. Products:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
 - b. CMP Specialty Products; Prepstar: www.cmpsp.com.
 - c. TEC Specialty Products LLC; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Remedial Floor Coating, Two-Component: Single-layer coating resistant to water vapor transmission meeting flooring manufacturer's emission limits, resistant to alkalinity (pH) level found, and suitable for flooring adhesion without further treatment.
 - 1. Material: Comply with ASTM F3010.
 - 2. Thickness: As required for application and in accordance with manufacturer's installation instructions.
 - 3. Water Vapor reduction system shall be a single coat, stand alone system with no requirements for additional components such as sand broadcast for adhesion of flooring systems.
 - 4. System must reduce Calcium Chloride readings of up to 25lbs/1000 ft²/24 hrs by 97% in one coat. System must be able to perform as required with RH Probe readings of 100%.
 - 5. Products:
 - a. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
 - b. CMP Specialty Products; Lockdown: www.cmpsp.com.
 - c. Koster American Corporation; VAP I 2000: www.kosterusa.com/#sle.
 - d. Or as approved by manufacturer of flooring system.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
 - 2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
 - a. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.
 - 3. Preliminary cleaning.
 - 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 - 5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 7. Specified remediation, if required.
 - 8. Patching, smoothing, and leveling, as required.
 - 9. Other preparation specified.
 - 10. Adhesive bond and compatibility test.
 - 11. Protection.
- B. Remediations:
 - 1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
 - 2. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.4 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.

- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.5 INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

3.6 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
 - 1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
 - 2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
 - 3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.
- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.7 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Comply with recommendations for preparation and application in accordance with ASTM F3010.

- D. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors to a Concrete Surface Profile (CSP) #3 or #4 and clean surfaces with an industrial vacuum cleaner and remove all residues from the substrate. Grinding is allowed only in areas not accessible by shot blasting. Remove ALL defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, Shot blast bee bees, etc. Repair all cracks, expansion joints, control joints, and open surface honeycombs and fill in accordance with Manufacturer's recommendations. If concrete additives such as chlorides or any other soluble compounds that may contaminate surfaces have been used in the concrete mix do not use this product on that floor without written approval from manufacturer. Reinforcing fibers that are visible after shot blasting must be removed and vacuumed leaving no fibers left on the concrete surfaces. Provide an uncontaminated, sound surface. DO NOT ACID ETCH!
- E. Repair concrete prior to moisture vapor reduction system installation by using MVRS manufacturer's approved concrete repair materials. Comply with all requirements as listed in Manufacturer's technical data information. Consult with vapor reduction manufacturer.
- F. Ensure surfaces to be treated with moisture vapor reduction system have NOT previously been treated with other materials such as underlayments, screeds, penetrating sealants, silicates, etc. If this is the case, consult with the Manufacturer's Representative prior to any application of moisture vapor reduction system.
- G. Any testing for concrete deficiencies or contamination such as alkali silica reaction, untreated silicates, organic residue, etc. is recommended and is the responsibility of the Building owner.
- H. Shot blast a small test area and review surface profile with the finished flooring applicator.
- I. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- J. Do not fill expansion joints, isolation joints, or other moving joints.

3.8 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. The Owner's Special Inspector shall verify proper adhesion of flooring adhesives, coatings, and leveling compounds to the final vapor reduction coating system for acceptability. Contact Manufacturer's Representatives for recommendations.
- B. Comply with requirements and recommendations of floor covering manufacturer.

3.9 APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.
- B. Allow to cure a minimum of 12 hours before installing flooring system.

3.10 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.
- B. Protect each coat during specified cure period from any kind of traffic, topical water and contaminants.

END OF SECTION

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SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Acoustic insulation.
- D. Gypsum sheathing.
- E. Cementitious backing board.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 21 00 - Thermal Insulation: Acoustic insulation.
- C. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

1.3 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- D. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- E. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- G. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- H. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- I. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- J. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).

- K. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- L. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- M. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- N. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2025.
- O. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- P. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- Q. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- R. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.
- S. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2024.
- T. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2024.
- U. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2025.
- V. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2025.
- W. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- X. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2024.
- Y. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019 (Reapproved 2024).
- Z. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- AA. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- BB. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- CC. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024c.
- DD. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- EE. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.
- FF. GA-224 - Installation of Predecorated Gypsum Board; Gypsum Association; 2008.
- GG. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2025.
- HH. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.
- II. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least ten years of documented experience.

1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies (Tested rating determined in accordance with ASTM119) with rating as indicated on drawings.
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. Marino: www.marinoware.com/#sle.
 - 3. MBA Studs: www.mbastuds.com
- C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: C-shaped with knurled or embossed faces.
 - 2. Minimum Base Metal Thickness: 18 mils; 0.018 inch, or as required to meet design or code requirements.
 - 3. Runners: U shaped, sized to match studs.

4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
- D. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
 1. Complete system incorporating products must be provided by the same manufacturer. Subject to performance criteria specified and as indicated on drawings:
 - a. Steel components: Minimum Base Metal Thickness: 33 mils; 0.033 inch
 - b. Steel C-H Studs, 212 CH20 or 400 CH20, hot dipped galvanized, lengths as required.
 - c. Steel E-Studs, 212 ES20 or 400 ES20, hot dipped galvanized, lengths as required.
 - d. Steel J-Runners, 212 JR20 or 400 JR20, hot dipped galvanized for use with shaft wall studs.
 - e. 1" and 5/8" Type X Gypsum Board.
 - f. Sound Attenuation Fire Blanket Insulation: Minimum 1 ½ inch for use with 2 ½ inch studs and minimum 3 inch for use with 4 inch studs.
 2. Products:
 - a. Same manufacturer as other framing materials.
- E. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
 4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
 - a. Products:
 - 1) ClarkDietrich; MaxTrak Slotted Deflection Track: www.clarkdietrich.com/#sle.
 - 2) Marino; Slotted Track: www.marinoware.com/#sle.
 - 3) MBA Building Supplies; Slotted Slip Track: www.mbastuds.com/#sle.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.

2.3 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 1. CertainTeed Corporation: www.certainteed.com/#sle.
 2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 3. National Gypsum Company: www.nationalgypsum.com/#sle.
 4. USG Corporation: www.usg.com/#sle.
- B. Gypsum Wallboard - General
 1. All gypsum wallboard incorporated into the Work, whether indicated or not, shall comply with all of the following:
 - a. Thickness: 5/8 inch.
 - b. Core: Type X, UL or WH listed.
 - 1) Exception: Where Fire Resistance Rating requires Type C.
 - c. Core and Face: Moisture and mold resistant, with a mold resistance score of 10, when tested in accordance with ASTM D3273.
- C. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at all locations.
 4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

GYPSUM BOARD ASSEMBLIES

5. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
 6. Mold-Resistant, Paper-Faced Products:
 - a. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.
 - d. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
 7. Glass Mat Faced Products:
 - a. Georgia-Pacific Gypsum; DensArmor Plus: www.gpgypsum.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Interior Extreme Fire-Shield Gypsum Panel: www.goldbondbuilding.com/#sle.
 - c. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough Regular 1/2 in. (12.7 mm): www.usg.com/#sle.
- D. Abuse Resistant Wallboard:
1. Application: High-traffic areas indicated.
 2. Surface Abrasion: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 6. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
 7. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
 8. Type: Fire-resistance-rated Type X, UL or WH listed.
 9. Thickness: 5/8 inch.
 10. Edges: Tapered.
 11. Paper-Faced Products:
 - a. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold Guard Abuse-Resistant: www.gpgypsum.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Hi-Abuse Gypsum Board: www.goldbondbuilding.com/#sle.
 - c. USG Corporation; Sheetrock Brand Mold Tough AR Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
 12. Glass Mat Faced Products:
 - a. Georgia-Pacific Gypsum; DensArmor Plus Abuse-Resistant: www.gpgypsum.com.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Interior Extreme AR Gypsum Panel: www.goldbondbuilding.com/#sle.
 - c. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough AR Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
- E. Impact Resistant Wallboard:
1. Application: As indicated on drawings.
 2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 7. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
 8. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
 9. Type: Fire-resistance-rated Type X, UL or WH listed.
 10. Thickness: 5/8 inch.
 11. Edges: Tapered.
 12. Paper-Faced Products:

- a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Hi-Impact Gypsum Board: www.goldbondbuilding.com/#sle.
 - b. USG Corporation; Sheetrock Brand Mold Tough VHI Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.
 13. Glass Mat Faced Products: Noncombustible, moisture-resistant gypsum core encased in a fiberglass face and back that shed water. Not intended for exterior applications or constant exposure to water. Protect from immersion in water and the eroding effects of cascading water. Product is not suitable for use as a substrate for tile in wet areas such as tubs, showers, gang shower and other areas subject to direct water exposure. Refer to Gypsum Association's GA-216 reference guide, or ASTM C840 reference standard for additional installation requirements.
 - a. Georgia-Pacific Gypsum; DensArmor Plus Impact-Resistant: www.gpgypsum.com.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Interior Extreme IR Gypsum Panel: www.goldbondbuilding.com/#sle.
 - c. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough VHI Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
- F. Backing Board For Wet Areas: One of the following products:
 1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 5/8 inch.
 - b. Products:
 - 1) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
 4. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
 - b. Products:
 - 1) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com/#sle.
- G. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
 1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Products:
 - a. CertainTeed Corporation; GlasRoc Shaftliner Type X: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant): www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Shaftliner: www.goldbondbuilding.com/#sle.
 - d. USG Corporation; Sheetrock Brand Glass-Mat Liner Panels Mold Tough 1 in. (25.4 mm): www.usg.com/#sle.

2.4 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
 1. Flame Spread Index: 25 or less, and Smoke Developed Index: 450 or less when tested in accordance with ASTM E84.
 2. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 3. Formaldehyde Content: Zero.
 4. Facing: Unfaced.
 5. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - d. Knauf Insulation: www.knaufinsulation.com.

GYPSUM BOARD ASSEMBLIES

6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
 1. Finish: Match glazing assembly framing finish.
- C. Mullion Extension: Extruded aluminum transition assembly with expandable foam infill to fill void between glass wall mullion and remote partition.
- D. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rolled zinc, unless noted otherwise.
 1. Types: As detailed or required for finished appearance.
 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
 3. Products:
 - a. Same manufacturer as framing materials.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 3. Joint Compound: Drying type, vinyl-based, ready-mixed.
 4. Joint Compound: Setting type, field-mixed.
- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
 1. Products:
 - a. CertainTeed Corporation; Level V Wall and Ceiling Primer/Surfer with M2Tech: www.certainteed.com/#sle.
 - b. USG Corporation; USG Sheetrock Brand Tuff-Hide Primer-Surfer: www.usg.com/#sle.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- I. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that project conditions are ready to receive work and opening dimensions are as indicated on shop drawings to commence.

3.2 EXISTING WORK

- A. Extend existing gypsum board installations using materials and methods as specified.
- B. Repair and remodel existing gypsum board assemblies which remain or are to be altered.

3.3 SHAFT WALL INSTALLATION

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
 - 1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
 - 2. Install studs at spacing required to meet performance requirements.
- B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.

3.4 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
- B. Studs: Space studs at 16 inches on center.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging. Provide extended leg ceiling runners with compressible fire rated fill.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
- E. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
- F. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.
- G. Blocking: Install wood blocking for support of:
 - 1. Wall-mounted cabinets.
 - 2. Plumbing fixtures.
 - 3. Toilet partitions.
 - 4. Toilet accessories.
 - 5. Wall-mounted door hardware.
 - 6. Wood frame opening.
 - 7. Or any other materials requiring blocking. Coordinate blocking requirements with other contractors.

3.5 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place two beads continuously on substrate before installation of perimeter framing members.
 - 2. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, rough-in boxes, and other equipment. Do Not seal penetrations scheduled to receive firestopping.

3.6 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
 - 1. Use screws when fastening gypsum board to metal furring or framing.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

- C. Double-Layer Non-Rated:
 - 1. Use gypsum backing board for first layer, placed perpendicular to framing or furring members, with ends and edges occurring over firm bearing. [Use fire rated gypsum backing board for fire rated partitions and ceilings.]
 - 2. Place second layer parallel to framing or furring members.
 - 3. Offset joints of second layer from joints of first layer.
 - 4. Treat cut edges and holes in moisture resistant gypsum board with sealant.
- D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
 - 1. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- F. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.
- G. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
- H. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- I. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.7 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces, complying with ASTM C840, GA-216, manufacturer's instructions, and as indicated.
 - 1. Not more than 30 feet apart for exposed interior linear construction.
 - 2. Not more than 25 feet where ceramic wall tile is installed on an interior wall.
 - 3. Not more than 12 feet where ceramic wall tile is installed on an exterior wall, in direct sunlight or wet conditions.
 - 4. Where control joints are required at or near door, window, or other openings, place control joint above jamb or corner of opening, not to exceed the maximum distance between control joints.
 - 5. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.8 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive satin, semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 3: Walls to receive textured wall finish.
 - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

6. Level 0: Surfaces indicated to be finished in later stage of project.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.9 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Stone thresholds.
- D. Ceramic trim.
- E. Non-ceramic trim.
- F. Accessory materials.

1.2 RELATED REQUIREMENTS

- A. Section 03 54 00 - Cast Underlayment: Hydraulic and cementitious underlayments where required by TCNA (HB) or TCNA (HB-GP) method specified.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.3 REFERENCE STANDARDS

- 1. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- B. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.
 - 1. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.
 - 2. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.
 - 3. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.
- C. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- D. ANSI A137.3/A108.19/A108.20 - American National Standard Specifications for Gauged Porcelain Tile and Gauged Porcelain Tile Panels/Slabs; 2021.
- E. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.
- F. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- G. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.
- H. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and ceramic accessories.
- D. Samples: Submit two sets of samples of the following for color selection or verification of color and finish variations:
 - 1. Tile products.
 - 2. Threshold, trims, and accessories.
 - 3. Grouts.
 - 4. Sealants.
- E. Certificate: Certify products of this section meet or exceed specified requirements.
- F. Installer's qualification statement.
 - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation; www.tile-assn.com/#sle
 - 2. Submit documentation of completion of apprenticeship and certification programs.
- G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 5 percent of each size, color, and surface finish combination, but not less than 2 of each type.

1.6 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements for closeout procedures.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten years of documented experience.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
 - a. Accredited Five-Star member of NTCA or Trowel of Excellence member of TCAA.
 - 2. Installer Certification:
 - a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
 - b. Apprenticeship Program: Installer has achieved Journeyworker status through an apprenticeship from the International Union of Bricklayers and Allied Craftworkers (IUBAC) or a U.S. Department of Labor (DOL)-recognized program.
 - c. Advanced Certifications for Tile Installers (ACT): Certification in installation of membranes, mortar bed (mud) floors, mortar (mud) walls, shower receptors, large format tile, gauged porcelain tile/panels/slabs, and grouts.

- d. International Masonry Training and Education Foundation (IMTEF): Supervisor Certification Program (SCP).
- C. Documents on Site: Maintain one copy of ANSI A108/A118/A136, TCNA (HB), ANSI A137.3/A108.19/A108.20, and TCNA (HB-GP) on site.
- D. Warranty: Installer of work contained in this Section to warrant installation for minimum of 1 year from date of completion for defects in workmanship.

1.8 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Construct tile mock-up where directed by Architect, incorporating all components specified for the location.
 - 1. Minimum size of mock-up shall be determined by Architect.
 - 2. Locate where directed by Architect.
 - 3. Mock-up may remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. See Section 01 60 00 - Product Requirements requirements for product storage and handling requirements.
- C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Provide lighting level of 80 fc measured mid-height at substrate surface.
- C. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tile:
 - 1. American Olean Corporation: www.americanolean.com/#sle.
 - 2. Crossville, Inc.: www.crossvilleinc.com
 - 3. Dal-Tile Corporation: www.daltile.com/#sle.
- B. Setting Materials:
 - 1. Bostik Inc: www.bostik.com/#sle.
 - 2. Custom Building Products: www.custombuildingproducts.com/#sle.
 - 3. LATICRETE International, Inc: www.laticrete.com/#sle.
 - 4. Mapei Corporation: www.mapei.com/#sle.
- C. Grout:
 - 1. Bostik Inc: www.bostik.com/#sle.
 - 2. Custom Building Products: www.custombuildingproducts.com/#sle.
 - 3. LATICRETE International, Inc: www.laticrete.com/#sle.
 - 4. Mapei Corporation: www.mapei.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

- A. Floor Tile: Provide tile for flooring applications with minimum wet Dynamic Coefficient of Friction (DCOF) of 0.42 when tested in accordance with ANSI A326.3.

2.3 TILE

- A. Porcelain Wall Tile, Type WT-1,2,3,4,5,6: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Sizes:
 - a. WT-1: 12 by 24 inch, nominal.
 - b. WT-2 & 5: 4 by 12 inch, nominal.
 - c. WT-3 & 6: 4 by 24 inch, nominal.
 - d. WT-4: 12 by 12 inch, nominal.
 3. Thickness: 0.37 inch.
 4. Edges: Square.
 5. Finishes: Unpolished with Cross-Sheen.
 6. Color(s): As indicated on drawings.
 7. Trim Units, Type WT-3 & 6: Matching bullnose shapes in sizes indicated.
 8. Products:
 - a. Basis of Design: Crossville Inc.; Color Blox 2.0: www.crossville.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Porcelain Tile, Type WT-7 & 8: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 8 by 8 inch, nominal.
 3. Thickness: 5/16 inch.
 4. Edges: Cushioned.
 5. Surface Finish: Satin.
 6. Color(s): As indicated on drawings.
 7. Products:
 - a. Basis of Design: Dal-Tile Corporation; Natural Hues: www.daltile.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Porcelain Wall Tile, Type WT-9,10,11: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 20 percent as tested in accordance with ASTM C373.
 2. Sizes:
 - a. WT-9 & 11: 6 by 36 inch, nominal.
 - b. WT-10: 6 by 18 inch, nominal.
 3. Thickness: 0.41 inch.
 4. Edges: Square.
 5. Surface Finish: UPS.
 6. Color(s): As indicated on drawings.
 7. Trim Units, Type WT-10: Matching bullnose shapes in sizes indicated.
 8. Products:
 - a. Basis of Design: Crossville Inc.; Nest Series: www.crossvilleinc.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Porcelain Tile, Type FT-1,2: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 24 by 24 inch, nominal.
 3. Thickness: 0.41 inch.
 4. Edges: Square.
 5. Surface Finish: Natural Plus.
 6. Color(s): As indicated on drawings.
 7. Products:
 - a. Basis of Design: Stonepeak Ceramics; Venice Villa: www.stonepeakceramics.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 TRIM AND ACCESSORIES

- A. Ceramic Trim, Type WT-3,6,10: Matching bullnose shapes in sizes indicated.
 - 1. Sizes:
 - a. WT-3 & 6: 4 by 12 inches, nominal.
 - b. WT-10: 6 by 18 inches, nominal.
 - 2. Applications:
 - a. Open Edges: Bullnose.
 - b. Inside Corners: Jointed.
 - 3. Manufacturers: Same as for tile.
- B. Non-Ceramic Trim, Type TS-1: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Thickness: As required by installation and to comply with ADA Regulations.
 - 2. Applications:
 - a. Open edges of wall tile.
 - b. Outside wall corners.
 - 3. Products:
 - a. LATICRETE International, Inc; Profiles and Trims: www.laticrete.com/#sle.
 - b. Profilitec; Profiles: www.us.profilitec.com.
 - c. Basis of Design: Schluter-Systems; Rondec: www.schluter.com/#sle.
- C. Thresholds, Type TS-4: 4 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
 - 1. Thickness: 1/2 inch.
 - 2. Material: Marble, honed finish.
 - 3. Color and Pattern: As indicated on drawings.
 - 4. Applications:
 - a. Toilet room thresholds.
 - 5. Products:
 - a. Basis of Design: Daltile; Thresholds: www.daltile.com.
 - b. Substitutions: See Section 01 60 00-Product Requirements.
- D. Non-Ceramic Trim, Type CG-1: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Thickness: As required by installation and to comply with ADA Regulations.
 - 2. Applications:
 - a. Outside corners of new wall tile meeting existing wall tile.
 - 3. Products:
 - a. Basis of Design: Inpro; Surface Mount Stainless Steel Corner Guard: www.inprocorp.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E.

2.5 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 - 1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
 - 2. Products:
 - a. LATICRETE International, Inc; 253 Gold: www.laticrete.com/#sle.
 - b. LATICRETE International, Inc; Tri-lite: www.laticrete.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 GROUTS

- A. Provide setting and grout materials from same manufacturer.

- B. High Performance Polymer Modified Grout, Type G-1 & 2: ANSI A118.7 polymer modified cement grout.
 - 1. Applications: Use where indicated on drawings.
 - 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 - 3. Colors: As scheduled. Refer to Finish Key.
 - 4. Products:
 - a. Basis of Design: LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Premixed Polymer Modified Grout, Type G-3: Single component, stain resistant grout.
 - 1. Applications: Use where indicated on drawings.
 - 2. Use for joints 1/16 inch to 1/4 inch wide.
 - 3. Color: As indicated on drawings.
 - 4. Products:
 - a. Basis of Design: LATICRETE International, Inc; SPECTRALOCK 1 Pre-Mixed Grout: www.laticrete.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.7 MAINTENANCE MATERIALS

- A. Tile Sealant, Type TS-2: Gunnable, silicone, siliconized acrylic, modified silane polymer, or urethane sealant; moisture- and mildew-resistant type.
 - 1. Applications:
 - a. Between tile and plumbing fixtures.
 - b. Wall tile to floor joints.
 - 2. Color(s): As indicated on drawings Refer to Finish Key.
 - 3. Products:
 - a. Basis of Design: LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.8 ACCESSORY MATERIALS

- A. Waterproofing and Slab Crack Isolation Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 - 1. Crack Resistance: No failure at 1/8 inch gap, minimum; comply with ANSI A118.12.
 - 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber.
 - b. Thickness: 25 mils, minimum, dry film thickness.
 - c. Products:
 - 1) Basis of Design: LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Backer Board: Cementitious type; See Section 09 21 16 - Gypsum Board Assemblies.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.

- C. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- D. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- E. Verify that sub-floor surfaces, in areas with floor drains, are pitched uniformly to drains at 1/4 inch per foot nominal if not indicated on the drawings.
 - 1. Exception: Where tile is installed in areas of previously removed floor covering, and the sub-floor does not meet the stated pitch, build up thinset during installation to provide a positive pitch to drains of 1/8" per foot, minimum in all directions.
- F. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 09 05 61.
 - 2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.2 PREPARATION

- A. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler.
- C. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to feather edge.
- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
- E. Scarify existing glazed structural block prior to installation of wall tile.
- F. Place thresholds and edge strips at exposed tile edges.
- G. Mix or shuffle all tile for intended installation area, including maintenance materials, from all packages in random fashion to avoid aesthetic issues. Repackage maintenance materials prior to turning over to Owner.

3.3 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108/A118/A136, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2" width is used.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
 - 1. Tile joint width shall be as recommended by manufacturer for the individual tile type indicated, however, tile joint shall be no less than 1/8 inch, unless otherwise noted.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where indicated on drawings.
- H. Sound tile after setting. Replace hollow sounding units.

- I. Control and Expansion Joints:
 - 1. Keep control and expansion joints free of mortar, grout, and adhesive.
 - 2. Provide interior control joints in tiled surfaces at 20'-25' in each direction.
 - 3. Provide exterior control joints in tiled surfaces at 8'-12' in each direction.
 - 4. Provide interior control joints in tiled surfaces exposed to direct sunlight or moisture at 8' to 12' in each direction.
 - 5. Provide movement joints where tile work abuts restraining surfaces, including perimeter walls, dissimilar floors, curbs, columns, pipes, door and window frames and where changes occur in backing materials.
 - 6. Joints through tilework directly over structural joints must never be narrower than the structural joint.
 - 7. Apply sealant to joints.
- J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- K. Grout tile joints unless otherwise indicated on drawings.
- L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
- M. When installation requires varying tile thickness due to patterning, build up thinset so that the entire installation is flush.
- N. Seal all sanded and unsanded grout, with the exception of epoxy grout, per grout manufacturer's installation instructions.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, on ground, with standard grout, unless otherwise indicated on drawings.
 - 1. Where waterproofing membrane is indicated on drawings, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout, on ground.
 - 2. Where epoxy bond coat and grout are indicated on drawings, install in accordance with TCNA (HB) Method F131.

3.5 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244C, using membrane at toilet rooms and kitchens.
- B. Over gypsum wallboard on wood or metal studs, install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat.
 - 1. Where mortar bed is indicated on drawings, install in accordance with TCNA (HB) Method W222, one-coat method, with waterproofing membrane.
- C. Over interior concrete and masonry, install in accordance with TCNA (HB) Method W202I, thin-set with dry-set or latex-Portland cement bond coat.

3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final Cleaning.
- B. Clean tile and grout surfaces per manufacturer's recommendations.

3.7 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit traffic over finished floor surface for 4 days after installation.

- C. Protect installed tile from damage due to subsequent construction until Date of Substantial Completion.

3.8 SCHEDULES

- A. Refer to Finish Key and Schedules.

END OF SECTION

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SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.
- D. CHPS (HPPD) - High Performance Products Database; Current Edition.
- E. Cisca (AC) - Acoustical Ceilings: Use and Practice; 1999.
- F. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling. Notify Architect in writing of any conflicts or dimensional changes.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 6 x 6 inch size illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Manufacturer's qualification statement.

- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.
 - 3. Extra Exposed Grid: Quantity equal to 2 percent of total installed.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing the work specified in this section with minimum five years documented experience.
- C. Conform to CISCA (AC) requirements.
- D. Single Source Responsibility: To obtain combined warranty for the suspension system and the acoustical panel, color match or ceiling panel and suspension system compatibility, all acoustical panel and suspension system components shall be produced and supplied by one manufacturer. Materials supplied by more than one manufacturer are not acceptable.
- E. Source quality control:
 - 1. Test reports: Manufacturer will provide test certification for minimum requirements as tested in accordance with applicable industry standards and/or to meet performance standards specified by various agencies.
 - 2. Changes from system: System performance following any substitution of materials or change in assembly design shall be certified by the manufacturer.
 - 3. All ceiling panel cartons must contain UL label for acoustical compliance.
 - 4. All suspension system cartons must contain UL label for load compliance per ASTM C635.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements.
- B. Storage:
 - 1. Panels: Storage time of materials at the job site should be as short as possible and environmental conditions should be as near as possible to those specified for occupancy.
 - 2. Suspension System: Store in manner that will prevent warping, scratches and damage of any kind.
- C. Handling: Handle in such manner to ensure against racking, distortion, or physical damage of any kind.
- D. Damaged or deteriorated materials shall be removed from the premises.

1.8 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.9 WARRANTY

- A. Provide written warranty executed by the manufacturer, agreeing to repair or replace acoustical ceiling products that fail within the warranty period. Failures include, but are not limited to:
 - 1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
 - 2. Grid System: Rusting and manufacturer's defects.
 - 3. Warranty Period:
 - a. Acoustical panels: Ten years from date of substantial completion.

- b. Grid: Ten years from date of substantial completion.
- c. Combined single source panel and grid: Thirty years from date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. USG Corporation: www.usg.com/#sle.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. VOC Content: As specified in Section 01 61 16.
 - 2. VOC Content: Certified as Low Emission by one of the following:
 - a. Product listing in UL (GGG).
 - b. Product listing in CHPS (HPPD).
 - 3. Inherently resistant to humidity, sag, mold, and mildew.
- B. Acoustical Panels, Type ACT-1: Mineral fiber with membrane-faced overlay, with the following characteristics:
 - 1. Application: General.
 - 2. Classification: ASTM E1264 Type A.
 - a. Form: A2.2, wet formed.
 - b. Pattern: G - smooth.
 - 3. Size: 24 by 24 inches.
 - 4. Thickness: 5/8 inch.
 - 5. Light Reflectance: 80 percent, in accordance with ASTM E1264.
 - 6. Noise Reduction Coefficient (NRC) Range: 0.65 to 0.70, in accordance with ASTM E1264.
 - 7. Ceiling Attenuation Class (CAC): 35, in accordance with ASTM E1264.
 - 8. Panel Edge: Square.
 - 9. Color: White.
 - 10. Suspension System: Exposed grid.
 - 11. Products:
 - a. Basis of Design: Armstrong World Industries, Inc; Canyon: www.armstrongceilings.com/#sle.
- C. Acoustical Panels, Type ACT-2 & 3: Mineral fiber with membrane-faced overlay, with the following characteristics:
 - 1. Application: Toilet rooms and wet areas.
 - 2. Classification: ASTM E1264 Type A.
 - a. Form: A2.2.
 - b. Pattern: "E" - lightly textured.
 - 3. Sizes:
 - a. ACT-2: 24 by 48 inches.
 - b. ACT-3: 24 by 24 inches.
 - 4. Thickness: 7/8 inch.
 - 5. Light Reflectance: 85 - 90 percent, determined in accordance with ASTM E1264.
 - 6. NRC Range: .80 to .85, determined in accordance with ASTM E1264.
 - 7. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 - 8. Panel Edge: Square.

9. Color: White.
 10. Suspension System: Exposed grid.
 11. Products:
 - a. Basis of Design: Armstrong World Industries, Inc; Ultima Health Zone High NRC: www.armstrongceilings.com/#sle.
 - b. USG Corporation; Mars Healthcare High-NRC Acoustical Panels: www.usg.com/ceilings/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Acoustical Panels, Type ACT-4: Cementitious wood fiber with the following characteristics:
1. Applications: Elementary Gymnasium.
 2. Size: 24 by 48 inches.
 3. Thickness: 1 inch.
 4. Light Reflectance: 75 percent, determined in accordance with ASTM E1264.
 5. NRC Range: .80 to .90, determined in accordance with ASTM E1264.
 6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 7. Panel Edge: Square.
 8. Suspension System: Exposed grid.
 9. Products:
 - a. Basis of Design: Armstrong World Industries, Inc; Tectum: www.armstrongceilings.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Acoustical Panels, Type ACT-5: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Application: Served.
 2. Size: 24 by 24 inches.
 3. Light Reflectance: 89 percent, determined in accordance with ASTM E1264.
 4. Ceiling Attenuation Class (CAC): 33, determined in accordance with ASTM E1264.
 5. Panel Edge: Square.
 6. Color: White.
 7. Products:
 - a. Basis of Design: Armstrong World Industries, Inc; Kitchen Zone: www.armstrongceilings.com/#sle.
 - b. USG Corporation; Kitchen Lay-in Panels: www.usg.com/ceilings/#sle.
- F. Acoustical Panels, Type ACT-6: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Application: Music Rooms.
 2. Light Reflectance: 85-90 percent, determined in accordance with ASTM E1264.
 3. NRC Range: .80 to .85, determined in accordance with ASTM E1264.
 4. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 5. Color: White.
 6. Products:
 - a. Basis of Design: Armstrong World Industries, Inc; Ultima High NRC: www.armstrongceilings.com/#sle.
 - b. USG Corporation; Mars High-NRC Acoustical Panels: www.usg.com/ceilings/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 SUSPENSION SYSTEMS

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.
1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dip galvanized steel grid and cap.
1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.

2. Profile: Tee; 15/16 inch face width.
3. Finish: Baked enamel.
4. Color: White.
5. Products:
 - a. Basis of Design: Armstrong World Industries, Inc.; Prelude XL 15/16": www.armstrongceilings.com.
 - b. USG Corporation; Donn Brand DX/DXL 15/16 inch Acoustical Suspension System: www.usg.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
 1. Provide in Elementary Gymnasium with ACT-4.
- D. Perimeter Moldings: Same metal and finish as grid.
 1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- E. Metal Edge Trim for Suspension Systems, Type AXT-1: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
 1. Trim Height: 8 inches.
 2. Finish: Baked enamel.
 3. Color: White.
 4. Products:
 - a. Basis of Design: Armstrong World Industries, Inc; Axiom: www.armstrongceilings.com/#sle.
 - b. USG Corporation; Compasso Suspension Trim: www.usg.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.
- C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.3 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636/C 636M and manufacturer's instructions, and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

- C. Locate system on room axis according to reflected plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Miter corners.
- E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Where installing sheet metal trim between two overlapping ceiling planes, provide a StrongBack Support (SB-12) as an attachment point for the lower ceiling plane. Span entire length of connection.

3.4 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. For some pattern edge details, if perimeter panels must be cut smaller, the cut edge must be field-rabbeted, or the wall angle must be lowered by reveal depth.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- G. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.
- H. Install hold-down clips on panels within 20 ft of an exterior door and throughout Elementary Gymnasium.

3.5 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.
- C. Replace damaged or abraded components.

3.7 SCHEDULE

- A. Refer to drawings for Finish Key and Schedule

END OF SECTION

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SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient tile/plank flooring.
- B. Resilient base.
- C. Installation accessories.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.
- B. Section 03 54 00 - Cast Underlayment: Cementitious underlayment for floor flatness and installation of resilient flooring specified in this section.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- D. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

- A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; 1998 (Reapproved 2023).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.
- E. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s); 2025.
- F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.
- G. UL 2824 - GREENGUARD Certification Program Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Field verify actual measurements before fabrication; indicate recorded measurements on shop drawings. Indicate floor patterns, colors and seaming plan.
- D. Verification Samples: Submit two samples, 12" x 12" illustrating color and pattern for each resilient flooring product specified.
- E. Installer's Qualification Statement.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience and approved by flooring manufacturer.

1.7 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements for general requirements for mock-up.
- B. Construct tile mock-up of each product type, incorporating all components specified for the location including transitions and trims.
 - 1. Minimum size of mock-up is 6 x 6 foot.
 - 2. Approved mock-up may remain as part of the Work upon Architect approval.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 60 00 - Product Requirements for additional storage and handling requirements.
- B. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- C. Store all materials off of the floor in an acclimatized, weather-tight space.
- D. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.9 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.10 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements for closeout procedures.
- B. Furnish 10 percent of installed vinyl tile flooring and base and 5 percent of installed quartz tile each type and color specified. Deliver all required overage and maintenance stock to Owner's specified location prior to start of installation.
- C. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials and suggested schedule for cleaning, stripping and re-waxing.

PART 2 PRODUCTS

2.1 TILE FLOORING

- A. Luxury Vinyl Tile - Type LVT-1,2,3: Class III Printed Vinyl Plank.
 - 1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 - 3. Mold and Microbial Resistance: Highly resistant when tested in accordance with ASTM D6329; certified in accordance with UL 2824.
 - 4. Size: 9 by 36 inch.
 - 5. Wear Layer Thickness: 0.03 inch.
 - 6. Total Thickness: 0.118 inch.
 - 7. Color(s): Refer to Finish Key.
 - 8. Products:
 - a. Basis of Design: Shaw Contract; Unveil: www.shawcontract.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Homogeneous Quartz Vinyl Tile, Type QTZ-1:
 - 1. Critical Radiant Flux (CRF): Minimum 0.96 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 - 2. Mold and Microbial Resistance: Highly resistant when tested in accordance with ASTM D6329; certified in accordance with UL 2824.
 - 3. Size: 24 by 24 inch.
 - 4. Total Thickness: 0.085 inch.
 - 5. Color(s): Refer to Finish Key.
 - 6. Products:
 - a. Basis of Design: Kahrs; Quartz Mosaic: www.kahrs.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 RESILIENT BASE

- A. Resilient Base - Type RB-1,2,3,4: ASTM F1861, Type TV, vinyl, thermoplastic; style as scheduled.
 - 1. Manufacturers:
 - a. Flexco Corporation; Base Sculptures: www.flexcofloors.com/#sle.
 - b. Roppe Corporation: www.roppe.com/#sle.
 - c. Basis of Design: Tarkett Flooring; Standard Cove Base: www.tarkett.com/#sle.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 - 3. Height: 4 inch.
 - 4. Thickness: 0.125 inch.
 - 5. Finish: Matte.
 - 6. Length: Roll.
 - 7. Color(s): Refer to Finish Key and Schedule.
 - 8. Accessories: Premolded external corners and end stops.

2.3 ACCESSORIES

- A. Subfloor Filler: Polymer modified cementitious; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
- C. Transition and Edge Strips: Metal, Type TS-3,5.
 - 1. Thickness: As required by installation and to comply with ADA Regulations.
 - 2. Color(s): As indicated on drawings.
 - 3. Applications:

- a. TS-3: Resilient flooring to existing flooring.
 - b. TS-5: Resilient flooring to carpet.
- 4. Products:
 - a. Basis of Design: Schluter-Systems; Vinpro-U, Vinpro-S: www.schluter.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Sealer and Wax: Types recommended by flooring manufacturer.
- E. Cementitious Underlayment: Blended cement mix, mixed with water in accordance with manufacturer's directions to produce self-leveling underlayment as specified in 03 54 00.
 - 1. Provide cast underlayment at the following:
 - a. Under any resilient installation in which floor flatness and smoothness is not within manufacturer's tolerances.

PART 3 EXECUTION

3.1 EXAMINATION

- A. See Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- C. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 09 05 61.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
 - 3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- C. Fill excessive low areas with self leveling flowable fill. Reduce ridges or bumps by grinding.
- D. Prohibit traffic until filler is fully cured.
- E. Clean substrate to remove adhesives, coatings or contaminants that will inhibit adhesion of the new floor system. Use chemical treatment or bead blast as dictated by the existing conditions and as recommended by the flooring manufacturer .
- F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.

- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. Install flooring in recessed floor access covers, maintaining floor pattern.
- H. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.4 INSTALLATION - UNDERLAYMENT

- A. Install in accordance with underlayment manufacturer's instructions.

3.5 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Install tile as specified, set, aligned, and patterned as indicated on drawings.

3.6 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.
- E. Reveal Base: Miter all corners.

3.7 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final Cleaning.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Clean, seal and maintain in accordance with manufacturer's instructions.

3.8 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Prohibit traffic on resilient flooring for 48 hours after installation.
- C. Upon completion of installation, protect resilient flooring in traffic areas with heavy duty kraft paper.

3.9 SCHEDULE

- A. Refer to Finish Keys and Schedules.

END OF SECTION

SECTION 09 66 23
RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Epoxy matrix terrazzo with ground and polished finish.
- B. Divider strips.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete subfloor with steel trowel finish.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between terrazzo work and adjacent construction and fixtures.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

- A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- B. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position; 2018.
- C. NTMA (EPOXY) - Epoxy Terrazzo Specifications; Current Edition.
- D. NTMA (GRAD) - Aggregate Gradation Standards; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
- C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components.
- D. Samples: Submit two samples, 12 inch by 12 inch in size illustrating each color, chip size and variation, chip gradation, matrix color, and typical divider strip.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com unless more stringent requirements are specified.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
 - 1. Minimum ten years of documented experience.
 - 2. Associate member firm of the National Terrazzo and Mosaic Association, Inc.

- C. Surface Burning Characteristics: When tested in accordance with ASTM D635, the Epoxy terrazzo shall comply with the following value: Self-Extinguishing, extent of burning 0.25 inches maximum. ASTM D648, Critical radiant flux, 1.0.
- D. Installer Qualifications: Company specializing in performing the type of work specified in this section.
 - 1. Minimum ten years of documented experience.
 - 2. Approved by matrix manufacturer.
 - 3. Contractor member of the National Terrazzo and Mosaic Association, Inc.
- E. Single Source Responsibility: To obtain combined warranty for the installed flooring system from manufacturer; obtain primary epoxy terrazzo flooring system materials including membranes, primers, moisture vapor primers, resins and hardening agents from a single manufacturer with proof of NTMA membership. Obtain aggregates, divider strips, sealers and cleaners from source recommended by primary materials manufacturer.
- F. Warranty: Installer to warrant installation for two years upon completion of work in this Section for defects in workmanship.

1.6 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements: Requirements for mock-up.
- B. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 10 by 10 feet.
- C. Locate where directed by Architect..
- D. Mock-up may remain as part of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Store terrazzo materials in a dry, secure area.
- C. Maintain optimal storage temperature of between 50 and 80 degrees F.
- D. Keep products away from fire or open flame.

1.8 PRE-INSTALLATION MEETINGS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meetings.
- B. Convene minimum one week prior to commencing work of this section.

1.9 FIELD CONDITIONS

- A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.
- B. Maintain ambient and substrate temperature within specified range 72 hours before, during, and 72 hours after installation of flooring.
- C. Prior to and during installation, the terrazzo contractor shall verify that the dew point is at least 5 degrees Fahrenheit less than the slab and air temperature.
- D. Provide ambient lighting level of 50 ft candles, measured at floor surface.

1.10 COORDINATION

- A. See Section 01 30 00 - Administrative Requirements: Requirements for coordination.

- B. Coordinate placement of terrazzo divider strips with location of mechanical and electrical access covers, floor mat frames, and other items built in to terrazzo.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design - Resinous Matrix Terrazzo Flooring: Terrazzo & Marble Supply Companies; Terroxy Resin Systems: www.tmsupply.com/#sle.
- B. Other Acceptable Manufacturers - Resinous Matrix Terrazzo Flooring:
 - 1. Key Resin Company; Key Epoxy Terrazzo System: www.keyresin.com/#sle.
 - 2. Sherwin-Williams Company; General Polymers Brand: www.generalpolymers.com/#sle.
 - 3. Or Approved Equal.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 EPOXY MATRIX TERRAZZO APPLICATIONS

- A. Floors, Type TZ-1,2,3:
 - 1. Application: Corridor.
 - 2. Thickness: 3/8 inch, nominal.
 - 3. Color(s): To match existing.
- B. Floors, Type TZ-4,5:
 - 1. Application: Main Lobby.
 - 2. Thickness: 3/8 inch, nominal.
 - 3. Color(s): To be selected by Architect.

2.3 MATERIALS

- A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
 - 1. Mix Proportions: As required to achieve appearance specified, refer to Finish Key on Drawings.
- B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
- C. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.

2.4 ACCESSORIES

- A. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.
- C. Expansion-Joint (isolation) strips: Separate double L-Type, positioned back to back with a minimum 1/8" to 1/4" width between. Fill areas between strips with semi flexible joint filler. Filler to match adjacent terrazzo matrix. Match material, thickness and color of the dividers strips and depth required for topping thickness indicated.
- D. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- E. Patching and Fill Material: 100% epoxy fill and selected aggregates as recommended by epoxy matrix manufacturer.

- F. Primer: 100% solids epoxy primer as manufactured by epoxy matrix manufacturer is required.
- G. Crack Suppression Membrane: Fiberglass scrim embeddeed into 100% solids, flexible epoxy installed at 40 mils thickness.
 - 1. Provide 100% percent coverage of slab to receive epoxy terrazzo.
- H. Base Cap, Base Divider Strip, and Separator Strip: Match divider strips.
- I. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.
 - 1. Products:
 - a. Basis of Design: Terrazzo & Marble Supply Companies; T-Rx: www.tmsupply.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. See Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.
- C. Do not begin terrazzo work until concrete substrate has wet cured 28 days, minimum.
- D. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- E. Cementitious Subfloor Surfaces: Verify that substrates are ready for terrazzo flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 09 05 61.
 - 2. Obtain instructions if test results are not within limits recommended by terrazzo flooring manufacturer.
 - 3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.
- F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Clean substrate of foreign matter.
- B. Prepare concrete subfloor by mechanically abrading surface in accordance with manufacturer's instructions to obtain a CSP within a range of 3 to 5.
- C. Prepare concrete surfaces according to ICRI 310.2R.
- D. Apply epoxy patching and fill material at saw cut control joints and other locations as necessary.
- E. Apply primer in accordance with manufacturer's instructions.
- F. Apply crack isolation membrane system in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Detail strip layout according to NTMA Guidelines.
- B. Install divider and control joint strips in adhesive setting bed without voids below strips or mechanically anchor strips as required to attach strips to substrate.
- C. Install control joint strips straight and flat to locations indicated.

- D. Install divider strips according to pattern approved on shop drawings.
- E. Install base and border divider and control joint strips to match floor pattern.
- F. Place terrazzo mix over substrate to thickness indicated.

3.4 FINISHING

- A. Finish terrazzo to NTMA requirements.
- B. Produce terrazzo finish surface to match approved mock-up, with 70 percent chip exposed.
- C. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust to a 120 grit finish prior to grouting.
- D. Cleanse: Clean the floor with water and rinse. Remove excess rinse water by wet vacuum and repeat process if necessary to remove all water and grinding dust. Allow the floor to completely dry before continuing with grouting.
- E. Apply grout to fill voids exposed from grinding.
- F. Remove grout coat by grinding, using a fine grit abrasive.
- G. Hand grind vertical and curved surfaces similarly.
- H. Final finish using successive grits down to 200 - 250 grit abrasive to achieve desired final appearance.

3.5 TOLERANCES

- A. See Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.
- C. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.6 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements: Final Cleaning.
- B. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.
- C. Immediately after terrazzo has dried, apply a minimum of 2 coats of sealer in accordance with manufacturer's instructions.
- D. Polish surfaces in accordance with manufacturer's instructions.

3.7 SCHEDULE

- A. Refer for Finish Key and Schedules on Drawings for mix design, including but not limited to: aggregate type, size and color for each finish specified.

3.8 PROTECTION

- A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.
- B. See Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.

END OF SECTION

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SECTION 09 67 00
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid-applied flooring and base.

1.2 RELATED REQUIREMENTS

- A. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing, testing, remediation procedures, and remediation procedures.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- C. Samples: Submit two samples, produced by flooring contractor, 12 by 12 inch in size illustrating color and pattern for each floor material for each color specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.
- E. Manufacturer's Qualification Statement.
- F. Applicator's Qualification Statement.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section.
 - 1. Minimum 10 years of documented experience.
 - 2. Approved by manufacturer.
- C. Supervisor Qualifications: Trained by product manufacturer , under direct full time supervision of manufacturer's own foreman.

- D. Single Source Responsibility: To obtain combined warranty for the installed flooring system from manufacturer, obtain flooring system materials from a single manufacturer throughout project.

1.6 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
 - 1. Number of Mock-Ups to be Prepared: One.
 - 2. Use same materials and methods for use in the work.
 - 3. Use approved design samples as basis for mock-ups.
 - 4. Locate where directed.
 - 5. Minimum Size: 120 inches by 120 inches.
- C. Obtain approval of mock-up by Architect before proceeding with work.
- D. Approved mock-up may remain as part of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store resin materials in a dry, secure area.
- B. Maintain optimal storage temperature of between 50 and 80 degrees F.
- C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.8 FIELD CONDITIONS

- A. Maintain optimal storage temperature in storage area of between 60 and 85 degrees F.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain ambient and substrate temperature required by manufacturer 72 hours prior to, during, and 72 hours after installation of materials.
- D. Prior to and during installation, the flooring contractor shall verify that the dew point is at least 5 degrees Fahrenheit less than the slab and air temperature.
- E. Provide ambient lighting level of 50 ft candles, measured at floor surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fluid-Applied Flooring:
 - 1. Key Resin Company: www.keyresin.com/#sle.
 - 2. Sherwin-Williams Company: www.protective.sherwin-williams.com/#sle.
 - 3. Terrazzo & Marble Supply Companies: www.tmsupply.com/#sle.

2.2 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring Type EPX-1: Waterbased epoxy, moisture tolerant, with broadcast aggregate.
 - 1. Application: Toilet rooms.
 - 2. Aggregate: Vinyl flakes.
 - 3. Top Coat: Compatible with basecoat and as recommended by manufacturer.
 - 4. System Thickness: 1/8 inch, nominal, dry film thickness (DFT).
 - 5. Texture: Smooth.

6. Sheen: High gloss.
 7. Accessories: Provide integrated cove base.
 8. Color: As indicated on drawings.
 9. Products:
 - a. Basis of Design: Sherwin Williams; Resuflor Aqua Deco Flake SB: www.sherwinwilliams.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fluid-Applied Flooring Type EPX-2,3,4: Waterbased epoxy, moisture tolerant, with broadcast aggregate.
1. Application: Cafeteria and Serving Kitchen.
 2. Aggregate: Quartz Granules.
 3. Top Coat: Compatible with basecoat and as recommended by manufacturer.
 4. System Thickness: 1/4 inch, nominal, dry film thickness (DFT).
 5. Texture: Slip resistant.
 6. Sheen: Satin.
 7. Accessories: Provide integrated cove base.
 8. Color(s): As indicated on drawings.
 9. Products:
 - a. Basis of Design: Sherwin Williams; Hybri-Flex EQ: www.sherwinwilliams.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 ACCESSORIES

- A. Base Caps, TS-6: Brushed stainless steel with projecting base of 1/8 inch; color as selected.
1. Product: Schiene manufactured by Schluter Systems.
- B. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- C. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 09 05 61.
 2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.
- D. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - ACCESSORIES

- A. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness required by manufacturer.
- C. Finish to smooth level surface.
- D. Cove at vertical surfaces.

3.5 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Carpet tile, fully adhered, and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- D. Section 09 65 00 -Resilient Flooring: Base finish and termination edging of adjacent floor finish.

1.3 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.
- C. CRI 104 - Standard for Installation of Commercial Carpet; 2018.
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints and direction of carpet pile.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Installer's Qualification Statement.
- G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum five years documented experience.

- B. Installer Qualifications: Company specializing in installing carpet with minimum 5 years experience.

1.6 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: submit maintenance procedures, recommended maintenance materials and suggested schedule for cleaning.

1.7 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum two week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver carpeting materials in original mill protective wrapping with mill register numbers and tags attached. Maintain wrappers and protective covers in place until carpet is ready for installation.
- B. Deliver all required overages and maintenance stock to Owner's specified location prior to beginning installation.
- C. Store materials inside, protected from weather, moisture and soiling.

1.9 EXTRA MATERIALS

- A. See Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Supply 5 percent of carpet of each type, color, and pattern specified.

1.10 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 48 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Interface, Inc: www.interface.com/#sle.
 - 2. Mannington Commercial: www.manningtoncommercial.com/#sle.
 - 3. Shaw Contract: www.shawcontract.com.
 - 4. Patcraft: www.patcraft.com.

2.2 MATERIALS

- A. Tile Carpeting, Type CPT-1,2,3: Multi-level Pattern Loop, manufactured in one color dye lot.
 - 1. Tile Size: 9 x 36 inch, nominal.
 - 2. Backing System:
 - a. Primary: Non, woven synthetic.
 - b. Secondary: EcoWorx Tile
 - 3. Yarn system: Solution Q Extreme Nylon.
 - 4. Color System: 100% Solution Dyed.
 - 5. Lifetime Warranty for EcoWorx with Stain and Color.
 - 6. Tufted Yarn Weight: 17 oz min.
 - 7. Pile Height: 0.11 inch.

8. Color(s): Refer to Finish Key.
 9. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 10. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 11. Installation Method: Brick Ashlar.
 12. Product:
 - a. Basis of Design: Patcraft; Color Reveal: www.patcraft.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Carpet Tile Type CPT-4: Multi-Level Pattern Loop, manufactured in one color dye lot.
1. Tile Size: 12 by 48 inch, nominal.
 2. Pile Height: 0.081 inch.
 3. Color: Refer to Finish Key.
 4. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 5. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 6. Backing System:
 - a. Primary: Non, woven synthetic.
 - b. Secondary: EcoWorx Tile
 7. Yarn System: Ecosolution Q100 Nylon
 8. Color System: 100% Solution Dyed.
 9. Lifetime Warranty for EcoWorx with Stain and Color.
 10. Tufted Yarn Weight: 15 oz min.
 11. Installation Method: Brick Ashlar.
 12. Products:
 - a. Basis of Design: Patcraft; Slope: www.patcraft.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 ACCESSORIES

- A. Sub-Floor Filler: type recommended by flooring material manufacturer.
- B. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 09 05 61.
 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
 3. Follow moisture and alkalinity remediation procedures in Section 09 05 61.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.
- E. Ventilate installation area during installation and for 72 hours after installation.
- F. Maintain minimum 70 degrees F ambient temperature 72 hours prior to, during and 24 hours after installation.
- G. Precondition: All of the carpet shall be spread in a room on site 14 days prior to actual installation with the room preconditioned at a minimum of 70 degree F with humidity between 35% to 65%.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Do not mix carpet from different cartons unless from the same dye lot.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile as specified, set, aligned and patterned as indicated on drawings.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.

3.4 SCHEDULE

- A. Refer to Finish Key and Schedules.

3.5 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 72 00
WALL COVERINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vinyl Wallcovering

1.2 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Substrate preparation.

1.3 REFERENCE STANDARDS

- A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020 (Reapproved 2025).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- C. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics; 2025.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets for wall covering and adhesive. Indicate compliance with specified flame spread and smoke developed ratings.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit two samples of wall covering, 12 by 12 inch in size illustrating color, finish, and texture. Verify image and substrate with Interior Designer/Architect/Owner.
- E. Manufacturer's Instructions: Indicate installation special procedures.
- F. Installer's qualification statement.
- G. Operation and Maintenance Data: Indicate cleaning, touch-up, and repair of covered surfaces.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide image full height, illustrating installed wall covering and joint seaming technique.
- C. Locate where directed by Architect.
- D. Mock-up may remain as part of work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials for damage upon arrival.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.8 FIELD CONDITIONS

- A. Maintain adhesive and wall covering manufacturer's recommended temperature ranges 24 hours before, during, and after installation.
- B. Provide lighting level of 80 fc measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.1 WALL COVERINGS

- A. Performance Requirements:
 - 1. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 50, maximum, when tested in accordance with ASTM E84.
 - 2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
- B. Wall Covering - Type WC-1: Fabric-backed vinyl roll stock.
 - 1. Application: Main office suite.
 - 2. Comply with ASTM F793/F793M, Category V, Type II.
 - 3. Total Weight: 20 oz./ Lineal Yd.
 - 4. Roll Width: 52 inches.
 - 5. Hanging: Reverse Hang.
 - 6. Backing: Woven, osnaburg fabric.
 - 7. Color: As indicated on drawings.
 - 8. Flame/Smoke Certifications: NFPA 265.
 - 9. Products:
 - a. Basis of Design: Wolf-Gordon; Ardley Cove: www.wolfgordon.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ACCESSORIES

- A. Adhesive: Type recommended by wall covering manufacturer.
- B. Termination Trim: Extruded plastic, clear.
- C. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- D. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate surfaces are primed and meet manufacturer's requirements to receive work.
- B. Measure moisture content of substrates with electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet or at rate greater than 1/16 inch/ft.
- D. Notify Architect of detrimental conditions affecting wall covering installation.
- E. Correct detrimental conditions before starting installation.

3.2 PREPARATION

- A. Remove wall plates and accessories impeding wall covering installation.
- B. Substrate Priming and Preparation:
 - 1. Fill cracks in substrate and correct irregularities with filler; sand smooth.
 - 2. For marks capable of bleeding through surface finishes, seal with shellac.
 - 3. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- C. Wash impervious surfaces with tetra-sodium phosphate; rinse and neutralize; wipe dry.
- D. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings before preparing surfaces or finishing.
- E. Correct surface defects affecting work of this section and clean surfaces. Remove existing coatings exhibiting loose surface defects.
- F. Vacuum surfaces to remove loose particles.

3.3 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall immediately before applying wall covering.
- C. Use wall covering in roll number sequence.
- D. Razor trim edges of wall covering. Do not razor trim on gypsum board surfaces.
- E. Smoothly apply wall covering without wrinkles, gaps, or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- F. Butt edges tightly.
- G. Horizontal seams are not permitted.
- H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.
- I. Install wall covering before installing bases and items attached to, abutting, or located within 1 inch of wall surface.
- J. Cover spaces above and below windows and above doors in pattern sequence from roll.
- K. Install wall covering behind fin tube cabinets.
- L. Where wall covering tucks into reveals, metal wallboard, or plaster stops, use contact adhesive within 6 inches of wall covering termination. Ensure complete contact bond.
- M. Install termination trim.
- N. Remove excess adhesive from seams while wet and before proceeding to next wall covering sheet.
- O. Reinstall wall plates and accessories removed to accommodate work of this section.

3.4 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean wall coverings of dust, dirt, excess adhesive, and other contaminants.

3.5 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

3.6 SCHEDULES

- A. Refer to Finish Key and Schedule.

END OF SECTION

SECTION 09 78 00
INTERIOR WALL PANELING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. PVC interior wall paneling.
- B. Laminated interior wall paneling.
- C. Accessories.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's descriptive literature for each specified product. Include anchorage devices specific to project substrate types.
- C. Shop Drawings: Submit elevations for each application and location. Indicate details of joints and attachments.
- D. Samples: Submit two samples 12 by 12 inches in size, indicating finish, surface design, and color for each type of panels.
- E. Manufacturer's Instructions: Provide manufacturer's installation instructions.
- F. Installer's qualification statement.
- G. Maintenance Data: Include recommended instructions, methods, and materials for cleaning panels.
- H. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.
- B. Installer Qualifications: Company specializing in installing work of the type specified in this section, and with at least three years of documented experience.

1.5 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Construct one mock-up, six feet long by six feet wide of wall paneling of each type, illustrating joints and trim.
- C. Locate where directed.
- D. Mock-ups may remain as part of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.
- B. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Extended Correction Period: Correct defective work within a 5-year period for failure of materials or workmanship commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Classification: Provide wall paneling assemblies meeting Class A when tested in accordance with ASTM E84.

2.2 PVC INTERIOR WALL PANELING

- A. PVC Sheet Cladding System, WP-1:
 - 1. Applications: Under cafeteria countertops and janitor room.
 - 2. Panel Size: 48 by 120 inches.
 - 3. Thickness: 0.060 inch.
 - 4. Color: As indicated on drawings.
 - 5. Products:
 - a. Basis of Design: Inpro Corp; Palladium Rigid Sheet - Patterns: www.inprocorp.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Accessories:
 - 1. Trim: Manufacturer's standard corner, connection, and top U- profiles.
 - 2. Adhesive: As recommended by wall panel manufacturer.
 - 3. Colors: As selected by Architect from manufacturers standard line.

2.3 LAMINATED INTERIOR WALL PANELING

- A. Laminated Wall Panels, Type HPL-2 & 3:
 - 1. Application: Cafeteria column wraps.
 - 2. Panel Size: As indicated on drawings.
 - 3. Thickness: 0.5 inch.
 - 4. Colors: As indicated on drawings.
 - 5. Edges: Square.
 - 6. Products:
 - a. Basis of Design: PSI Panel Specialists; Wall Panel System - High Pressure Laminate: www.panelspec.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Molding System: 310.
 - 1. All moldings to be 0.062" thick (at structural areas) 6063 alloy aluminial wiith T5 temper.
 - 2. Finish: Architect to select from manufacturer's standard finishes.
- C. Materials:
 - 1. Substrate/Core: 3/8 inch Particle Board.

2. Facing: High pressure laminate sealed with Acrylic PUR-Resin.
 - a. Color: As indicated on drawings.
 3. Chemical and Scratch resistant.
- D. Fabrication: Shop fabricate to greatest extent possible.
- E. Accessories:
1. Moldings: Provided by wall panel manufacturer.
 2. Adhesive/Joint Filler: Concrete wall adhesive, single-component, high-solids, modified-silane polymer with low VOC content, low odor, and no shrinkage.
 3. Horizontal Strapping: to be installed every two feet for wall panel system.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate surfaces for adhered items are clean and smooth.
 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer.
 2. Comply with adhesive manufacturer's recommendations for remedial measures at locations and application conditions where adhesion test results are unsatisfactory.
- C. Start of installation constitutes acceptance of project conditions.

3.2 INSTALLATION

- A. Install panels in accordance with manufacturer's instructions.
- B. Apply adhesive to back side of panel using trowel recommended by adhesive manufacturer.
- C. Apply panels to wall with vertical joints plumb and horizontal joints level and pattern aligned with adjoining panels.
- D. Using a roller, apply pressure to panel face to ensure proper adhesion between surfaces.
- E. Install panels with manufacturer's recommended gaps for panel field and corner joints.
- F. Install trim with adhesive.
- G. Seal joints at wall base and between panels with approved sealant to prevent moisture intrusion.
- H. Remove excess sealant after paneling is installed and prior to curing.

3.3 ADJUSTING

- A. Replace paneling installed out of plumb and/or not aligned with adjacent panels or construction.

3.4 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean panel faces using cleaning agents and methods recommended by manufacturer to remove soiling.

3.5 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals for closeout submittals.

3.6 PROTECTION

- A. Protect installed interior wall paneling from subsequent construction operations.

END OF SECTION

SECTION 09 84 30
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sound-absorbing panels.

1.2 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout.
- D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

PART 2 PRODUCTS

2.1 FABRIC-COVERED SOUND-ABSORBING UNITS

- A. General:
 - 1. Prefinished, factory assembled fabric-covered panels.
 - 2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Fabric-Covered Acoustical Panels for Walls, Type AWP-4:
 - 1. Panel Core: Manufacturer's standard thermo-molded copolymer core.
 - 2. Sound Absorption: Noise Reduction Coefficient (NRC) or Sound Absorption Average (SAA) of 0.10 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
 - 3. Panel Size: 24 inches by 24 inches.
 - 4. Fabric: Woven polyester.
 - 5. Color: As indicated on drawings.
 - 6. Mounting Method: Back-mounted with mechanical fasteners, Z-clips and angle brackets.
 - 7. Products:
 - a. Basis of Design: Kinetics: Geometric Diffuser: www.kineticnoise.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PET FELT SOUND ABSORBING UNITS

- A. Manufacturers:
 - 1. Acoufelt: www.acoufelt.com.
 - 2. Armstrong World Industries, Inc.: www.armstrongceilings.com.
 - 3. Sonus: www.sonusna.com.
 - 4. Turf Design: www.turf.design.com.
- B. Polyethylene Terephthalate (PET) Felt Panels for Walls, Type AWP-1,2,3:
 - 1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 2. Sound Absorption: Noise Reduction Coefficient (NRC) or Sound Absorption Average (SAA) of 0.45 when tested in accordance with ASTM C423 for Type A mounting, complying with ASTM E795.
- C. Direct Attached Wall Panels:
 - 1. Thickness: 0.5 inch, nominal.
 - 2. Sizes:
 - a. AWP-1: As indicated on drawings.
 - b. AWP-2: 36 by 24 inch, nominal.
 - c. AWP-3: 18 by 18 inches, nominal.
 - 3. Mounting: Direct attached from back of baffle with panel adhesive.
 - 4. Products:
 - a. Basis of Design: Acoufelt; Solid 12MM Panel: www.acoufelt.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 FABRICATION

- A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
 - 1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.4 ACCESSORIES

- A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:

SOUND-ABSORBING WALL AND CEILING UNITS

1. Z-clip hanger and magnet system with magnets recessed into panel frame and designed to engage steel mounting plates secured to substrate with screws.
- B. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install suspension system in accordance with manufacturer's instructions and as supplemented in this section.
- C. Install mounting accessories and supports in accordance with shop drawings.
- D. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- E. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
 1. Plumb and level.
 2. Flatness.
 3. Width of joints.

3.3 CLEANING

- A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.4 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

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SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.2 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.3 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- F. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.
- G. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

4. Manufacturer's installation instructions.
 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, for selected colors.
1. Where sheen is specified, submit samples in only that sheen.
 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 3. Label each container with color in addition to the manufacturer's label.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. Pittsburgh Paints: www.pittsburghpaintsco.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. 6 CRR-NY, Chapter III, Subpart A.
 - c. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
 - 1) Opaque, Flat: 50 g/L, maximum.
 - 2) Opaque, Nonflat: 100 g/L, maximum.
 - 3) Opaque, High Gloss: 150 g/L, maximum.
 - d. Architectural coatings VOC limits of the State of New York.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.
 - 2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Exterior Plaster and Stucco: 12 percent.
 - 2. Fiber Cement Siding: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 - 1. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- H. Masonry:
 - 1. Prepare surface as recommended by top coat manufacturer.
- I. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- J. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

- K. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- L. Concrete Floors and Traffic Surfaces: Remove contamination, using alkaline based cleaners where required, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- M. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- N. Galvanized Surfaces:
- O. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Sand metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.7 SCHEDULE - PAINT SYSTEMS: ALL MATERIALS ARE BASED ON PITTSBURGH PAINTS UNLESS NOTED OTHERWISE.

- A. Concrete, Concrete Masonry Units (CMU), Concrete Block, Brick Masonry: Finish surfaces exposed to view.
 - 1. One coat of Perma-Crete Block & Masonry Surfacers/Filler 4-100XI @ 8.0 to 11.0 MDFT.
 - 2. Two coats of Perma-Crete 4-22 HB Acrylic Flat @ 3.2 to 5.8 MDFT.
- B. Exterior Gypsum Board: Finish surfaces exposed to view.
 - 1. One coat of Perma-Crete 4-603XI Alkali resistant primer @ 1.4 MDFT, minimum.
 - 2. Two coats of Perma-Crete 4-22 HB Acrylic Flat @ 3.2 to 5.8 MDFT.
- C. Exterior Plaster: Finish surfaces exposed to view.
 - 1. One coat of Perma-Crete 4-603XI Alkali resistant primer @ 1.4 MDFT, minimum.
 - 2. Two coats of Perma-Crete 4-22 HB Acrylic Flat @ 3.2 to 5.8 MDFT.
- D. Wood: Finish surfaces exposed to view.
 - 1. One coat of Exterior Oil-Based Wood Primer.
 - 2. Two coats of Acry-Shield Max Exterior Latex Satin.
- E. Steel - Exposed steel lintels, Overhead doors, Frames, other Ferrous metal:
 - 1. One coat of Speed Hide One-component, interior/exterior rust inhibitive steel primer 6-208 Series.
 - 2. Two coats of Pitt-Tech Plus Int./Ext Semi-Gloss Industrial Coating 90-1610 HP Series.
 - 3. Application: Preparation and prime coat is to be applied in factory by steel fabricator.
- F. Steel - Exposed steel columns and beams:
 - 1. Minimum surface preparation is to meet SSPC-SP6.
 - 2. One coat of Speed Hide One-component, interior/exterior rust inhibitive steel primer 6-208 Series.
 - 3. Two coats Sil-Shield Silicone Alkyd Enamel High Gloss 95-5000 Series.
 - 4. Application: Preparation and prime coat is to be applied in factory by steel fabricator.
- G. Galvanized Steel: Finish surfaces exposed to view.
 - 1. Two coats of Pitt-Tech Plus Int./Ext. Gloss Industrial Coating 90-1310 Series @ 2.0 - 4.0 MDFT, minimum.
 - 2. Application: Preparation and prime coat is to be applied in factory by fabricator.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladders.
 - 3. Surfaces inside cabinets.
 - 4. Prime surfaces to receive wall coverings.
 - 5. Exposed walls and bottom of swimming pools and fountains.
 - 6. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Glass.
 - 9. Acoustical materials, unless specifically indicated.
 - 10. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 50 00 - Metal Fabrications: Shop-primed items.
- C. Section 09 91 13 - Exterior Painting.

1.3 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2024.
- E. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).
- F. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- G. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- H. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- I. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- J. SSPC-SP 3 - Power Tool Cleaning; 2024.
- K. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.
- L. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
 - 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
 - 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience and approved by manufacturer.

1.7 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, 10 feet long by 10 feet wide, illustrating paint color, texture, and finish.
- C. Provide door and frame assembly illustrating paint color, texture, and finish.
- D. Locate where directed by Architect.
- E. Mock-up may remain as part of the work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 1. Pittsburgh Paints: www.pittsburghpaintsco.com/#sle.

- 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. 6 CRR-NY, Chapter III, Subpart A.
 - c. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
 - 1) Opaque, Flat: 50 g/L, maximum.
 - 2) Opaque, Nonflat: 100 g/L, maximum.
 - 3) Opaque, High Gloss: 150 g/L, maximum.
 - d. Architectural coatings VOC limits of the State of New York.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.
 - 1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 - 3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Plaster and Stucco: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Clean concrete according to ASTM D4258. Allow to dry.
 - 3. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- H. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
- I. Concrete Floors and Traffic Surfaces: Remove contamination, using alkaline based cleaners where required, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- J. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- K. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.

- L. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- M. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- N. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.7 SCHEDULE - PAINT SYSTEMS: ALL MATERIALS ARE BASED ON PITTSBURGH PAINTS UNLESS NOTED OTHERWISE.

- A. Concrete Block:
 - 1. One coat Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI. (MPI #4)
 - 2. Two coats UltraLast Interior Latex; Semi-Gloss Sheen. (MPI #147)
- B. Concrete:
 - 1. One coat Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI Series. (MPI #3)
 - 2. Two coats UltraLast Interior Latex, Semi-Gloss Sheen. (MPI #147)
- C. Concrete Floors (Lt. - Med. Duty):
 - 1. One coat Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200XI. (MPI #99)
 - 2. Two coats Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200XI. (MPI #99)
- D. Steel and Metal - Steel access doors and frames, hollow metal doors and frames, all new removable mullions, stair railings, hollow metal Windows frames, existing painted fire extinguisher cabinets:
 - 1. One coat Pitt-Tech Plus DTM Industrial Primer/Finish 4020.
 - 2. Two coats Pitt-Tech Plus EP DTM Acrylic, Flat and Semi-Gloss Sheen.
- E. Galvanized Metal: Exposed miscellaneous metal, exposed ducts, conduits, mechanical and electrical devices.
 - 1. One coat Pitt-Tech Plus DTM Industrial Primer/Finish, 4020.
 - 2. Two coats Pitt-Tech Plus EP DTM Acrylic, Semi-Gloss Sheen. (MPI #153)
- F. Aluminum - Mill Finish:
 - 1. One Coat Pitt-Tech Plus EP DTM Acrylic Primer/Finish 90-1908 Series over abraded surface.
 - 2. Two coats Pitt-Tech Plus EP DTM Acrylic, Gloss Sheen @ 2.0 to 4.0 MDFT. (MPI #154).
- G. Steel - Exposed steel lintels:
 - 1. One coat Pitt-Tech Plus DTM Industrial Primer/Finish 4020.
 - 2. Two coats Pitt-Tech Plus EP DTM Acrylic, Gloss Sheen.
- H. Gypsum Board: Finish surfaces exposed to view.
 - 1. All interior drywall gypsum board wall surfaces for a painted finish. (Spot prime all joints and spots with primer first)
 - a. Walls and ceilings: Two coats Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer.
 - b. Walls: Two coats UltraLast Interior Latex, Eggshell Sheen.
 - c. Ceilings: Two coats UltraLast Interior Latex, Eggshell Sheen.
- I. Plaster: Finish surfaces exposed to view.
 - 1. All interior plastered wall surfaces for a painted finish. (Spot prime all joints and spots with primer first)
 - a. Walls and ceilings: Two coats Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer.
 - b. Walls: Two coats UltraLast Interior Latex; Eggshell Sheen.
 - c. Ceilings: Two coats UltraLast Interior Latex; Eggshell Sheen.
- J. New Wood Casework: See Section 06 41 00 - Architectural Wood Casework, for required factory finish.
- K. New Wood Doors: Refer to appropriate door specification for required factory finish.

3.8 SCHEDULE

- A. Refer to Finish Key and Schedule on Drawings.

END OF SECTION

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SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Porcelain enamel steel markerboards.
- B. Glass markerboards.
- C. Tackboards.
- D. Porcelain markerboard wall.
- E. Tackstrips.
- F. Tackable wall panels.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.
- C. Section 09 91 23 - Interior Painting: Finishing of wood frame and marker rail.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
- C. ANSI A208.1 - American National Standard for Particleboard; 2022.
- D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- E. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2025.
- F. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.
- G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).
- H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- J. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics; 2025.
- K. PS 1 - Structural Plywood; 2022.
- L. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
- D. Samples: Two, 2 by 2 inches in size illustrating materials and finish, color and texture of porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surfacing, and trim.
- E. Maintenance Data: Include data on regular cleaning, and stain removal .

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 VISUAL DISPLAY UNITS

- A. Porcelain Enamel Steel Markerboards:
 - 1. Manufacturers:
 - a. ASI Visual Display Products: www.asi-visualdisplayproducts.com/#sle.
 - b. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.
 - c. Platinum Visual Solutions: www.pvsusa.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Color: As selected from manufacturer's full range.
 - 3. Size: As indicated on drawings.
 - 4. Frame: 3/4" Wide Perimeter trim, with concealed fasteners.
 - 5. Accessories: Provide map rail, flag holder, and cleaning instruction plate.
 - 6. Products:
 - a. Basis of Design: Claridge Products and Equipment; Series 2: www.claridgeproducts.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 7. Chalk Tray: Chalktrough with end closures.
- B. Magnetic Glass Markerboards:
 - 1. Manufacturers:
 - a. Claridge Products and Equipment, Inc; Tableau: www.claridgeproducts.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Glass: Laminated, low iron, 1/4 inch thick, with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry erase board or projection surface.
 - 3. Glass Finish: White back-coating.
 - 4. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch .
 - 5. Size: As indicated on drawings.
 - 6. Frame: 1/4" face extruded aluminum, with concealed fasteners.
 - 7. Frame Finish: Anodized, natural.
 - 8. Mounting: Concealed Z clips.
 - 9. Accessories: Provide magnetic marker tray and magnetic marker holder.
- C. Tackboards: Vinyl coated fabric roll stock, conforming to the following.

1. Cork Thickness: 1/4 inch.
 2. Fabric: Vinyl-coated fabric.
 3. Color: As selected from manufacturer's full range.
 4. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
 5. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 6. Size: As indicated on drawings.
 7. Frame: Same type and finish as for adjacent markerboard ; 3/4" framed and 1/4", as indicated on drawings.
- D. Frameless Tackboards, Type TB-1,2,3: Fabric wrapped, conforming to the following.
1. Cork Thickness: 1/4 inch.
 2. Fabric: Woven.
 3. Colors: As indicated on drawings.
 4. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
 5. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 6. Sizes:
 - a. TB-1: 48 by 36 inches.
 - b. TB-2 & 3: 24 by 36 inches.
 7. Frame: No frame , with concealed fasteners.
 8. Products:
 - a. Basis of Design: Claridge Products and Equipment; Edge Wrapped Tackboard: www.claridgeproducts.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Tackstrips: Vinyl laminated to cork.
1. Cork Thickness: 1/8 inch.
 2. Fabric: Vinyl-coated fabric.
 3. Color: As selected from manufacturer's full range.
 4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 5. Height: 1 inch.
 6. Length: As indicated on drawings.
 7. Frame and End Stops: Extruded aluminum, with concealed fasteners.
 8. Frame Profile: As indicated on drawings.
 9. Frame Finish: Anodized, natural.
- F. Combination Units and Units Made of More Than One Panel: Factory-assembled markerboards and tackboards in a single frame, of materials specified above.
1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.
 2. Configuration: As indicated on drawings.

2.2 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Float Glass: Provide float-glass-based glazing unless otherwise indicated.
- C. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
- D. Vinyl-Coated Fabric: ASTM F793 Category VI.
- E. Woven: Tightly woven, flame retardant treated.
- F. Adhesives: Type used by manufacturer.

2.3 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.
- B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.
- C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- D. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board.
- E. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on a metal plate fastened to perimeter frame near chalkrail.
- F. Chalk/Marker Tray: Aluminum, manufacturer's standard extruded profile closed ends; concealed fasteners, same finish as frame.
- G. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.

3.3 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Dimensional letter signage.

1.2 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 - 2010 ADA Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
- D. Selection Samples: Where materials, colors, and finishes are not specified, submit two sets of selection charts or chips.
- E. Verification Samples: Submit samples showing colors and finishes specified.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package dimensional letter signs as required to prevent damage before installation.
- B. Store under cover and elevated above grade.

1.6 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Dimensional Letter Signs:
 - 1. ASI Sign Systems, Inc: www.asisignage.com
 - 2. Inpro Corporation: www.inprocorp.com/#sle.
 - 3. Takeform: www.takeform.net/#sle.

2.2 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.3 DIMENSIONAL LETTERS

- A. Applications: Room identification.
 - 1. Use individual metal letters.
 - 2. Mounting Location: Interior as indicated on drawings.
 - 3. Allow for total of 15 letters, 20 inches high.
- B. Metal Letters:
 - 1. Material: Stainless steel sheet, fabricated reverse channel.
 - 2. Thickness: Manufacturer's standard for letter size.
 - 3. Letter Height: 20 inches.
 - 4. Text and Typeface:
 - a. Character Font: Century Gothic Bold.
 - b. Character Case: Upper case only.
 - 5. Finish: Brushed, satin.
 - 6. Color: As selected by Architect.
 - 7. Mounting: Concealed screws.
 - 8. Products:
 - a. Basis of Design: ASI; LPS Series Cut Metal Dimensional Letters: www.asisignage.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

3.3 CLEANING, PROTECTION AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet interior and 10 feet exterior.
- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- C. Dispose of construction debris.

3.4 SCHEDULE

- A. Refer to Signage Schedule, Signage Type Schedule and Drawings for sizes, locations and layout of signage types, sign text copy and graphics.

END OF SECTION

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SECTION 10 14 23
PANEL SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Panel signage.

1.2 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
 - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - c. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.
- E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.
- F. Verification Samples: Submit samples showing colors, materials, and finishes specified.
- G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- H. Manufacturer's qualification statement.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.

- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store under cover and elevated above grade.
- D. Store tape adhesive at normal room temperature.

1.6 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Panel Signage:
 - 1. ASI Sign Systems, Inc: www.asisignage.com.
 - 2. ID Signsystems: www.idsignsystems.com.
 - 3. Inpro Corporation: www.inprocorp.com/#sle.
 - 4. Takeform: www.takeform.net/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.
- B. Surface burning characteristics: Maximum flame spread of 25 (Class A) when tested in accordance with ASTM E84.

2.3 PANEL SIGNAGE

- A. Panel Signage Type 1,3,4,11:
 - 1. Application: Room and door signs.
 - 2. Description: Flat signs co-molded media, tactile characters.
 - 3. Sign Size: As indicated on drawings.
 - 4. Total Thickness: 1/8 inch.
 - 5. Sign Edges: Squared.
 - 6. Corners: Squared.
 - 7. Color and Font, unless otherwise indicated:
 - a. Character Font: Century Gothic.
 - b. Character Case: Upper case only.
 - c. Background Color: As selected by Architect.
 - d. Character Color: Contrasting color.
 - 8. Material: One-piece injection molded polycarbonate plastic with raised letters and braille.
 - 9. Profile: Flat panel without frame.
 - a. Clear Cover: For customer produced sign media, provide clear cover of polycarbonate plastic, glossy on back, nonglare on front.
 - 10. Tactile Letters: Raised 1/32 inch minimum.
 - 11. Braille: Grade II, ADA-compliant.
 - 12. One-Sided Wall Mounting: Tape adhesive.
 - 13. Products:
 - a. Basis of Design: ASI: InForm-FR; www.asisignage.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Panel Signage Type 2:
 - 1. Application: Emergency evacuation map signs.
 - 2. Description: Flat signs for customer-produced media, tactile characters.
 - 3. Sign Size: As indicated on drawings.
 - 4. Total Thickness: 1/8 inch.
 - 5. Sign Edges: Squared.
 - 6. Corners: Squared.
 - 7. Color and Font, unless otherwise indicated:
 - a. Character Font: Century Gothic.
 - b. Character Case: Upper and lower case (title case).
 - c. Background Color: As selected by Architect.
 - d. Character Color: Contrasting color.
 - 8. Profile: Flat panel in aluminum frame.
 - a. Frame Finish: Natural (clear) anodized.
 - b. Clear Cover: For customer produced sign media, provide clear cover of polycarbonate plastic, glossy on back, nonglare on front.
 - 9. Tactile Letters: Raised 1/32 inch minimum.
 - 10. Braille: Grade II, ADA-compliant.
 - 11. One-Sided Wall Mounting: Concealed or exposed screws.
- C. Panel Signage Type 9:
 - 1. Application: Occupancy signs.
 - 2. Description: Flat signs with applied character panel media, tactile characters.
 - 3. Sign Size: 4 inches by 6 inches.
 - 4. Total Thickness: 1/8 inch.
 - 5. Color and Font, unless otherwise indicated:
 - a. Character Font: Century Gothic.
 - b. Character Case: Upper and lower case (title case).
 - c. Background Color: As scheduled.
 - d. Character Color: Contrasting color.
 - 6. Tactile Letters: Raised 1/32 inch minimum.

2.4 SIGNAGE APPLICATIONS

- A. Room and Door Signs:
 - 1. Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 2. Office Doors: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section for replaceable occupant name.
 - 3. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
 - 4. Rest Rooms: Identify with pictograms, the names as indicated on room finish schedule located on drawings, and braille.
- B. Emergency Evacuation Map Panel Signs:
 - 1. Allow for one map per elevator lobby.
 - 2. Map content to be provided by Owner.

2.5 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel or chrome plated.
- B. Exposed Screws: Chrome plated.
- C. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

- A. Ensure new and existing substrate surfaces are suitably cleaned prior to installation to remove dust, dirt, and other contaminants that would adversely affect tape adhesive attachment.
- B. Install in accordance with manufacturer's instructions.
- C. Install with horizontal edges level.
- D. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

3.3 CLEANING, PROTECTION AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet interior and 10 feet exterior.
- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- C. Dispose of construction debris.

3.4 SCHEDULE

- A. Refer to Signage Schedule, Signage Type Schedule and Drawings for sizes, locations and layout of signage types, sign text copy and graphics.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Diaper changing stations.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Placement of concealed wood blocking and backing plates for support of accessories.
- B. Section 09 30 00 - Tiling: Ceramic washroom accessories.

1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).
- F. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.
- I. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Samples: Submit two samples of each accessory, illustrating color and finish.

- D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc (ASI): www.americanspecialties.com.
 - 2. Bobrick Washroom Equipment, Inc.: www.bobrick.com
 - 3. Bradley Corporation: www.bradleycorp.com/#sle.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Diaper Changing Stations:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
- C. Provide products of each category type by single manufacturer.

2.2 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide 3 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.4 COMMERCIAL TOILET ACCESSORIES

- A. Waste Receptacle: Stainless steel, freestanding style with swing top.
 - 1. Liner: Removable seamless stainless steel receptacle.
 - 2. Minimum capacity: 13 gallons.
- B. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
 - 1. Size: As scheduled.
 - 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 - 4. Fixed Tilt Mirrors: Minimum 3 inches tilt from top to bottom.

TOILET, BATH, AND LAUNDRY ACCESSORIES

- C. Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.
- D. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.5 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Stainless steel.
 - 2. Mounting: Surface.
 - 3. Minimum Rated Load: 250 pounds.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 06 10 00 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

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SECTION 11 40 00 FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Supply, deliver and set in place all food service equipment at identified locations, and level before and after final connections by others. FEC to coordinate with authorized service agents any start up requirements called out in this written specification as well as provide prompt demonstrations to owner.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by Contract Documents. Substitutions require approval by Architect for use or implementation.
 - 1. Substitutions provisions are handled under Division 01 Section.

1.4 REFERENCES

- A. All food service refrigeration equipment must comply with C403.10 refrigeration equipment performance equipment of the 2020 Energy Conservation code of New York State.
- B. All Food Service Equipment provided and installed must comply with below agencies, state department of health and county or local laws and ordinance.
- C. American Society for Testing Materials (ASTM):

1. ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 2. ASTM A446, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
 3. ASTM C1036, Specification for Flat Glass.
 4. ASTM C1048, Specification for Heat Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
- D. American Welding Society (AWS).
- E. National Electrical Manufacturers Association (NEMA).
- F. National Fire Protection Association (NFPA 96).
- G. National Sanitation Foundation (NSF).
- H. Underwriters Laboratories Listing (UL).
- I. Reference Standard AGS Grease Hoods, ductwork and fire extinguishing system per NYSBC 904.2.1

1.5 SUBMITTALS

- A. Within sixty (60) days after award of contract (before equipment is purchased) the following shall be submitted in accordance with Section 013300 SUBMITAL PROCEDURES. It shall be the responsibility of the FEC (Food Equipment Contractor) to confirm construction schedule with Architect and adjust the submittal process to accommodate any fast track project.
1. The submittal package will include the following: Product data book (cut sheet book) this product data book should account for all item numbers in this contract up to and including spare numbers and existing equipment. Product data cut sheets shall be marked up in a way that indicates model and accessories included with the item. No generic manuals will be accepted
 2. Submittal drawings will consist of the following: Custom shop drawings (hoods, walk-ins, millwork, serving lines custom fabrication, etc.) Equipment layout drawings, Plumbing connection drawings, electrical connection drawings, HVAC layout drawings and Special condition drawings (Wall backing, floor depressions, etc.)
 3. All submittal packages shall be at least 98% complete at submission, unless pre-approved by Architect and the Food Service Consultant
- B. Electronically submit (PDFs) assembly drawings, electrical and mechanical rough-in connection plans, details for plumbing, electrical, air conditioning and ventilation services for all kitchen equipment and brochures, catalog cut-sheets, specifications and operating characteristics for buy-out equipment. Clearly indicate any deviations from contract Documents, such as arrangement of piping, connections, wiring method of fabrication, manner of structural conditions, standard shop practices, or other reasons, and note in Cover Sheet accompanying submittals.
- C. Drawing of fabricated equipment shall not be less than $\frac{3}{4}$ " equal one-foot scale.
- D. Rough-in drawings shall not be less than $\frac{1}{4}$ " equal one-foot scale.
- E. Product Data: Provide data on appliances; indicate configuration, sizes, materials, finishes, locations, utility connections and locations.
- F. Samples: Submit samples of stainless steel and other finished materials for color selection.

- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Manufacturer's Certificate: Certify that exhaust system and tests meet or exceed specified requirements.
- I. It shall be the FEC responsibility to coordinate all color selections that are not already selected with Architect. Any color selections stated in written specifications shall be confirmed by the FEC with Architect prior to ordering.

1.6 CLOSEOUT SUBMITTALS

- A. Within thirty (30) days after completion of contract the following shall be submitted.
 - 1. Operation and Maintenance Data:
 - a. Operation Data: Provide manuals with a sequence of operation and utility connection diagram explaining system operation and corresponding to actual devices. After approval, submit 2 sets of three ring binders and an electronic copy.
 - b. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.
 - c. Within this manual Provide serial numbers on all equipment including walk in boxes and refrigeration when manual covers more than one model, indicate model provided
 - d. FEC to indicate model of items provide NO generic manuals will be accepted.
 - 2. Warranty letter by the FEC (Food Service Equipment Contractor) stating date of completion of installation for warranty issues.
 - 3. Demonstration sign in sheet listing what was demonstrated and all parties that attended this demonstration
 - 4. Equipment keys and spare parts list to include what was turned over and to whom.
 - 5. Signed by owner or owner's representative the punch list determining that all punch list items have been completed and to the owner's satisfaction.
 - 6. Provide documentation on all cooking equipment startups performed by an authorized service agent.
 - 7. Documentation of startups by authorized service agent
 - 8. Provide copy of Ansul tag and testing
 - 9. Provide signed transmittal of all spare parts and keys that have been turned over to CM/GC or owner.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Conform to applicable State and local codes for utility requirements.
 - 2. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.
- B. Energy Ratings: Provide appliances with energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by Federal Trade Commission.
 - 1. Provide all appliances that are Energy Star Rated.

1.8 QUALIFICATIONS

- A. Installer: Must have a minimum of 5 years documented installation experience with projects similar to this project.
- B. Fabricator: Must specialize in manufacture of commercial food services equipment with minimum 5 years documented experience.

- C. Manufacturer: Must specialize in manufacturing products specified in this section with a minimum of 5 years documented equipment manufacturing experience.
- D. One qualified full-time site superintendent all be satisfactory to the Owner and Architect in all respects, and owner shall have the right to require Contractor to dismiss from the project any superintendent whose performance is not satisfactory to Owner and Architect except with another superintendent satisfactory to the Owner and Architect in all respects. At the request of the Architect, the Contractor's superintendent shall attend project meetings, whether the project meetings are prior to the start of the Contractor's work.
 - 1. Contractor shall provide a superintendent with experience in managing project of this size and complexity with minimum three (3) projects including projects completed on time per contract. Experience shall be documents in writing from end user and design consultant.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Store products clear of floor in a manner to prevent damage.
- B. Coordinate size of access and route to place of equipment installation.
- C. Coordinate equipment delivery and installation with all other trades.
- D. Contractor takes all responsibility for equipment damage incurred before, during and after installation, until Substantial Completion has been determined by Architect.
- E. One site superintendent all be satisfactory to the Owner and Architect in all respects, and owner shall have the right to require Contractor to dismiss from the project any superintendent whose performance is not satisfactory to Owner and Architect except with another superintendent satisfactory to the Owner and Architect in all respects. At the request of the Architect, the Contractor's superintendent shall attend project meetings, whether the project meetings are prior to the start of the Contractor's work.
 - 1. Contractor shall provide a superintendent with experience in managing project of this size and complexity with minimum three (3) projects including projects completed on time per contract. Experience shall be documents in writing from end user and design consultant.

1.10 COORDINATION

- A. Coordinate existing equipment with Owner per Part 3 Existing Equipment.
- B. Coordinate with other trades to ensure existing equipment is disconnected prior to removal by this contractor. Supply and install all necessary drain traps, steam traps, vents, shut-offs, valves, pipe fittings, and/or other materials to complete final plumbing and electrical or steam connections between the rough-in and the connection or connections on each piece of equipment.
- C. Ductwork and ductwork connections from hoods unless otherwise indicated.
- D. Install all drain fittings, tailpieces, faucets, operating switches, and/or starters.
- E. Coordinate sequencing of equipment installation with other trades prior to installing any piece of equipment.
- F. Coordinate special conditions with other trades, i.e. floor depression, soda line conduit requirements, roof curbs, control wiring,

etc.

1.11 WARRANTY

- A. Provide a one (1) year parts and labor guarantee on all new equipment.
- B. Components of equipment subject to replacement prior to one year's use and those items which may fail due to improper or inadequate periodic maintenance by the Owner/Operator are not intended to be included within the scope of warranty.
- C. For all equipment that has refrigeration systems and semi-hermetic compressors, furnish an additional four (4) year warranty on all compressors.
- D. Guarantee/Warranty period shall commence with the date of Substantial Completion.
- E. Warranty includes all costs incurred for removal and re-installation of the replacement component or equipment.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. All products shall be new. Use salvaged materials only where specifically directed to do so.
 - 3. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 5. Where products require color selection the Architect will make the selection.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 7. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 - 1. Products:
 - a. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 - 2. Manufacturers:
 - 3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

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

2.3 MATERIALS

- A. Sheet Steel: ASTM A446; 1.25 ounce per square foot galvanized coating.
- B. Stainless Steel: ASTM A167; Type 304 commercial grade, No. 4 finish.
- C. Glass: 3/16-inch float conforming to ASTM C1036 and ASTM C1048; exposed edges ground; cut or drilled to receive hardware.
- D. Plastic Laminate: NEMA LD3; 0.050-inch-thick; color as selected by Architect.
- E. Laminate Backing Sheets: LD3-BK20, 0.020-inch-thick, unfinished plastic laminate.
- F. Finish Hardware: Manufacturer's standard.
- G. Work Surfaces: As specified.
- H. Fittings: Sink drains with crumb cup and waste fittings, faucets, and electrical outlets.
- I. Service Outlet Covers and Escutcheons: Stainless steel.
- J. Service Accessories and Connections:
1. Provide control switch or starter on each motor-driven appliance or heating element, under provisions of UL requirements.
 2. Provide internal wiring for equipment, including electrical devices, wiring controls, and switches to a common junction box.
 3. Provide suitable length of 4 wire cord with plugs to match building receptacles.
 4. Provide lamps for fixtures in equipment.
 5. Provide equipment with connection terminals, so that connections of plumbing, gas, steam, electrical, ventilation, and refrigeration services can be made. Where receptacles are specified for custom equipment, supply cut-outs and outlet boxes set in place accessible for connections of electrical work.

2.4 EQUIPMENT

- A. Provide rough-in hardware, supports and connections, attachment devices, closure panels, trim strips, and all accessories required for proper operation of equipment.
- B. Standard of Comparison: The specified equipment has been established to set a standard of quality and features.
- C. If substitutions require different utility/building conditions, electrical, plumbing, ventilation, etc., from those specified, a complete list of those changes for each item shall be included with the request for substitution. Any costs associated with these changes will become the responsibility of this Contractor.
- D. Verify direction of door swings.

2.5 FABRICATION

- A. General Requirements:
 1. Stainless Steel Fastenings and Fittings: Bolts and screws with countersunk flat heads at interior and exterior visible or accessible surfaces. Use concealed fastenings where possible
 2. Form edges smooth. Fabricate sheet material for work surfaces, facings, shelves, and drainboards of straight length in one continuous sheet when not over 12 feet in length.
 3. Fix leg-mounted units by dowelling to floor with 1/4-inch stainless steel pins, where vibration or oscillation is anticipated.
 4. Provide legs with stainless steel adjustable feet. Fasten legs to equipment securely and rigidly.
 5. Install rubber or nylon button feet or other protective device on bearing surface of any item positioned on a finished surface.
 6. Isolate rotating or reciprocating machinery to prevent noise and vibration.
 7. Provide accommodation for installation of final connections by other trades and accessibility to components such as compressors, junction boxes, etc....
 8. Grind welds of stainless steel smooth and flush; polish to match adjacent surfaces.
 9. Cut and drill components for service outlets and fixtures.
 10. Provide access panels where required to access utilities.
 11. Shop assemble work where possible.
- B. Load Carrying Counter Surfaces: Reinforce frame support system and surfaces so that surfaces may safely support a load of 200 pounds concentrated on one square foot in any area or surface with no indentation showing on surface, and with permanent set not exceeding 0.005 inches.

2.6 FINISHES

- A. Metal (Except Stainless Steel): Degrease and phosphate etch followed by primer and minimum 2 coats factory baked epoxy enamel, color as selected by Architect from manufacturer's full range of standard and custom colors.
- B. Plastic Laminate: Color as selected by Architect from manufacturer's full range of standard and custom colors.
- C. Stainless Steel: Number 4 finish (unless indicated otherwise).
- D. Bituminous Paint: Sound deaden internal surfaces of metal work and underside of metal counters and sinks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all existing conditions and existing equipment requirements.
- B. Verify ventilation outlets, service connections, and supports are correct and in required location.
- C. Verify operational condition of existing equipment.
- D. Report equipment discrepancies or non-operational equipment to the Architect.

3.2 INSTALLATION

- A. Pre-installation site visits are required to obtain field measurements, verify finish dimensions, examine rough in progress and to coordinate with trades on site.
- B. Use anchoring devices appropriate for equipment and expected usage.
- C. Verify equipment is installed in accordance with the manufacturer's recommendations and requirement.
- D. Insulate to prevent electrolysis between dissimilar metals. Provide sealant to achieve clean joint without crevices.
- E. Weld and grind joints in stainless steel work tight, without open seams, where necessary due to limitations of sheet sizes or installation requirements.
- F. Sequence installation and erection to ensure mechanical, plumbing and electrical connections are achieved in an orderly and expeditious manner.
- G. Cut, fit, and patch where necessary. Coordinate work with other trades.
- H. Cut and drill tops, backs or other elements for service outlets, fixtures, and fittings.
- I. Provide access panel or cutting and patching of items of this Section required for the installation or services of equipment.
- J. Remove and reinstall existing equipment required under this Section. Foodservice Equipment contractor shall verify condition of existing equipment prior to removal, if being reinstalled by this contractor or reused by Owner.
- K. Protect new and existing equipment during construction phase as required to prevent damage to equipment.

3.3 EXISTING EQUIPMENT

- A. The Owner reserves the right to keep any existing equipment, coordinate with Owner on removal and transportation of equipment to a location of their choice. It shall be the responsibility of this contractor to salvage equipment the Owner chooses not to retain.
 - 1. Prior to removal from the kitchen any equipment that is labeled existing & relocate, Existing & remains or existing & reuse, the FEC shall verify that the equipment is in working order and document via photos any damage and cleanliness. Any damaged or not working equipment should be reported to GC/CM or Architect prior to moving.
- B. It shall be the responsibility of this contractor to salvage equipment the Owner chooses not to retain. FEC shall supply a list of salvage equipment (to include description, model, manufacture and serial number) to CM/GC/Owner for sign off prior to removal. Provide document in FSE submittal process.

- C. MEP disconnections by related trades, move, store and re-install equipment, ready for utility connection.
- D. Coordinate scope of work and timeline with Owner and other trades prior to removal of existing equipment.
- E. Clean and re-furbish existing equipment to be re-used to "like new" condition, as noted.
 - 1. Prior to removal from the kitchen any equipment that is labeled existing & relocate, Existing & remains or existing & reuse, the FEC shall verify the cleanliness of existing equipment Any overly dirty/overly damaged equipment should be reported to the GC/CM or Architect prior to moving.
- F. It is the responsibility of this contractor to provide storage as required until the piece of equipment is installed or re-installed.
- G. It is the responsibility of this contractor to evacuate refrigerant, dismantle and remove all refrigeration equipment associated with existing walk-in cooler, freezer or equipment with remote refrigeration components (if applicable).

3.4 ADJUSTING

- A. Upon completion of installation, adjust new and existing equipment and apparatus to ensure proper working order and conditions.
- B. If a new piece of equipment is not functioning properly and determined to be non-repairable in the field, it shall be removed and replaced with a new piece of equipment.
- C. Inspect all equipment and run each piece of equipment through a complete operating cycle to verify that equipment is fully operational.

3.5 CLEANING

- A. Cleaning shall be conducted prior to the turnover of the kitchen to the owner
- B. Remove masking or protective covering from stainless steel and other finished surfaces, including walk in panels, door handles and trim strips
- C. Remove all packing materials and debris from jobsite.
- D. Wash and clean new and existing equipment.
- E. Polish glass, plastic, hardware and accessories, fixtures and fittings.

3.6 DEMONSTRATION AND TESTING

- A. Demonstrations MUST be conducted prior to the turnover of the kitchen to owner. FEC shall provide a sign-in sheet from the demonstration showing attendance and what items were demonstrated. This document will be included with closeout documents. It is expected that the FEC will attend all demonstrations to ensure all were conducted.
- B. All demonstrations must be coordinated by the FEC and performed prior to kitchen turnover. All demonstrations/training to be performed by a qualified manufactures representative. Demonstrations must include but not limited to operating procedures and maintenance.

- C. Individuals performing demonstration shall be fully knowledgeable of all operating and service aspects of equipment.
- D. Demonstrations on all new equipment shall NOT be performed by the FEC.
- E. Test existing and new equipment to confirm equipment is operating as specified prior to demonstration. All testing of new equipment shall NOT be performed by the FEC.
- F. Start-up, test, and adjust new equipment. Authorized factory technicians shall start up equipment requiring testing and balancing, i.e. hoods, pulping systems, equipment with remote components, etc.
- G. All equipment that qualifies for factory startups will be coordinated by FEC and completed prior to equipment turn over to owner.
- H. IT SHALL BE THE RESPONSIBILITY OF THE FEC TO ENSURE THAT ALL START UPS ARE COMPLETED AND ANY RETURN TRIPS BY SERVICE AGENT TO FINISH DUE TO INCORRECT CONNECTIONS WILL BE PAID BY THIS CONTRACTOR.

PART 4 - LISTING OF FOODSERVICE EQUIPMENT

BROADWAY

4.1 Item 1 – 2 Door Roll In Refrigerator (Existing Item #E29 – Relocate) – One (1)

4.2 Item 2 – Sheet Pan Racks (Existing Item #E15 – Relocate) – One Lot (1 Lot)

4.3 Item 3 - Work Table – One (1) Required

- A. Custom Model by EMI size and shape as shown on drawing#26EB01. Approximately 36" X 96" X 34" high. Top to be constructed of a 14-gauge 304 stainless steel with S/S channel edge construction. "C" channel bracing cylindrical gussets and mastic sound deadening. 6" back splash at 90 degree and ¾ turn down enclosed back and ends.
- B. 1 5/8" OD stainless legs adjustable s/s flanged feet. 16-gauge under shelf the length of the table. Under Shelf to be welded to legs 10" AFF with S/S "C" Channel bracing.
- C. Provide Two (2) 20" X 20" stainless steel drawers as seen on drawing. Drawers to be double pan construction with HD S/S rollers bearing, integral pull handle, lock and cutting boards.. To be NSF & UL approved.

4.4 Item 4 - Double Batch Ventless Pizza Oven – One (1) Required

- A. TurboChef (Middleby) Model DOUBLE BATCH, 1P Dimensions: 23.2(h) x 27.7(w) x 31.7(d) HHD-9500-801 Double Batch™ Oven, electric, 1-phase ventless, countertop, stackable, (2) independent decks, store up to 800 recipes (400 per cavity), smart voltage sensor technology (North America only), internal catalytic converters, 16" pizza capacity per deck, (1) oven cleaner, (1) oven guard, (1) aluminum paddle, (2) trigger sprayers, (2) standard racks, (2) top & bottom jetplates, stainless steel front, top & sides, rubber seal for surface mounting, cULus, UL EPH Classified, TÜV, CE. Provide with the following:
 - 1. 1 ea. Model MDD-1001 1-year OK subscription, CW2 module (WiFi), no SAP
 - 2. 1 ea. One year parts and labor warranty
 - 3. 1 ea. (DOUBLE BATCH, 1P-1) 208/240v/60/1-ph, 50.0 amps, 8.32/9.6 kW, 6 ft. cord & plug (nominal), NEMA 6-50P, standard

4. 1 ea. Model 100014 Screen, Cooking, PTFE, Mesh, 12" x 12" (30.5 cm x 30.5 cm)
5. 6 ea. Model NGC-1478 Paddle, Aluminum, 12.3" x 13.6" (31.2 cm x 34.5 cm)
6. 1 ea. Model HHD-3019 Baking Stone, Fiber Reinforced, Double Batch and Single Batch Ovens, 18.12" x 16.15" x .375"

4.5 Item 4A -Double Batch Ventless Pizza Oven – (1) Future Item

4.6 Item 5 - Pizza Prep Unit (Existing item #E25 – Relocate) - One (1)

4.7 Item 6 - Mobile Proofer -One (1) Required

- A. Metro Model C539-CDC-U Dimensions: 71(h) x 27.63(w) x 31.5(d) Quick Ship - C5™ 3 Series Heated Holding & Proofing Cabinet, with Red Insulation Armour™, mobile, full height, insulated, Dutch clear polycarbonate doors, removable bottom mount control module, thermostat to 200°F, universal wire slides on 3" centers, adjustable on 1-1/2" increments (18) 18" x 26" or (34) 12" x 20" x 2-1/2" pan capacity, 5" casters (2 with brakes), aluminum, 120v/60/1-ph, 2000 watts, 16.7 amps, NEMA 5-20P, cULus, NSF. Supply with the following:
1. 1 ea. 1 year warranty against manufacturing defects
 2. 1 ea. Right hand hinging, standard

4.8 Item 7 - Hand Sink – One (1) Required

- A. Advance Tabco Model 7-PS-20 Dimensions: 13(h) x 17.25(w) x 17.25(d) Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, 20-gauge 304 stainless steel, with heavy duty deck mounted fixed faucet, basket drain, NSF, cCSAus. Provide with the following:
1. 1 ea. Model K-316-LU Wrist Handles Only, for splash or deck mount hand sink faucet (1 pair hot & cold 4" long blades), fits faucets supplied after November 2015 with hot & cold color rings that do not have exposed screw head
 2. 1 ea. Model 7-PS-10 P-trap, heavy duty, 1-1/2", 17 gauge

4.9 Item 8 – Work Table W/Sink – One (1) Required

- A. Custom Model by Marlo size and shape as shown on drawing#26EB01 Approximately 30" X 84" X 34" high. Top to be constructed of a 14-gauge 304 stainless steel with S/S channel edge construction. "C" channel bracing cylindrical gussets and mastic sound deadening. 6" back splash at 90 degree and ¾ turn down enclosed back and ends. 1 5/8" OD stainless legs adjustable s/s flanged feet. 16-gauge under shelf the length of the table. Under Shelf to be welded to legs 10" AFF with S/S "C" Channel bracing. (excluding sink section).
- B. Provide TWO (2) 20" X 20" stainless steel drawers as seen on drawing. Drawers to be double pan construction with HD S/S rollers bearing, integral pull handle, lock and cutting boards.
- C. One (1) 20" x 20" X 10" deep cove construction prep sink with twist handle waste with bracket and overflow. No under shelf at sink area. To be NSF & UL approved. Supply with the following:
1. 1 ea. T & S Brass Model B-0221-EE Mixing Faucet, deck mount, 12" swing nozzle, 8" centers on deck faucet with 1/2" IPS EE male inlets with adjustable flange, quarter-turn Eterna cartridges with spring checks, lever handles, low lead content, ADA Compliant
 2. 1 ea. T & Brass Model B-1100-KIT 24" Inlet Supply Hoses (3/8" Compression x 1/2" NPSM Female)

4.10 Item 9 – Spare Number

4.11 Item 10 - Mobile Hot Holding Cabinets – Three (3) Required

- A. Metro Model C539-CDC-U Dimensions: 71(h) x 27.63(w) x 31.5(d) Quick Ship - C5™ 3 Series Heated Holding & Proofing Cabinet, with Red Insulation Armour™, mobile, full height, insulated, Dutch clear polycarbonate doors, removable bottom mount control module, thermostat to 200°F, universal wire slides on 3" centers, adjustable on 1-1/2" increments (18) 18" x 26" or (34) 12" x 20" x 2-1/2" pan capacity, 5" casters (2 with brakes), aluminum, 120v/60/1-ph, 2000 watts, 16.7 amps, NEMA 5-20P, cULus, NSF . Provide each with the following:
1. 1 ea. 1 year warranty against manufacturing defects
 2. 1 ea. Right hand hinging, standard

4.12 Item 11 – Breath Protector – One (1) Required

- A. Premier Metal & Glass Model TM2N-A-EXT – Per drawing #160965 -1" OD Gearless Adjustable Food Shield With Top Shelf And Rear Supports; 3/8" Clear Tempered Glass With Polished Edges And Radius Corners; Both End Panels Included (Squared); 644b-3/1 Surface Mounting Option; No Heat/Light Included; Brushed Stainless Finish; Approx 70" CI Length; Approx 182 Lbs. Ea. (2 End Supports) Fully Adjustable Guard "Box" Style With No Slant Single Tier No Heat Or Light To Protect Item 11
1. FEC to ship to Piper for factory installation

4.13 Item 12 – Solid Top Unit – One (1) Required

- A. Piper Products/Servolift Eastern Model 5-ST Per drawing #8331Dimensions: 36(h) x 74(w) x 28(d) Elite Utility Serving Counter, 74"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters, NSF . Provide with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
 3. 1 ea. Model FLP Filler Strips, for Elite systems
 4. 1 ea. Model HD-74 Hinged doors for (5) openings Elite system
 5. 1 ea. Model LD Locks, for doors for Elite system
 6. 1 ea. Model FRMAD-74 Formica laminate with doors, for Elite systems FEC to coordinate color selections with Architect
 7. 1 ea. Model SCB-8-74 Cutting Board for Elite system, 8", for (5) openings - 74"W, stainless
 8. 1 ea. Model SRTS-74 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (5) openings - 74"W
 9. 1 ea. Model INSTALL PACKAGE INSTALL PACKAGE - to include cut-out in the counter top, install for the drop-in provided by FEC, electrical hook-up, reinforced top, and louvered panels if required. ***Drop-in ALTO-SHAAM 500-HWI/D6 (208V/60/1PH/10.8AMPS/NEMA 6-15P) to be provided by FEC.*** ITEM 13
 10. 1 ea. Model PG MOUNT Mounting of other manufacturer's sneeze guard. ITEM 11 TM2N-A-EXT GUARD
 11. ***ELECTRICAL TO EXIT OPERATOR RIGHT BACK LEG.***

4.14 Item 13 – 5 Well Hot Food Unit – One (1) Required

- A. Alto-Shaam Model 500-HWI/D6 Dimensions: 9.31(h) x 66.81(w) x 23.19(d) Halo Heat® Hot Food Well Unit, Drop-In, Electric, (5) 12" x 20" full-size pan capacity (pans NOT included), 6-3/8" deep well, holds 6" deep pans, includes (10) half/third-size divider bars, (5) individual adjustable thermostatic controllers, stainless steel construction, EcoSmart®, cULus, UL EPH Classified, CE, IPX3, TUV NORD. Provide with the following:

1. 1 ea. 208-240v/50/60/1-ph, 10.8-12.5 amps, 2.3-3.0kW, 9 ft. cord, NEMA 6-15P
2. 1 ea. Cord located on back of control box, standard
3. FEC to ship to Piper for factory installation

4.15 Item 14 - Mobile Tray Lowerators – One Lot (1 Lot) Required

- A. Piper Products/Servolift Eastern Model PT/1014MO Dimensions: 36.13(h) x 14.94(w) x 18.5(d) Mobile Tray Dispenser, solid bottom, self-leveling, single stack, holds (150) 10-3/4" x 15-1/8" trays, with corner bumpers, stainless steel all tubular frame, NSF . Provide each with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 st Model -WB Wheel brakes (set of 2)
 3. FEC to verify tray size with Owner

4.16 Item 15 Solid Top Unit – One (1) Required

- A. Piper Products/Servolift Eastern Model 2-ST-MOD Pre Drawings #8331 Dimensions: 36(h) x 32(w) x 28(d) Elite Utility Serving Counter, 32"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters, NSF, MODIFIED TO 30"L. Provide with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
 3. 1 ea. Model FLP Filler Strips, for Elite systems
 4. 1 ea. Model HD-30 Hinged doors for (2) openings Elite system
 5. 1 ea. Model LD Locks, for doors for Elite system
 6. 1 ea. Model FRMAD-30 Formica laminate with doors, for Elite systems FEC to coordinate color selection with Architect
 7. 1 ea. Model SRTS-30 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (2) openings - 32"W

4.17 Item 16 - Solid Top Unit– One (1) Required

- A. Piper Products/Servolift Eastern Model 6-ST Pre Drawing #8331 Dimensions: 36(h) x 88(w) x 28(d) Elite Utility Serving Counter, 88"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters. NSF Provide with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
 3. 1 ea. Model FLP Filler Strips, for Elite systems
 4. 1 ea. Model HD-88 Hinged doors for (6) openings Elite system
 5. 1 ea. Model LD Locks, for doors for Elite system
 6. 1 ea. Model FRMAD-88 Formica laminate with doors, for Elite systems FEC to coordinate color selection with Architect
 7. 1 ea. Model SRTS-88 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (6) openings - 88"W
 8. 1 ea. Model INSTALL PACKAGE INSTALL PACKAGE - to include cut-out in the counter top,
 9. install for the drop-in provided by FEC , electrical hook-up, reinforced top, and louvered panels if required. ***Drop-in HATCO GR5B-72-I (120V/60/1PH/12AMPS/NEMA 5-15P) to be provided by FEC.*** ITEM 17

10. 1 ea. Model PG MOUNT Mounting of other manufacturer's sneeze guard. ITEM 19 TM2N-A-EXT GUARD
11. ***ELECTRICAL TO EXIT OPERATOR RIGHT BACK LEG.***

4.18 Item 17 – Heated Shelf – One (1) Required

- A. Hatco Model GRSB-72-I Dimensions: 2.88(h) x 73.5(w) x 21(d) Glo-Ray® Drop In Heated Shelf with Recessed Top, 73-1/2" x 21", 1/2" deep recessed surface area, hardcoat aluminum top, control thermostat, illuminated on/off switch & mounting bracket, NSF, CE, cUL, UL, UL EPH Classified, CSA. Provide with the following:
 1. 1 ea. NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
 2. 1 ea. 1-Yr Warranty on Blanket Heating Elements against burnout, standard
 3. 1 ea. 120v/60/1-ph, 1440 watts, 12.0 amps, NEMA 5-15P (domestic voltage), standard
 4. 1 ea. NOTE: Recommended for use in metallic countertop, verify that the material is suitable for temperatures up to 200 degree F
 5. 1 ea. Thermostat control with lighted rocker switch (available at time of purchase only), standard
 6. FEC to ship to Piper for factory installation

4.19 Item 18 – Spare Number

4.20 Item 19 – Breath Protector – One (1) Required

- A. Premier Metal & Glass Model TM2N-A-EXT – Per Drawing #160965 - 1" OD Gearless Adjustable Food Shield With Top Shelf And Rear Supports; 3/8" Clear Tempered Glass With Polished Edges And Radius Corners; Both End Panels Included (Squared); 644b-3/1 Surface Mounting Option; No Heat/Light Included; Brushed Stainless Finish; Fully Adjustable Guard "Box" Style With No Slant Single Tier Tier No Heat Or Light To Protect Item 17
 1. FEC to ship to Piper for factory installation

4.21 Item 20 – Mobile Warming Cabinets (Existing Item #E42 – Relocate) – Two (2)

4.22 Item 21 – Hot Sandwich Slide – One (1) Required

- A. Hatco Model HXMS-48D Dimensions: 32.71(h) x 51.9(w) x 28.13(d) Slant Heated Merchandiser with LED Lighting Warmer, 48" W, countertop, dual shelf, (18) divider rods, (4) bulbs per shelf, thermostat, infrared heat, hardcoat aluminum base, tempered side glass hinged to post . Provide with the following:
 1. 1 ea. NOTE: Includes 24/7 parts & service assistance, call 414-671-6350
 2. 1 ea. One year on-site parts & labor warranty, plus one additional year parts only warranty on all Glo-Ray metal sheathed elements
 3. 1 ea. 120/208v/60/1-ph, 2900 watts, 12.1 amps, NEMA L14-20P (domestic voltage), standard
 4. 1 ea. Model BLACK Black, designer color (available at time of purchase only)
 5. 1 ea. NOTE: Flip door not available for both front & rear configurations
 6. 1 ea. NOTE: Flip door not available for both front & rear configurations
 7. FEC to coordinate with Piper

4.23 Item 22 – Solid Top Unit – One (1) Required

- A. Piper Products/Servolift Eastern Model 4-ST Per drawing #8331Dimensions: 36(h) x 60(w) x 28(d) Elite Utility Serving Counter, 60"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters, NSF Provide with the following:

1. 1 ea. 1 year warranty parts and labor
2. 1 ea. Model SOUT SINGLE RECEPTACLE (L14-20R) FOR ITEM 21 DISPLAY MERCHANDISER
3. 1 ea. Model CWB Cut out with bushing for cords & wires - FOR ITEM 21 DISPLAY MERCHANDISER ITEM 21 HATCO HXMS-48D DISPLAY MERCHANDISER TO SIT ATOP COUNTER - PROVIDED BY AND INSTALLED BY FEC. **
4. 1 ea. Model FLP Filler Strips, for Elite systems
5. 1 ea. Model HD-60 Hinged doors for (4) openings Elite system
6. 1 ea. Model LD Locks, for doors for Elite system
7. 1 ea. Model FRMAD-60 Formica laminate with doors, for Elite systems FEC to coordinate color with the Architect
8. 1 ea. Model SRTS-60 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (4) openings - 60"W

4.24 Item 23 - 3 Well Hot / Cold Unit – Two (2) Required

- A. Duke Manufacturing Model HCF-3 Dimensions: 25.94(h) x 48.82(w) x 25.5(d) Hot/Cold/Freeze Drop-In Food Well Unit, 48-13/16"W x 25-1/2"D x 25-13/16"H, flush mount pans, (3) 12" x 20" individual pan, individual wired remote digital controls for hot or cold operation, individual drain, 10 ft. cord & plug, cULus, UL EPH Classified. Provide each with the following:
1. 1 ea. Model HCF-3-208 120/208v/60/1-ph, 18.4 amps, NEMA L14-30P
 2. FEC to ship to Piper for factory installation

4.25 Item 24 – Breath Protector – Two (2) Required

- A. Premier Metal & Glass Model TM2N-A- Per drawing # 160965 -1" OD Gearless Adjustable Food Shield With Top Shelf And Rear Supports; 3/8" Clear Tempered Glass With Polished Edges And Radius Corners; Both End Panels Included (Squared); 644b-3/1 Surface Mounting Option; No Heat/Light Included; Brushed Stainless Finish; Approx 55" CI Length; Approx 182 Lbs. Ea. (2 End Supports) B. Fully Adjustable Guard "Box" Style With No Slant Single Tier Tier No Heat Or Light To Protect Item 23
1. FEC to ship to Piper for factory installation

4.26 Item 25 – Solid Top Unit - One (1) Required

- A. Piper Products/Servolift Eastern Model 4-ST Per drawing #8331 Dimensions: 36(h) x 60(w) x 28(d) Elite Utility Serving Counter, 60"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters, NSF . Provide with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model FLP Filler Strips, for Elite systems
 3. 1 ea. Model HD-60 Hinged doors for (4) openings Elite system
 4. 1 ea. Model LD Locks, for doors for Elite system
 5. 1 ea. Model FRMAD-60 Formica laminate with doors, for Elite systems FEC to coordinate color selections with the Architect
 6. 1 ea. Model SRTS-60 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (4) openings - 60"W
 7. 1 ea. Model INSTALL PACKAGE INSTALL PACKAGE - to include cut-out in the counter top, install for the drop-in provided by FEC , electrical hook-up, reinforced top, and louvered panels if required. ***Drop-in DUKE HCF-3 (120/208V/60/1PH/18.4AMPS/NEMA L14-30P) to be provided by FEC.*** ITEM 23
 8. 1 ea. Model PG MOUNT Mounting of other manufacturer's sneeze guard. ITEM 24 TM2N-A-EXT GUARD
 9. ***ELECTRICAL TO EXIT OPERATOR RIGHT BACK LEG.***

4.27 Item 26 – Solid Top Unit - One (1) Required

- A. Piper Products/Servolift Eastern Model 4-ST Per Drawing #8331 Dimensions: 36(h) x 60(w) x 28(d) Elite Utility Serving Counter, 60"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters, NSF Provide with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model FLP Filler Strips, for Elite systems
 3. 1 ea. Model HD-60 Hinged doors for (4) openings Elite system
 4. 1 ea. Model LD Locks, for doors for Elite system
 5. 1 ea. Model FRMAD-60 Formica laminate with doors, for Elite systems FEC to coordinate color selection with Architect
 6. 1 ea. Model SRTS-60 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (4) openings - 60"W
 7. 1 ea. Model INSTALL PACKAGE INSTALL PACKAGE - to include cut-out in the counter top, install for the drop-in provided by FEC, electrical hook-up, reinforced top, and louvered panels if required. ***Drop-in DUKE HCF-3 (120/208V/60/1PH/18.4AMPS/NEMA L14-30P) to be provided by others.*** ITEM 23
 8. 1 ea. Model PG MOUNT Mounting of other manufacturer's sneeze guard. ITEM 24 TM2N-A-EXT GUARD ***ELECTRICAL TO EXIT OPERATOR RIGHT BACK LEG.***

4.28 Item 27 - Spare Number

4.29 Item 28 – Utility Carts (Existing Item #E1 - Relocate) – One Lot (1 Lot)

4.30 Item 29 – 2 Tier Hot / Cold Unit – One (1) Required

- A. Duke Manufacturing Model HF91-2-HFL-HFL Dimensions: 45.25(h) x 92.88(w) x 24(d) HotFrost™ Hot Frost Shelf Merchandiser, 2-tier hot/cold switchable food display, drop-in unit, 93"W x 24"D, fits (3) 18 x 26" pan per tier, individually controlled tiers, programmable color touch screen control, stainless steel body and shelves, self-contained refrigeration, 120-208v/60/1 phase, 26.8 amps, NEMA 14-50P. Provide with the following:
1. FEC to ship to Piper for factory installation

4.31 Item 30 – Solid Top Unit - One (1) Required

- A. Piper Products/Servolift Eastern Model 6-ST-MOD Per Drawing #8331 Dimensions: 36(h) x 88(w) x 28(d) Elite Utility Serving Counter, 88"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters, NSF, MODIFIED TO 98"L TO ACCOMMODATE ITEM 29 DUKE DROP-IN Provide with the following:
1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
 3. 1 ea. Model FLP Filler Strips, for Elite systems
 4. 1 ea. Model HD-98 Hinged doors for (6) openings Elite system
 5. 1 ea. Model LD Locks, for doors for Elite system
 6. 1 ea. Model FRMAD-98 Formica laminate with doors, for Elite systems FEC to coordinate color selection with the Architect
 7. 1 ea. Model SCB-8-98 Cutting Board for Elite system, 8", for (6) openings - 88"W, stainless
 8. 1 ea. Model SRTS-98 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (6) openings -

88"W

9. 1 ea. Model INSTALL PACKAGE INSTALL PACKAGE - to include cut-out in the counter top, install for the drop-in provided by FEC, electrical hook-up, reinforced top, and louvered panels if required. ***Drop-in DUKE HF91-2-HFL-HFL (120/208V/60/1PH/26.8AMPS/NEMA 14-50P) to be provided by FEC.*** ITEM 29

4.32 Item 31– Spare Number

4.33 Item 32 - 2 Door Roll In Refrigerator – One (1) Required

- A. Continental Refrigerator Model D2RINSA Designer Line Refrigerator, roll-in, two-section, self-contained refrigeration, stainless steel exterior, aluminum interior, standard depth cabinet, full-height solid doors, electronic controller w/ digital display, removable stainless steel ramps, electronic controller w/ digital display, ENERGY STAR®. Provide with the following:
 1. 1 ea. Standard warranty: 7 year parts, labor, and compressor
 2. 1 ea. 115v/60/1-ph, cord & plug standard
 3. 1 ea. Left Door hinged on left & right door hinged on right, standard
 4. 1 ea. Stainless steel case back including rear grill & concealed drain

Item 33 – Ice Cream Merchandisers – Two (2) Required

- B. Master-Bilt Products Model MSC-41AA Dimensions: 33.5(h) x 39.5(w) x 27.5(d) COLDIN-3™ Display Freezer, 9.7 gross cu. ft., curved tempered glass sliding lids, (4) standard baskets, (4) basket dividers, external analog thermometer and lock, white zinc-coated enamel steel exterior, painted white steel interior with LED lighting, defrost water drain, temperature range -18° to 10°F (-27° to -12° C), self-contained refrigeration, heavy duty 2" casters, R290 Hydrocarbon refrigerant, 3/8 hp, 115v/60/1-ph, 1.4 amps, 6-1/2' cord, NEMA 5-15P, cETLus, ETL-Sanitation. Provide with the following:
 1. 1 ea. 1 year parts and labor warranty

4.34 Item 34 - Solid Top Unit – One (2) Required

- A. Piper Products/Servolift Eastern Model 2-ST Per Drawing#8331 Dimensions: 36(h) x 32(w) x 28(d) Elite Utility Serving Counter, 32"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18 gauge stainless steel undershelf, 5" casters, NSF . Provide with the following:
 1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model SOUT SINGLE RECEPTACLE (5-15R) FOR ITEM 33 DISPLAY FREEZER
 3. ITEM 33 MASTER-BILT MSC-41AA DISPLAY FREEZER - PROVIDED BY AND INSTALLED BY FEC. **
 4. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
 5. 1 ea. Model FLP Filler Strips, for Elite systems
 6. 1 ea. Model HD-32 Hinged doors for (2) openings Elite system
 7. 1 ea. Model LD Locks, for doors for Elite system
 8. 1 ea. Model FRMAD-32 Formica laminate with doors, for Elite systems
 9. 1 ea. Model SRTS-32 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (2) openings - 32"W, OPERATOR LEFT
 10. 1 ea. Model ME Mitered end for tray slide for Elite system

4.35 Item 35 – Silverware Units – Two (2) Required

- A. Steril-Sil Model TC-6 two row Silverware Dispenser, (6) hole, stainless steel. Provide each with the following:

1. 6 ea. Model S-500 Stainless Steel Silverware Cylinders

4.36 Item 36 - Mobile Sheet Pan Racks – Two (2) Required

- A. Channel Model WS02 Bun Pan Rack, Walk-In, Stainless Series, 20.5"W x 26"D x 64"H, Stainless Steel Construction, End Load, 2" Angle Spacing, (27) 18" x 26" or (54) 13" x 18" pans (2 per shelf), 5" Swivel Plate Casters model # CPS45U, Made in USA, NSF, 70lbs. (ITEM WEIGHT ONLY), weight does not include 50 lbs. for pallet weight

4.37 Item 37 – Cash Registers (Existing Item #E10 – Relocate) – One Lot (1 Lot)

4.38 Item 38 – Cashier Station – One (1) Required

- A. Piper Products/Servolift Eastern Model 2-CD-MOD Per Drawing #8331 Dimensions: 36(h) x 30(w) x 28(d) Elite Cashier's Serving Counter, 30"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top with register cord hole, 20 gauge stainless steel front & end panels, 5" casters, MODIFIED TO HAVE UTILITY DRAWER (NO LOCKING CASH DRAWER). Provide with the following:
 1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model DOUT Duplex Outlet, 120V for Elite system
 3. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
 4. 1 ea. Model FLP Filler Strips, for Elite systems
 5. 1 ea. Model TFR Tubular foot rest-cashier unit, Elite systems
 6. 1 ea. Model FRMA-30 Formica laminate without doors, for Elite systems FEC to coordinate color selections with Architect
 7. 1 ea. Model SRTS-30 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (2) openings - 30"W, OPERATOR LEFT

4.39 Item 39 – Cashier Station – One (1) Required

- A. Piper Products/Servolift Eastern Model 2-CD-MOD Per Drawing #8331 Dimensions: 36(h) x 30(w) x 28(d) Elite Cashier's Serving Counter, 30"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top with register cord hole, 20 gauge stainless steel front & end panels, 5" casters, MODIFIED TO HAVE UTILITY DRAWER (NO LOCKING CASH DRAWER). Provide with the following:
 1. 1 ea. 1 year warranty parts and labor
 2. 1 ea. Model DOUT Duplex Outlet, 120V for Elite system
 3. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
 4. 1 ea. Model FLP Filler Strips, for Elite systems
 5. 1 ea. Model TFR Tubular foot rest-cashier unit, Elite systems
 6. 1 ea. Model FRMA-30 Formica laminate without doors, for Elite systems FEC to coordinate color selections with Architect
 7. 2 ea. Model SRTS-30 Trayslide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (2) openings - 30"W,

4.40 Item 40 – Solid Top Unit – One (1) Required

- A. Piper Products/Servolift Eastern Model 2-ST Per Drawing #8331 Dimensions: 36(h) x 32(w) x 28(d) Elite Utility Serving

Counter, 32"L x 36"H, mobile modular design with interlocking mech., 14 gauge stainless steel top, 20 gauge stainless steel front & end panels, 18-gauge stainless steel undershelf, 5" casters, NSF. Provide with the following:

1. 1 ea. 1 year warranty parts and labor
2. 1 ea. Model SOUT SINGLE RECEPTACLE (5-15R) FOR ITEM 33 DISPLAY FREEZER
3. ** ITEM 33 MASTER-BILT MSC-41AA DISPLAY FREEZER - PROVIDED BY AND INSTALLED BY FEC
4. 1 ea. Model JC Unit to include 14 gauge stainless steel "J" channel cord chase to keep cords for interconnected wired units (IWU) off the floor
5. 1 ea. Model FLP Filler Strips, for Elite systems
6. 1 ea. Model HD-32 Hinged doors for (2) openings Elite system
7. 1 ea. Model LD Locks, for doors for Elite system
8. 1 ea. Model FRMAD-32 Formica laminate with doors, for Elite systems FEC to coordinate color selection with Architect
9. 1 ea. Model SRTS-32 Tray slide for Elite system, 12" solid ribbed, heavy gauge stainless steel, for (2) openings - 32"W
10. 2 ea. Model ME Mitered end for tray slide for Elite system

4.41 Item 41 – Milk Cabinet – One (1) Required

- A. Continental Refrigerator Model MC5NSSD Dimensions: 47(h) x 58(w) x 33(d) Milk Cooler, 58" long, dual access, forced air cooling, (16) 13" x 13" x 11" or (10) 19" x 13" x 11" crate cap., stainless steel interior & exterior, electronic controller w/digital display, (4) locking swivel casters, ENERGY STAR®. Provide with the following:
1. 1 ea. Standard warranty (for the United States & Canada Only): 7 year parts, labor, and compressor
 2. 1 ea. 115v/60/1-ph, cord, NEMA 5-15P, standard

4.42 Item 42 – Refrigerated Merchandiser – One (1) Required

- A. Federal Industries Model ECSS40SC Dimensions: 60(h) x 40(w) x 41(d) Specialty Display End Cap Refrigerated Self-Serve Merchandiser, 40"W x 41"D x 60"H, self-contained refrigeration with condensate pump, adjustable temperature control, 3500K LED top & undershelf lighting, (3) tiers of adjustable black metal shelves with price tag molding, curved air deflector, black metal base, black interior & canopy, choice of laminate, 1 HP, cULus, UL EPH Classified, Made In USA, DOE 2017 compliant Provide with the following:
1. 1 ea. One year parts & labor warranty, standard
 2. 1 ea. Self-contained refrigeration, standard
 3. 1 ea. 208-230v/60/1-ph, 1 hp, 20.0-amp circuit
 4. 1 ea. Cord and plug.
 5. 1 ea. Condensate Evaporator Assembly (field Installed by FEC), requires 120V/1PH - 15A.
 6. 1 ea. Five year compressor warranty, standard (for self-contained units only)
 7. 1 ea. Laminate special color (Formica/Wilsonart) standard offerings -FEC to coordinate color selections with Architect

4.43 Existing Equipment Removals:

- A. It is the responsibility of this contractor to fully remove all existing food service equipment from the High School servery, this includes existing millwork counters (electric, plumbing & HVAC disconnections by related trades). Refer to 3.3 of this specification for existing equipment requirements.
1. FEC to provide list to owner for sign off on all equipment being removed and disposed of prior to removing from the building.
 2. It is the responsibility of this contractor to fully remove existing equipment that will not be reused.

4.44 Reused Existing Equipment:

- A. This Kitchen Equipment Contractor (KEC) shall be responsible for identifying, tagging and/or removing all existing equipment, which will be reused. Verify and coordinate specific equipment with these plans and specifications, and the Owner. This shall include items existing, and the associated work necessary, at the time of the signing of the Contract for the Foodservice Equipment section; and shall not include any item(s) added, changed, or damaged (by other than the Kitchen Equipment Contractor (KEC)) after the signing; except to the extent of work which would have been included with the original existing item(s).
- B. Remove from existing locations, clean and renovate as noted below, store and re-install existing equipment to be reused, in the new locations as shown on plans; ready for utility connections, as appropriate. Existing equipment to be reused, with utility connections, shall be removed after disconnection as noted in below paragraph.
- C. Do work in cooperation with Owner, so that normal functioning of services is minimally interrupted. Coordinate all removal and replacement scheduling with the Construction Scheduling Manager (or similar responsible party), to ensure adequate time to complete the necessary work. If adequate time to properly relocate and reset the existing items and complete all cleaning and repair will not be available, due to continuing use of the existing item(s), or the allotted construction time; contact the Owner and obtain a written agreement as to what work is to be deleted or delayed; such as cleaning, repainting, or repairs.
- D. All surface dirt, grease, oil, food residues, ingredients, extraneous matter and other soiling materials shall be removed in order to obtain minimum acceptable sanitation and food service standards. Through final rinsing of all cleaning agents shall be at a minimum temperature of 180 degrees F where possible without damage to equipment or controls. Otherwise, use USDA approved cleaning agents and/or cleaning agents, which are acceptable for use with commercial food service equipment. This shall include all exterior surfaces of the existing equipment to be reused, and interior work surfaces such as inside oven compartments, fryer vats, ware washers, etc.
- E. All painted items with major paint blemishes shall be sanded, primed, and repainted to match the original color and type paint. Primer and paint shall be of a type approved for use with commercial food service equipment. All controls, lights, view windows, non-painted parts, etc. shall be protected as recommended by the Manufacturer. Minor paint blemishes shall be touched up in a professional manner. This work shall be included in the Bid Submittal, as a separate line cost, at the end of the Bid Submittal.
- F. Replace or repair minor broken parts to produce a cleanable and functional item, where possible. Repairs and/or parts shall be for minor required items such as control knobs, handles, pilot lamps, belts, oil changes, minor adjustments and recalibrations, etc. This shall not include addition or replacement of any wearing components such as cutters, blades, etc.; or any accessory components such as mixer beaters, hooks, whips, etc., except for presently existing accessory components which are broken and nonfunctional, or as noted in the itemized specifications.

4.45 Existing Conditions:

- A. It is the responsibility of this contractor to fully review the existing conditions of the building and the new kitchen. This contractor shall be familiar with access to the kitchen location, including equipment access by elevators, stairwells, corridors, openings, including access around the exterior of the building for a crane or hoisting equipment (if required). It will be the responsibility of this contractor to coordinate equipment installation with the owner, CM, GC, etc.

4.46 Plumbing of Equipment

- A. The plumbing and food service equipment contractors are to comply with 1370-a and 1110, Subpart 67-4 of Title 10 (Health) of the Official Compilation of Codes, Rules and Regulations of the State of New York. All outlet fixtures used for drinking or cooking shall be tested by Owner prior to being put into service. All test results in exceedance of the action level shall require the fixture to be replaced until satisfactory test results are obtained at no additional cost to Owner."

PART 5 - DETAILS OF CONSTRUCTION

5.1 DETAIL DRAWINGS

- A. The following details are a part of these specifications and shall be referred to for additional design requirements: BW-F1.0, BW-F1.1, BW-F1.2 & BW-F1.3

END OF SECTION 11 40 00

SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basketball backboards, goals, and support framing.
- B. Gym divider curtains.

1.2 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel Framing: Structural members supporting basketball systems.
- B. Section 05 21 00 - Steel Joist Framing: Building framing supporting backstops.
- C. Section 26 05 83 - Wiring Connections.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- B. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- D. NCAA (BR) - Men's and Women's Basketball Rules and Interpretations; current edition.
- E. NFHS (Guide) - Court and Field Diagram Guide; current edition.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.
- H. International Basketball Federation: FIBA-Official Basketball Rules for Men and Women.
- I. Underwriters Laboratories Inc.: UL - Electrical Construction Equipment Directory.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.
- C. Coordination:
 - 1. Coordinate layout of backstops and support framing with the following to avoid interferences:
 - a. HVAC equipment, ductwork, outlets, and inlets.
 - b. Lighting.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Electrical characteristics and connection locations.
 - 2. Fire rating certifications.
 - 3. Manufacturer's installation instructions.
 - 4. Colors available.
 - 5. Submit general construction, component connections and details, wiring diagram and electrical equipment.
- C. Shop Drawings: For custom fabricated equipment indicated, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.
 - 1. Shop drawings and calculations shall be signed and sealed by Professional Engineer, licensed in the State of New York.
 - 2. Plan of gymnasium at 1/8" scale. Indicate size and location of backstops and Gymnasium Dividers.
 - a. Show operable backstops in fully extended and retracted positions.
 - 3. Indicate operator locations and mounting details. Include wiring diagrams for electric operators and controls.
 - 4. Indicate magnitude and location of loads imposed on building framing.
- D. Erection Drawings: Detailed dimensional requirements for proper location of equipment.
- E. Samples: Submit samples of pads, coverings and roll-up curtain fabrics in manufacturer's available range of colors.
- F. Operating and maintenance data for each operating equipment item.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Operation and Maintenance Data: Include the following:
 - 1. Description of method of operation and motor control system.
 - 2. Parts catalog with complete list of replacement parts.
 - 3. Lubrication requirements and frequency, and periodic adjustments required.
 - 4. Schematic wiring diagrams of installed electrical equipment.
- C. Certificates: Affidavit, signed by the Company field advisor and notarized, certifying that the equipment meets the contract requirements and is operating properly.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified with minimum 10 years of experience.
- C. Manufacturer shall be represented by a local agency to provide maintenance and service of specified equipment.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached. Inspect for damage.

- B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.
- C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Gymnasium Equipment:
 - 1. Draper, Inc www.draperinc.com/#sle.
 - 2. Performance Sports Systems: www.perfsports.com/#sle.
 - 3. Porter Athletic Equipment Company: www.porterathletic.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 GENERAL REQUIREMENTS

- A. See drawings for sizes and locations, unless noted otherwise.
- B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
 - 1. NFHS (Guide) - National Federation of State High School Associations sports rules.
- C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.
- D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
- E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.
- F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.3 GYMNASIUM DIVIDER CURTAINS

- A. Gymnasium Divider Curtains:
 - 1. Curtain Material: Class A rated, self-extinguishing vinyl coated polyester complying with NFPA 701.
 - 2. Upper Section: 9 oz/sq yd vinyl mesh fabric.
 - 3. Lower Section: 18 oz/sq yd solid vinyl coated polyester.
 - 4. Travel: Rolling Action Shall be from the middle of curtain, and shall be achieved without use of belts or cables..
 - 5. Controls: Provide key lock, 3- Position, momentary contact wall control switch to lower, raise and stop gymnasium divider. Provide with switch box and plastic cover plate..
 - 6. Width: As indicated on drawings.
 - 7. Operation:
 - a. Electric Operator: 12 inches per second traveling speed; adjustable friction clutch brake actuated by solenoid controlled motor starter; enclosed limit switch; enclosed magnetic reversing starter.

- b. The electric device controlling the operation of the partition shall be capable of being reversed at any point in the extend, retract, or stack travel cycle.
- c. Control Station: Two standard keyed, tamper-proof, three button constant pressure type; 24 volt circuit, wired in series; surface mounted.
 - 1) Control stations shall be located at opposite ends of, on opposite sides of, and in view of the curtain so as to require simultaneous activation of both control stations to operate the partition.
 - 2) Key switch prepared for mortise lock cylinder.
 - 3) Key switches alike.
 - 4) Control stations shall have prominently posted signage at each regarding safe and proper operation and supervision:

CAUTION

ELECTRICALLY POWERED PARTITION

Only Appropriately Trained Staff may operate this partition.

Control stations must be attended by staff members while the partition is in motion.

Staff members must stand on opposite sides of the opening or closing partition.

Students must stay away from the partition when in motion.

- d. Safety Features:
 - 1) Limit Switches: Automatic type, at both extremes of travel, to prevent over-travel.
 - 2) Emergency Release: Mechanism to disengage motor drive system and permit manual operation.
 - 3) Devices that will stop the forward motion of the partition when a body or object passes between the leading edge of curtain and a wall or other termination point, that will stop curtain movement prior to an occupant reaching the curtain.
 - (a) Devices shall provide full coverage, using multiple devices if required, and located such that no occupant may pass over or under the sensing range to avoid detection.
 - (b) Devices may include, but is not limited to:
 - (1) Beam type sensors with sending and receiving devices.
 - (2) Motion detection sensors.
 - 4) Devices that will stop the backward motion of the curtain, stopping the stacking motion when a body or object is within or enters the stacking area of partition.
 - (a) Devices shall provide full coverage, using multiple devices if required, and located such that no occupant may pass over or under the sensing range to avoid detection.
 - (b) Devices within the pocket area may include, but is not limited to:
 - (1) Beam type sensors with sending and receiving devices.
 - (2) Motion detection sensors.
 - (3) Pressure or weight sensitive mats.
 - (4) Heat detection sensors.
 - 5) All sensing devices shall be required to be manually reset.
 - 6) Provide Draper Model 503229 Aut-O-Loc™ 2 safety device. Aut-O-Loc™ 2 to be sensitive to automatically lock divider curtain in position at any time during storage or operation. Aut-O-Loc™ 2 is permanently locked when a load of more than [1000 pounds] [453.6 kg] of force is captured and will not be functional after it has caught a significant load to prevent possible re-use and failure of critical components that are stressed when the unit engages a load.
 - 7) Safety Strap
- 8. Manufacturers:
 - a. Draper, Inc; Mid-Roll Divider (Basis of Design): www.draperinc.com/#sle.
 - b. IPI by Bison, Inc; IP850 Fold Up Curtains: www.ipibybison.com/#sle.
 - c. Porter Athletic Equipment Company: www.porterathletic.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 BASKETBALL

- A. Basketball System: Backstop assembly, backboard, and goal.
 - 1. Provide system components from a single source manufacturer for design and functional compatibility.
 - 2. Manufacturers:
 - a. Draper, Inc; TF-20 (Basis of Design): www.draperinc.com/#sle.
 - b. IPI by Bison, Inc: www.ipibybison.com/#sle.
 - c. Porter Athletic Equipment Company: www.porterathletic.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
 - 1. Framing: Fully welded Center strut; forward folding; front-braced framing.
 - a. Support steel and fittings anchored to overhead structural framing members with adjustable hangers for precise plumbing of backstop.
 - b. Heavy structural steel weldment at center strut for goal direct-through-backboard attachment to eliminate strain on backboard.
 - c. Brace assembly shall lock in place upon deployment, and be automatically released by cable hoist during retraction.
 - 2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
 - a. Hoist shall be capable of holding backstop at any position.
 - b. Motor: 3/4 hp with key switch control.
 - 1) Provide key switches master keyed to school's system. Gang one half of total switches together in two locations (one each side of the folding partition). Coordinate switches with operable partition contractor.
 - 3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
 - 4. Framing Color: As selected from manufacturer's standard selection.
 - 5. Backboard Type: Rectangular Glass backstop
 - 6. Safety Belt and Lock:
 - a. Provide each backstop with a safety belt and lock test to withstand 1750 lbs free fall load.
 - b. Safety lock: Inertia sensitive to automatically lock backstop in position at any time during storage, raising or lowering. Sudden increase in either tension or speed shall activate lock.
 - c. Safety Belt: 2 inch wide nylon belt rated at 6000 lbs breaking strength.
- C. Backboards: Tempered glass, rectangular shaped.
 - 1. Conform to all NCAA (BR) and NFHS (Guide) requirements.
 - 2. Frame: Brushed aluminum edge, steel mounting.
 - 3. Dimensions: 42 inches high by 72 inches wide
 - 4. Markings: Integrally manufactured.
 - 5. Provide safety padding for bottom edge of backboard.
 - 6. Provide mounting kit.
 - 7. Color: As selected from manufacturer's standard selection.
 - 8. Manufacturers: Same as backstop assembly.
- D. Breakaway Goals: Steel rim, mounted to backboard, with attached nylon net; complete with shock absorption feature and mounting hardware.
 - 1. Regulation 5/8 inch cold drawn alloy steel, formed to 18 inch inside diameter ring. Inside diameter of ring shall be positioned 6 inches from face of backboard.
 - 2. Rim shall be rigidly braced by means of formed, die cut steel braces on underside for maximum support.
 - 3. Net Attachment Device: Tube-tie.
 - 4. Finish: Powder coat orange.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.
- C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.
- D. Verify that electrical services are correctly located and have proper characteristics.
- E. Verify building structural frame and wall surfaces are ready to receive equipment.
- F. Verify finishing operations, including painting, are complete before installing equipment.

3.2 INSTALLATION

- A. Install in accordance with contract documents approved shop drawings and manufacturer's instructions.
- B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.
- C. Install equipment rigid, straight, plumb, and level.
- D. Secure equipment with manufacturer's recommended anchoring devices.
- E. Separate dissimilar metals to prevent electrolytic corrosion.
- F. Install backstops in accordance with NCAA and NFHS requirements.
- G. Coordinate installation schedule with the schedules of other trades to ensure orderly and timely progress of the total work.
- H. Assemble components furnished loose for field assembly.
- I. Install backboards plumb, level, and parallel to basketball court end line.
- J. Placement of equipment relating to floor groove lines shall be coordinated with work under gymnasium flooring section.
- K. Install goals level and at elevation indicated on Drawings.
- L. Secure wall pads to block wall with 1/2" diameter bolt. Bolts staggered; (1) maximum spacing 18" O.C. Bolt holes neatly drilled.
- M. Touch up damaged finishes to match shop finish.

3.3 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.
- C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.
- D. Adjust limit switches to prevent damage to equipment.

3.4 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.5 DEMONSTRATION

- A. Manufacturer's Representative shall demonstrate operation and maintenance of all units, winches and backboard height adjustment.

END OF SECTION

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SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior manual roller shades.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.
- B. Section 26 27 26 - Wiring Devices: Finish requirements for wall controls specified in this section.

1.3 REFERENCE STANDARDS

- A. ASTM E2180 - Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Materials; 2018.
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.
- C. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.
- D. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
- B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- C. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- G. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.
 - 1. Manufacturer's authorized representative.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.8 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Fabric: One year.
 - 3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 - 1. Draper, Inc: www.draperinc.com/#sle.
 - 2. MechoShade Systems LLC: www.mechoshade.com/#sle.
 - 3. Drapery Industries, Inc: www.draperyindustries.com..
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ROLLER SHADES

- A. General:
 - 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 - 2. Provide shade system that operates smoothly when shades are raised or lowered.

- B. Interior Roller Shades:
1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
 - a. Mounting: Wall mounted.
 - b. Size: As indicated on drawings.
 - c. Fabric: As indicated under Shade Fabric article.
 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Hardware Type: Mounting end caps with fascia.
 3. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
 - a. Material: Extruded aluminum or Steel, with wall thickness and material selected by manufacturer.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
 4. Hembars: Designed to maintain bottom of shade straight and flat, selected from manufacturer's standard options.
 - a. Style: Closed pocket; aluminum elliptical slat inside pocket with heat-sealed ends.
 5. Manual Operation:
 - a. Clutch Operator Location: Right side, unless noted otherwise.
 - b. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
 - c. Drive Chain: Continuous loop, stainless steel, beaded ball chain, 95 lb minimum breaking strength; comply with WCMA A100.1. Provide upper and lower limit stops.
 - d. Shade Lift Assistance: Manufacturer's standard spring device contained in the idler end of roller tube to reduce force required to lift shades; as required based on shade weight.
 - e. Chain Retainer:
 - 1) Chain tensioning device complying with WCMA A100.1.
 - 2) Manufacturer's standard clip.
 6. Accessories:
 - a. Fabric Retention System: Manufacturer's system of side channels with fabric retainer and light seal, and shade fabric fabricated with steel stays.
 - b. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; clear anodized finish.
 - c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.3 SHADE FABRIC

- A. Fabric - Type WS-1: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Material: Vinyl coated polyester.
 2. Material Certificates and Product Disclosures:
 - a. Low-Emitting Material Certification: Greenguard Gold certified and listed in UL (GGG).
 3. Performance Requirements:
 - a. Flammability: Pass NFPA 701 large and small tests.
 - b. Antimicrobial Resistance: Greater than 95 percent reduction of bacteria when tested in accordance with ASTM E2180.
 4. Openness Factor: 3%.
 5. Color: As indicated on drawings.

2.4 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: As recommended in writing by manufacturer.

- C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.
- C. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

3.5 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

3.6 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.7 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 12 35 83
MUSIC CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Factory-fabricated musical instrument storage cabinet system.
- B. Cabinet hardware.
- C. Accessories.

1.2 RELATED REQUIREMENTS:

- A. Section 06 10 00 - Rough Carpentry: Grounds and support framing.
- B. Section 06 41 00 - Architectural Wood Casework
- C. Section 09 65 00 - Resilient Flooring: Vinyl Base.

1.3 REFERENCES

- A. American Laminators Assoc. Performance Standard ALA 1985.
- B. ANSI - BHMA Standard A156.9, Grade 1.
- C. ANSI A135.4 - Basic Hardboard.
- D. AWI (Architectural Woodwork Institute) - Quality Standards.
- E. BHMA A156.9 - Cabinet Hardware.
- F. NEMA (National Electric Manufacturers Association) LD3 - High Pressure Decorative Laminates.

1.4 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements , for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit two, 4 x 4 inch size samples, illustrating cabinet finish.
- E. Samples: Submit two, 4 x 4 inch size samples, illustrating counter top finish and construction.
- F. Samples: Submit two samples of drawer pulls, hinges, and other accessories, illustrating hardware finish.
- G. Product Data: Submit applicable reference standards, performance data and application recommendations and limitations..

1.5 WARRANTY

- A. Provide manufacturer's written warranty that products not in accordance with requirements of Contract Documents within three years after date of Substantial Completion shall be corrected promptly after receipt of written notice from Owner. Warranty is to include labor and material costs.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Pack and ship to avoid damage according to manufacturer's recommendations:
 - 1. Finish and assemble components in factory before shipment.
 - 2. Ship components in individual, sealed, labeled cartons.
 - 3. Deliver components to room designated for installation.
- B. Store products in heated indoor storage near point of installation. Retain protective packaging until installing.

1.7 ENVIRONMENTAL REQUIREMENTS:

- A. Do not install cabinets until all mortar, wet and dust producing work is completed.

1.8 FIELD MEASUREMENTS

- A. Obtain required field measurements from the Contractor and indicate on Shop Drawings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Wenger Corporation.
 - 2. Substitutions: Section 01 60 00 - Substitution Requirements.

2.2 MATERIALS

- A. Cabinet Wall Panels: 3/4 inch thick industrial (cabinet) grade particle board, minimum 48 pcf with thermoset polyester laminate on both sides for balanced construction.
 - 1. Color: as selected by Architect
- B. Cabinet Shelving:
 - 1. Cabinets up to 27 inches wide: One-piece high molecular blow-molded polyethylene with 1-3/8 inch radius from edge. Mount to cabinet walls with one-piece molded ST nylon clip. Shelf is to be removable.
 - 2. Cabinets over 27 inches wide: One-piece high molecular formed polyethylene with radius front edge and 3/16" wall thickness. Ribbed for structural integrity. Supported by four structural tubular members 1 1/2" x 1" x 16 ga. wall thickness with 14 gage welded end plates.
- C. Doors: Metal grille doors
- D. Edging: Heat bonded 3mm beveled PVC edge-banding.
 - 1. Color: as selected by Architect
- E. Finish Hardware:
 - 1. Joinery Hardware: two inch, 1/4-20 panel connectors with 15mm head diameter, and steel thread inserts.
 - a. Finish: Powder paint coating: Oyster color.
- F. Cabinet Back Panel:
 - 1. Standard cabinet back to be 1/4" thick prefinished hardboard perforated with sound absorbing insulation backing.
 - a. Color: Oyster to match side panels interior.

2.3 FABRICATION

- A. Fabricate and package all components in the factory and ship fully assembled to job site.

2.4 ACCESSORIES

- A. Vertical Closure Kit: Provide visual closure between wall and cabinet. Constructed of .750 inch thick thermoset composite wood to match cabinet side panels.
 - 1. Color: as selected by Architect
- B. Top Back Filler Kit: Provide visual closure between back wall and top panel of cabinet. Constructed of .750 inch thick thermoset composite wood to match cabinet top panels.
 - 1. Color: as selected by Architect
- C. Finished Back Panel: Provide panel to attach to cabinet back that is exposed. Constructed of .500 inch thick thermoset composite wood to match cabinet.
 - 1. Color: as selected by Architect

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Verification of existing conditions before starting work.
- B. Field verify and coordinate blocking and support framing. Required for anchorage of casework.
- C. Field verify and coordinate location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set and secure casework in place; rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- H. Provide and install all trim and filler panels required to fill in all gaps between casework and adjacent wall. Provide a complete seamless installation.
 - 1. Trim and filler panels to match material and finish of cabinets. Filler panels shall be of equivalent length at each side of each run of casework

3.3 ADJUSTING

- A. See Section 01 70 00 - Execution and Closeout Requirements: General Installation Requirements: Adjust installed work. Test installed work for rigidity and ability to support loads.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements: Cleaning installed work.
- B. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Wall-hung counters and vanity tops.
- C. Solid surface window sills.

1.2 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- G. PS 1 - Structural Plywood; 2023.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

COUNTERTOPS

- G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- H. Installer's qualification statement.
- I. Installation Instructions: Manufacturer's installation instructions and recommendations.
- J. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Countertops, Type HPL-1: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - 1. Laminate Sheet: NEMA LD 3, Grade HGP, for postforming, 0.039 inch nominal thickness.
 - a. Manufacturers:
 - 1) Arborite: www.arborite.com/#sle.
 - 2) Formica Corporation: www.formica.com/#sle.
 - 3) Wilsonart: www.wilsonart.com.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
 - d. Finish: Matte or suede, gloss rating of 5 to 20.
 - e. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.

2. Backing Sheet: Same material as laminate; non-decorative surface, .039 inch thickness, minimum.
 3. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch thick with radiused edge, integral coved backsplash with radiused top edge.
 4. Back and End Splashes: Same material, same construction.
 5. Fabricate in accordance with manufacturer's standard requirements.
- C. Solid Surfacing Countertops, Type SSM-1: Solid surfacing sheet or plastic resin casting self-supporting over structural members.
1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont: www.corian.com/#sle.
 - 2) Meganite, Inc: www.meganite.com/#sle.
 - 3) Wilsonart: www.wilsonart.com/#sle.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 3. Countertops shall be conventionally fabricated and self-edge banded with backsplash at cabinetry.
 4. Other Components Thickness: 1/2 inch, minimum.
 5. Exposed Edge Treatment: Built up to minimum 1-1/2 inch thick; square edge.
 6. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 - a. Provide backsplash at all cabinetry, unless noted otherwise, and side splashes where indicated.
 7. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
- D. Solid Surfacing Window Sills, Type SSM-1: Solid surfacing sheet or plastic resin casting self-supporting over structural members.
1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont: www.corian.com/#sle.
 - 2) Meganite, Inc: www.meganite.com/#sle.
 - 3) Wilsonart: www.wilsonart.com/#sle.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - d. Color and Pattern: As indicated on drawings.
 3. Sills shall be solid 1/2 inch solid surface material and fabricated as scheduled in drawings.
 4. Other Components Thickness: 1/2 inch, minimum.
 5. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
 6. Fabricate in accordance with manufacturer's standard requirements.

2.2 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, color to match adjacent material.

2.3 ACCESSORIES

- A. Steel Fixed Countertop Support Brackets:
 - 1. Material: Steel; ASTM A36/A36M.
 - 2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
 - 3. Color: To be selected by Architect.
 - 4. Products:
 - a. Face Mounted: Front Mounting Plus Bracket.
 - 5. Manufacturer:
 - a. Centerline Brackets: www.countertopbracket.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing Countertops: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
 - 1. Provide secondary 3/4 inch plywood ladder type spacer frames with stiles corresponding to support structure upon which the frame will rest.
- D. Solid Surfacing Sills: Fabricate sills up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
 - 1. Provide secondary 1/2 inch x 3 inch plywood spacer or shims as necessary for level installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners where appropriate. Make flat surfaces level; shim where required.
- B. Solid surface counters: Secure plywood spacer frames to support structure; then set counter in dabs of silicone adhesive every 12 - 18 inches. Verify tops are level.
 - 1. Alternately, if plywood spacer frame has been fabricated integral to the counter, secure assembly to support structure in dabs of silicone adhesive every 12 - 18 inches. Verify tops are level.
- C. Solid surface sills: Set spacers or shims in silicone adhesive at each end, and no more than 24 inches on center. Set sill in similar fashion. Verify sills are level.
- D. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- E. Seal joint between back/end splashes and sills and vertical surfaces.

3.4 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

- A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 14 28 19
ELEVATOR EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide all labor, equipment and materials for the complete modernization of the elevator systems detailed herein.

1.2 RELATED REQUIREMENTS

- A. Section 09 65 00 - Resilient Flooring: Floor finish in car.
- B. Section 09 91 23 - Interior Painting: Field painting of hoistway entrance doors and frames.
- C. Section 26 05 00 - Common Work Results For Electrical: Electrical power for elevator installation and testing.
- D. Section 28 46 21.16-Existing Fire Alarm System: Fire alarm signal lines to elevator controller cabinet.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.
- C. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, Dumbwaiters, and Material Lifts; 2023.
- D. ASME QEI-1 - Standard for the Qualification of Elevator Inspectors; 2024.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.
- F. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.
- G. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.
- H. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- K. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

- N. NEMA MG 1 - Motors and Generators; 2018.
- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Prior to submission of cost proposal, the contractor is responsible to examine, measure, and otherwise determine that the work can be performed as specified. Any discrepancies or ambiguities found in the specifications shall be reported to the Owner, in writing, no less than seven (7) days prior to bid for resolution. Submission of discrepancies in writing will be accepted in writing via email, facsimile, or mail. All requests will be answered and copied to all interested vendors.

1.5 SUBMITTALS

- A. Prior to commencement of fabrication, submit details of proposed replacement items and finish samples for selection for approval. No fabrication will proceed without approval.
- B. Product Data: Submit data on following items:
 - 1. Signal and operating fixtures, operating panels, and indicators.
 - 2. Car layout, and components.
 - 3. Car and hoistway door and frame details.
 - 4. Electrical characteristics and connection requirements.
- C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
 - 1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 - 2. Clearances and over-travel of car.
 - 3. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
 - 4. Location and sizes of hoistway and car doors and frames.
 - 5. Interface with building access control system.
 - 6. Electrical characteristics and connection requirements.
 - 7. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- B. Installer Qualifications: Trained personnel and supervisor on staff of elevator equipment manufacturer.
 - 1. The Contractors Management, Field Management and Field Leadership Staff must have been performing elevator maintenance, service repairs and modernization for a minimum of five years.
- C. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
- D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.7 MAINTENANCE

- A. Maintenance during use, including cleaning, lubricating and adjusting equipment and components for proper elevator operation shall be performed only by the elevator manufacturer. Cost for maintenance shall be covered under modernization contract.
- B. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
- C. Manufacturer shall have a service office and full-time service personnel within 120-mile radius of the project site.
- D. The Elevator Contractor shall furnish preventative maintenance, on all equipment, described herein, for a period of twelve (12) months commencing on the date of final acceptance of the entire elevator system. The maintenance shall include systematic examination, adjustment and lubrication of all elevator and related equipment. The Elevator Contractor shall repair or replace electrical and mechanical part whenever required and shall use only genuine, standard parts produced by the Manufacturer of the equipment installed.
- E. All maintenance work shall be performed by competent personnel under the supervision and a direct employee of the Elevator Contractor.
- F. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours

1.8 CODE REQUIREMENTS

- A. Work covered by these specifications is to be done in full accordance with Federal, State and City codes, ordinances and elevator safety orders that are in effect at the time of execution of the contract.
- B. All of the requirements of the State of New York are to be fulfilled by the contractor and subcontractors. The entire elevator plant, including all elevator equipment and work, shall be in accordance with the latest edition and supplements of the American National Standard Safety Codes for elevators, dumbwaiters, escalators, and moving walks, ASME A17.1, current applicable Building Code, NFPA 70, and ADA Standards.

1.9 OWNER'S MANUALS AND WIRING DIAGRAMS

- A. The following shall be provided upon completion and prior to Final Acceptance of the Installation:
 - 1. Drawings submitted.
 - 2. Two (2) complete sets of Wiring Diagrams for the elevator submitted to the Owner.
 - 3. One (1) complete set of Wiring Diagrams to be left in the elevator equipment room for use by maintenance personnel.
 - 4. Provide all instruments, specialty tools, and equipment necessary for proper maintenance and service of the elevator. These should also include ALL programming / installation tools and manuals.
- B. Ownership of all above noted instruments, manuals, tools, and/or equipment will convey to the Owner upon completion and Final acceptance of the elevator and will be retained on site in a location to be designated by the Owner.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials, components and equipment in manufacturer's protective packaging. Store materials in a dry protected area provided by building owner. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling, or deterioration.

1.11 WARRANTY

- A. The Elevator Contractor shall warrant that the material and workmanship of the equipment installed by them under these specifications will be first-class in every respect and will make good any defects except those due to improper use, which may develop within twelve months from the Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: ThyssenKrupp Elevator: www.thyssenkruppelevator.com/#sle.
- B. Other Acceptable Manufacturers:
 - 1. Otis Elevator: www.otis.com/#sle.
 - 2. Schindler Elevator Corporation: www.schindler.com/#sle.

NO PROPRIETARY SOFTWARE / HARDWARE EQUIPMENT SHALL BE INSTALLED

2.2 MATERIALS:

- A. Steel:
 - 1. Shapes and bars: ASTM A36/A36M.
 - 2. Sheet: ASTM A1008/A1008M, cold-rolled steel sheet, commercial quality, Class 1, matte finish, stretcher leveled.
 - 3. Finish: Factory-applied baked enamel.
- B. Stainless steel:
 - 1. Shapes and bars: ASTM A276/A276M, Type 300 (18-8).
 - 2. Tubing: ASTM A269/A269M, Type 300 (18-8).
- C. Aluminum:
 - 1. Sheet and plate: ASTM B209, alloy 6063-T52.
 - 2. Extrusions: ASTM B221, alloy 6063-T52.
- D. Plastic laminate:
 - 1. Decorative high-pressure type, complying with NEMA LD 3, Type GP-50 General Purpose Grade, nominal 0.050" thickness.

2.3 SYSTEM OPERATING FEATURES

- A. Duty
 - 1. The present capacity and speed will be retained (2100 lbs. @ 100 ft./min).
- B. Travel
 - 1. The present travel and rise will be retained.
- C. Stops and Openings
 - 1. The present stops and openings will be retained: 2 Stops, 2 Openings.
- D. Automatic Self-Leveling
 - 1. The elevator shall be provided with automatic self-leveling that shall typically bring the elevator car level with the floor landings +/-1/4" regardless of load or direction of travel.
- E. Operation: One Car

1. Operation shall be automatic by means of the car and landing buttons. Stops registered by momentary actuation of the car or landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated. All stops shall be subject to the respective car or landing button being actuated sufficiently in advance of the arrival of the car at that landing to enable the stop to be made. The direction of travel for an idle car shall be established by the first car or landing button actuated.
 2. Landing calls shall be answered while the car is traveling in the up direction and "DOWN" landing calls shall be answered while the car is traveling down. The car shall reverse after the uppermost or lowermost car or landing call has been answered, then proceed to answer car calls and landing calls registered in the opposite direction of travel.
 3. If the car without registered calls arrives at a floor where both up and down hall calls are registered, it shall initially respond to the hall call in the direction that the car was traveling. If no car call or hall call is registered for further travel in that direction, the car shall close its doors and immediately reopen them in response to the hall call in the opposite directions. Direction lanterns, if furnished, shall indicate the change of direction when the doors reopen.
 4. An independent service switch shall be provided in the car operating panel which, when actuated, shall cancel previously registered car calls, disconnect the elevator from the hall buttons and allow operation from the car buttons only.
- F. Firefighters' Emergency Operation (FEO)
1. Special Emergency Service operation shall be provided in compliance with the latest applicable revision of the ASME A17.1 Code.
 2. Firefighters' Emergency Operation Phase I to return the elevator non-stop to a designated floor shall be initiated by an elevator smoke detector system or a key switch provided in a lobby fixture.
 3. Provide contacts on the elevator controller to receive signals from the smoke detector system.
 4. A FEO cabinet shall be installed in the Car Operating Panel with a key switch for in-car control of the elevator when on Phase II of FEO.
 5. If the elevator is on independent service when the elevator is recalled on Phase I operation, a buzzer shall sound in the car and a jewel shall be illuminated, subject to applicable codes.

2.4 ELEVATOR MODERNIZATION EQUIPMENT

- A. Controller
1. A microprocessor-based control system shall be provided to perform all the functions of safe elevator motion and elevator door control. This shall include all the hardware required to connect, transfer and interrupt power, and protect the motor against overloading.
 - a. 24 VDC signal voltage.
 - b. Auto light & fan feature.
 - c. Car Independent Service.
 - d. Car Traveling Lantern circuitry.
 - e. Door bypass operation.
 - f. Electronic door detector interface.
 - g. Hoistway access and enable.
 2. The controller cabinet containing memory equipment shall be properly shielded from line pollution. The microcomputer system shall be designed to accept reprogramming with minimum system downtime.
 3. Real-time, cloud-based predictive maintenance capabilities.
 4. Battery Lowering in controller:
 - a. Provide an Emergency Return Unit (ERU) providing auxiliary power to the hydraulic elevator. In the event of a primary power failure or a single-phase condition, the ERU is designed to automatically return the elevator to its lowest landing at normal speed and allow all passengers to exit safely.
 - b. Four to six seconds after a power failure has been sensed, an electronic timer in the ERU is designed to turn on an inverter (converting DC battery power into elevator operating voltages). Six seconds later, the device is designed to send a signal to the microprocessor to disengage the hall and car floor buttons, close the door(s), and open the valve to return the car to the lowest landing at normal speed.

- c. When the car reaches the lowest landing, the ERU is designed to open the door(s) for a preset time. The device is also designed to allow the DOOR OPEN button to continue to operate normally to allow passengers to exit safely. After all passengers have exited, the car remains parked with the door(s) closed. To preserve battery life, the ERU is designed to turn off after four minutes.
 - d. If all elevator controls are in normal position, the elevator will be able to resume normal operation when building power is restored. Once main power has returned, it takes from six to 24 hours for the batteries to become fully charged, depending on the amount of power consumed in performing an ERU operation.
 - 5. Solid state starter: A new solid-state starter will be provided to control the motor starting and limit the in-rush current. The new starter will have built in protection for overload conditions, reverse phase, loss of phase, and shortened SCR. It will be of the same power requirement and starting configuration as presently exists.
 - 6. Viscosity control.
- B. Power Supply
 - 1. The present power supply will be retained.
- C. Power Unit:
 - 1. The existing power unit shall be replaced with a new submersible power unit. The new power unit consists of a positive displacement pump, motor, integral 4-coil control valve, oil tank and muffler. The pump and motor are submerged and are mounted to the tank with rubber isolators to reduce vibration and noise. The pump and motor are externally mounted and are belt driven. A muffler is provided to dissipate pulsations and noise from the flow of hydraulic fluid. The valve consists of up, up leveling, down and down leveling controls along with manual lowering and a pressure relief valve.
- D. Car & Cab Equipment:
 - 1. Car Equipment:
 - a. Toe Guard.
 - b. Fan: Two-speed.
 - c. Car top exit switch.
 - 2. Cab Equipment:
 - a. Car door.
 - b. Enclosure.
 - 3. Door Equipment:
 - a. Hoistway doors with Gibs & Escutcheons as needed - Front
 - b. Front hoistway door equipment, complete:
 - 1) Tracks & hangers - The existing tracks, hangers, rollers and interlocks shall be replaced. A thorough examination will be made of all mechanisms. All replacement components will be the original manufacture replacement parts or equal. Components will be cleaned, inspected and adjusted as necessary.
 - 2) Interlocks & pickups - interlock / pickup assemblies for existing Dover operators including closers - Front.
 - 3) Reel closers.
 - c. Door Operator with complete carside equipment (Front):

- 1) A new closed loop door operator shall be provided. Doors on the car and at the hoistway entrances shall be power operated by means of a closed loop door operator mounted on top of the car. The door operator is a closed-loop system designed to provide consistent door performance despite changes in temperature or wind and despite the presence of minor debris in the door track. The system continuously monitors door speed and position and adjusts them to match the predefined profile. Door operation shall be automatic at each landing, with door opening initiated as the car arrives at the landing. Closing will take place after an adjustable time interval expires. An electric car door contact shall prevent the elevator from operating unless the car door is in the closed position. Door close shall be arranged to start after a minimal time, consistent with disabled persons' requirements. Doors shall be arranged to remain open for an adjustable time period sufficient to meet ADA requirements. Elevator cars' door-open time intervals, when the car is at a landing, shall be adjustable independently for the cars' responses to car and hall calls.
 - d. Door Protection Device
 - 1) A solid state infrared passenger protection system shall be installed on the car door. The system shall continuously scan for interrupted beams. If any beam in the curtain is interrupted, the system will reopen the elevator door instantly. The systems infrared beams will also detect approaching objects within the elevator entrance which reduces potential for damage to elevator doors.
 - e. Door Restrictors
 - 1) Provide new code compliant restrictors.
 - f. Elevator Doors and frames on each floor shall be primed and painted, color to be determined.
- E. Hoistway Equipment:
1. HN Boxes (per each (2) cars, grouped).
 2. Steel tape with mounting hardware, selector and magnets (terminal limits included)
 3. Controller field friendly wiring package including:
 - a. Single travelling cable.
 - b. Hoistway wiring.
 - c. Interlock wiring.
 - d. Interlock connectors.
 - e. Serial wiring.
 4. Hoistway duct kit.
- F. Pit Equipment:
1. Pit Switch: An emergency pit stop switch shall be located in the pit accessible from the pit access door.
 2. Shutoff valve kit.
 3. Pit Ladder.

2.5 ELEVATOR FIXTURES AND AESTHETICS

- A. Car Operating Panel
1. Provide a new applied Car Operating Panel containing all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish. It shall contain a bank of round satin stainless steel, LED illuminated mechanical buttons. Flush mounted to the panel and marked to correspond to the landings served.
 2. The car operating panel shall be equipped with the following features:
 - a. Raised markings and Braille to the left-hand side of each push-button.
 - b. Digital Car Position Indicator at the top of and integral to the car operating panel.
 - c. Door open and door close buttons.
 - d. Inspection Station.
 - e. Hoistway Access switches or Lunar Key Access as required by code.
 - f. Emergency Communications:
 - 1) Comply with the requirements of ASME A17.1, and as supplemented herein.

- 2) Provide two-way hands free communications between the car and a location inside the building, switching over to another location if the call is unanswered, where authorized personnel are available who can take the appropriate action.
 - 3) Communications system shall support both verbal and non-verbal communication, activated by push button, and shall be located in accordance with current ADA requirements. Indication shall be given to acknowledge that communications with authorized personnel have been established.
 - 4) Operating instructions shall be incorporated or posted adjacent to the activation push button.
 - 5) Provide a means to display video to observe passengers at any location on the car floor to authorized personnel for entrapment assessment.
 - 6) Emergency communications systems shall automatically transfer to an auxiliary power supply if normal building power fails.
 - g. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
 - h. An emergency power unit employing a 12-volt sealed rechargeable battery and a totally static circuit shall be provided within the car operating panel. The light shall illuminate the elevator car and provide current to the alarm bell in the event of normal power failure. The equipment shall comply with the requirements of the latest revision of the ASME A17.1 Code.
- B. Hall Buttons
1. Provide new stainless-steel hall buttons and faceplates at each landing with a single button at each terminal landing. Faceplates shall be surface mounted to wall.
 2. A call shall be registered by momentary pressure of a landing button. The button shall become illuminated and remain illuminated until the call is answered. All buttons to be long life LED illumination.
- C. In Car Lantern and Chime
1. Install in the car entrance, a new car lantern with chime indicating directional lantern visible from the corridor. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
- D. Cab Interiors
1. Renovate the interior of the elevator which shall include the following:
 - a. New cab interior panels – The existing elevators shall have the existing panels removed to accommodate the Interiors Package. This shall include a modular horizontal panel system that spans the full width of the wall sections. Reveals shall be installed in the corners and against the return and strike jamb portions of the interior. Panels shall be finished in plastic laminate as selected from standard laminate selections. The base shall be finished in plastic laminate. Furnish a one-eighth inch satin stainless steel inlay in the horizontal reveals between each panel.
 - b. Ceiling: New frame ceiling with LED lighting shall be furnished.
 - c. Handrail: New satin stainless-steel handrails shall be mounted to the new interior. panels on the rear wall and side walls in accordance with ADA requirements and local governing codes.
 - d. Contractor to remove existing floor covering and provide new VCT flooring. See Section 09 65 00 - Resilient Flooring for requirements.
- E. Emergency Lighting
1. Provide as required by code.

2.6 REMOTE SERVICES

A. Remote Services

1. A microprocessor system that continuously monitors the Unit(s) on a 24-hour per day, year-round basis will be provided. The system will notify a dispatching center that the elevator is inoperative by sending a message via telephone line. This makes it possible to have a mechanic dispatched rapidly in response to such a message.
2. The monitoring system will collect data on the equipment condition whether the operation of a Unit has been interrupted.

2.7 GENERAL REQUIREMENTS

A. Wiring

1. All insulated conductors and conduits or tubing as well as fittings including metal boxes, troughs and ducts to comply with the requirements of NFPA 70.
2. Provide complete, new insulated wiring to connect all parts of new equipment and interface with retained components.
3. Insulated wiring shall have (NEC 600 VOLT) insulation, type THW for power items. Type TF in sizes # 16 and # 18 may be used for push buttons and control items. Install provided wiring in metal conduits. Existing raceways, and conduits may be reused if practical and if in conformance to code.
4. Provide new traveling cables between the car and controller. Provide NEC type ETT with thermoplastic insulation. Each cable conductor shall be color-coded and have at least 10% spare conductors per AWG. All cables provided will contain steel supporting fillers for hanging to remove the weight from the wires. Cables must be flexible and suitably supported to reduce strain on individual conductors to a minimum and always be free from contact with the hoistway construction or other equipment.
5. Provide dedicated ground where required by control equipment manufacturer. Ground all motors, controller cabinets, junction boxes and disconnects.

B. Engineering Design

1. All new material furnished shall be specifically designed to operate with the original equipment being retained, thus assuring maximum performance and eliminating any divided responsibility.

C. Permits and Inspections

1. The elevator contractor shall furnish all licenses and permits and shall arrange for and make all required inspections and tests.

D. Code

1. The elevator equipment shall be furnished and installed in accordance with the applicable version of the ASME A17.1 Safety Code for Elevators and Escalators, An American National Standard, including the latest Supplement, and the Americans with Disabilities Act.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway, pit, and machine room are ready for work of this section.
- C. Verify that electrical power is available and of correct characteristics.

3.2 INSTALLATION

- A. Install system components, and connect equipment to building utilities.
- B. Provide conduit, electrical boxes, wiring, and accessories. Refer to Sections 26 05 33.13.
- C. Install hydraulic piping between cylinder and pump unit.

- D. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- E. Adjust equipment for smooth and quiet operation.

3.3 TESTING AND FINAL ACCEPTANCE

- A. Upon completion of the installation and before the elevator is placed in service, perform Acceptance Inspection and Test to determine that all parts of the equipment and installation conform to these specifications and referenced standards and codes. All protective devices and safety equipment must function as required.
 - 1. Testing and inspection by regulatory agencies certified in accordance with ASME QEI-1.
 - 2. Perform tests as required by ASME A17.2.

3.4 CLEAN-UP AND PAINTING

- A. Clean all new and reused components to remove all construction debris, dirt, rust or other impurities.
- B. All metal surfaces shall be painted with two (2) coats of rust inhibiting paint after installation. Including but not limited to, guide rails (EXCEPT GUIDE SURFACES), pit equipment, dust covers and fascias.
- C. Clean all horizontal and vertical surfaces within the hoistway including walls, floors, beams, ledges, brackets, vent louvers, screens, etc., all shall be brushed down and vacuumed to remove accumulated lint, dust and dirt.

3.5 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Demonstrate proper operation of equipment to Owner's designated representative.
- C. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Manufacturer's training personnel.
 - 4. Location: At project site, unless noted otherwise.

END OF SECTION

SECTION 14 42 00
WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vertical platform wheelchair lifts.

1.2 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.
- D. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts; 2023.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- G. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2025.
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- I. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015 (Reapproved 2025).
- J. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- L. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- N. ITS (DIR) - Directory of Listed Products; Current Edition.
- O. NEMA MG 00001 - Motors and Generators; 2024.
- P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Q. UL (DIR) - Online Certifications Directory; Current Edition.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate installation of wheelchair lift system with adjacent construction using necessary attachments; provide anchoring devices in accordance with manufacturer's installation instructions; coordinate installation of cast-in-place concrete components.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Include data on material descriptions, construction details, component dimensions and profiles, and finishes; include data on rated capacities, electrical and operating characteristics, and necessary accessories.
- C. Shop Drawings: Include plans, elevations, sections, and attachment details; include equipment assembly details with dimensions, weights, loads, required clearances, components, size and location of anchors and required field connections, and methods for field assembly; provide diagrams indicating signal, power, and control wiring.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.
- F. Testing agency's qualification statement.
- G. Executed warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.6 FIELD CONDITIONS

- A. Use of wheelchair lifts during construction for hoisting materials or personnel is not permitted.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 7-year manufacturer warranty to repair or replace wheelchair lift system components that fail in materials or workmanship. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A18.1, ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
- B. Accessibility Requirements: Comply with ADA Standards and ICC A117.1.
- C. Structural Performance: Comply with ASCE 7 for loading of wheelchair lift components and assemblies.
- D. Perform welding of steel in accordance with AWS D1.1/D1.1M.
- E. Perform electrical work in accordance with NFPA 70.

2.2 VERTICAL PLATFORM WHEELCHAIR LIFTS

- A. Manufacturers:
 - 1. Butler Mobility Products: www.butlermobility.com/#sle.
 - 2. Garaventa Lift; Genesis Opal - Unenclosed Vertical Platform Lift(Basis of Design): www.garaventalift.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Vertical Platform Wheelchair Lifts: Provide manufacturer's standard type that complies with indicated requirements. Use manufacturer's standard components for vertical platform wheelchair lifts as required for complete system unless otherwise indicated.
 - 1. Type of Vertical Platform Wheelchair Lift:
 - a. Vertical platform wheelchair lift without shaftway or enclosure; platform includes sidewalls and gate creating safety barrier for passenger.
 - 2. Configuration:
 - a. 90-degree turn entry/exit, with front and side openings.
 - b. Number of Stops: Two.
 - c. Landing Openings, Self-Closing:
 - 1) Lower landing with platform-mounted gate.
 - 2) Upper landing with gate and platform mounted gate.
 - 3. Location:
 - a. Interior of building, as indicated on drawings.
 - 4. Lift Load Capacity: 750 lb, maximum.
 - 5. Lifting Height from Bottom to Upper Floor Level: As indicated on drawings.
 - 6. Platform Width Clearance: 42 inches.
 - 7. Platform Length Clearance: 60 inches.
 - 8. Platform Side Wall Panels: Nominal height of 42 inches, with galvanized steel sheet panels, and enclosed within rectangular extruded aluminum framework.
 - 9. Platform Floor: Steel sheet with matte finish, having overall thickness not greater than 1-1/2 inches.
 - 10. Access Ramp at Bottom Landing: retractable automatic ramp to transition from floor level to lift platform, with ramp finish to match lift platform.
 - a. Size: Provide end ramps at least 32 inches wide and side ramps at least 42 inches wide; length as required for slope with 1:12 maximum slope.
 - 11. Drive System:
 - a. Leadscrew: 2 HP Motor, travel speed at 3 meters (10 ft) per minute. Hydraulic: 3 HP motor Continuous Mains Powered with an auxiliary power system. Lift travels at 5.2 meters (17 ft) per minute.
 - 12. Drive System Enclosure: Provide rectangular galvanized steel tube frame with flush steel sheet panels on sides and top to enclose drive system components; securely attach enclosure to adjacent substrate.

2.3 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Electrical Characteristics:
- B. Platform Controls: Continuous pressure switch, one for each direction, with keyless operation.
- C. Geared Motor: Comply with NEMA MG 1.
- D. Motor Control: Inverter control and other components as required by manufacturer for system indicated.
- E. Emergency Operation: Provide manual operation, battery-powered system, and connection to standby electrical power to raise or lower lift to landing due to malfunction or loss of power.
- F. Electrical Components, Boxes, Conduit, Wiring, and Devices: Comply with NFPA 70 and UL (DIR) or ITS (DIR) listed and labeled, and marked as applicable for proposed locations.

2.4 MATERIALS

- A. Rolled Steel Sections, Shapes, and Rods: Comply with ASTM A36/A36M.
- B. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.
- C. Rolled Steel Floor Plates: Comply with ASTM A786/A786M, 1/8 inch thick, with manufacturer's standard surface pattern; rolled from steel plate complying with ASTM A572/A572M, Grade 55 (380).
- D. Steel Tubing: Comply with ASTM A500/A500M, cold formed.
- E. Anchor Bolts and Rods: Comply with ASTM F1554, Grade 55.
- F. Welding: Comply with applicable requirements of AWS D1.1/D1.1M and AWS D1.3/D1.3M.
- G. Touch-Up Primer for Galvanized Surfaces: Zinc-rich type.

2.5 EQUIPMENT

- A. Lubrication of Equipment: Provide grease fittings for lubricating bearings requiring periodic lubrication, automatic feed type grease cups, and visible and easily accessible lubrication points.
- B. Guide Rails, Ropes, Counterweights, Sheaves, Attachment Brackets, and Anchors: Sized in accordance with local building code, including safety factors.
- C. Maintenance Devices: Provide as necessary within wheelchair lift system, supported on structural members within accessible locations.
- D. Emergency Alarm: Provide audible and visual alarm system that indicates emergency stop button on platform has been activated.

2.6 FINISHES

- A. Baked-On Factory Finish for Structural Metal Surfaces: Clean surfaces of rust, oil, or grease and wipe clean with solvent; apply manufacturer's standard two-coat, baked-on finish consisting of primer and thermosetting top coat.
 - 1. Color: Manufacturer's standard color.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that areas and conditions comply with installation tolerances and other conditions affecting this work.
- B. Verify that locations for electrical rough-in connections to system equipment are in acceptable locations before installing equipment.
- C. Verify that electrical power is available and of correct characteristics.
- D. Do not proceed with installation until unacceptable conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces of substrates using methods in accordance with lift manufacturer's installation instructions.
- B. Clean surfaces thoroughly before starting installation of lifts.

3.3 INSTALLATION

- A. Install wheelchair lift system and components in accordance with manufacturer's written installation instructions.
- B. Install wheelchair lift system securely to supporting structure, and flush with adjacent surfaces.
- C. Install structural components using methods that comply with requirements indicated relative to layout and structural position.

3.4 ADJUSTING

- A. Adjust wheelchair lift equipment to operate smoothly and safely.
- B. Verify vertical travel of wheelchair lift system; adjust as necessary to maintain operating range indicated.
- C. After installation, inspect exposed factory-finished wheelchair lift equipment and repair damaged finishes.

3.5 CLEANING

- A. Remove protective coverings from finished surfaces.
- B. Clean surfaces and components.

END OF SECTION

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SECTION 19 20 00
THEATRICAL LIGHTING & CONTROL SYSTEMS

PART 1 - GENERAL

1.1 PROJECT INFORMATION:

- A. Owner: Elmira Central School District
Broadway 2026 Renovations
1000 Broadway Street
Elmira, New York 14904
- B. Architect: Hunt Engineers, Architects & Land Surveyors P.C.
Airport Corporate Park
100 Hunt Center
Horseheads, New York 14845
- C. Consultant: AVL Designs, Incorporated
1788 Penfield Rd, Suite 1
Penfield, New York 14526
Phone (585) 586-1100
- D. Contractor: The successful bidder for the work described herein. Also referred to as the Theatrical Contractor (TC), the lighting contractor, the lighting installer or the bidder.
- E. Others: Various companies doing construction work under the general contract.

1.2 PROFESSIONAL STANDARDS:

- A. The contractor is expected to install all work to the appropriate industry professional standards, manufacturer recommendations, and current applicable codes. If any work required exceeds the skills of the contractor, they will employ appropriate subcontractors for the scope required.
- B. The acceptability of materials and workmanship will be determined by the Architect, Consultant, and CM.
- C. Any work that might be damaged, be inadvertently painted, or become dirty during construction will be protected by the contractor. All responsibility for protection shall be by the contractor. The contractor will provide final cleaning and or repair of all equipment in their scope to like new condition.
- D. The contractor will attend and/or arrange meetings as required to make sure their scope is coordinated with all other trades. The contractor is responsible to make known to all other trades critically dimensioned items and locations to avoid conflicts. Where conflicts occur follow required procedures in the project manual to seek resolution.
- E. Where any substandard work is provided by related trades that impedes the work of the contractor, they will notify the CM, Consultant, Architect, or Engineer in writing as called for one the project manila to rectify the issue.
- F. Where work is provided by others the contractor is responsible to verify installation conditions that relate to their work. If installation of related work is substandard the contractor shall generate a written RFI through proper channels based upon the project manual. The contractor shall not install their work to any substandard devices, etc. provided by others until such work has been resolved or until the contractor has received written authorization from the construction manager to proceed. If the contractor ignores substandard installation work by others and proceeds to install his devices

to these items, then he accepts and bears sole responsibility to repair, reinstall and correct any found deficiencies to the satisfaction of the owner upon final inspections.

- G. The contractor will comply with the AHJ (Authority Having Jurisdiction) as it relates to programming any and all emergency interfaces.
- H. The contractor is expected to possess knowledge of the equipment of their industry and to provide all small items required to install the specified equipment. Provide small items such as rack rails, DIN rails, rack panels, power cords, connectors, wall wart power supplies, crimps, Nicopress and other misc. items that may not be called out on drawings or in specs but are required to support primary equipment.
- I. When in doubt about any aspect of the work the contractor should not proceed until they obtain clarification from the appropriate entity following procedures detailed in the project manual.

1.3 DEFINITIONS:

AFF	Above finished floor (finished walkable floor/platform surface referenced)
At Height/Working At Height	Working in any place or location and at a height AFF where a person could fall and potentially injure themselves; there is no minimum or upper limit to this height.
Code Requirements	Minimum requirements as specified by all applicable and published codes.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Diagrammatic	A diagram, paragraph, note or drawing serving to explain general intents and requirements (not necessarily an exact representation).
Devices	Any piece of gear, equipment, indicated component and any misc. related items required to implement and install a fully functioning system.
Equal or Equivalent	Equally acceptable as determined by Owner's Representative.
ETR	Existing to remain.
Extend	To increase the length(s) of any indicated conduit/wiring, etc. so as to reach a particular specified or implied point – including the provision of any misc. additional equipment as required for proper extension and to maintain full system functionality.

Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location to the appropriate trade responsible for installation.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative
Install	Mount and connect equipment and associated items and make ready for use.
Labeled	Refers to classification by a standards agency.
Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional, Construction Management or Clerk of the Works.
Patching	Repair/repainting of holes, marks and damage/damaged surfaces left from removals or new installations work. Consult project manual for additional requirements.
Provide	Procure all required materials, labor, coordination and equipment and locate, install, connect and test ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Remove	Safely Disconnect including any and all wiring, hardware, conduit (except concealed), anchors, suspension hardware etc. Legally dispose of items not called out to be offered to or returned to owner.
Review	A general contractual conformance check of specified products.

Satisfactory	As specified in contract documents.
Shall	Indicates that the contractor must perform work and provide devices as indicated. This is a mandatory, obligatory, contractual requirement and is not optional in any way.
VIF (Verify in Field)	Verify in field (VIF) is understood to require the contractor to verify and obtain specific dimensions, locations, interconnections, configurations and other related details regarding the existing site conditions. It acknowledges that certain limitations may exist in the preliminary site surveys and existing documentation due to inaccessibility or unintended inaccuracies and explicitly transfers the responsibility to verify these items to the executing contractor. It requires the construction team to physically confirm these items on-site before fabricating components or proceeding with installation.

Refer to General Conditions of the Contract for additional definitions.

1.4 INTENT OF DRAWINGS:

- A. Throughout the contract documents there are various manufacturers and products referenced. It is understood that these products establish a basis of design that all other "or equal" substitutions must meet or exceed. All submitted devices must be the referenced product or approved equal.
- B. The drawings in this package are diagrammatic in nature, unless detailed dimensioned drawings are included. The drawings show the approximate locations of equipment and devices. The final and exact locations of all non-dimensioned devices are subject to the approval of the Owner or the Owner's Representative. Devices with detailed installation dimensions; however, are critically located and must be installed to those indicated dimensions unless alternate instructions have been given to the contractor in writing by the consultant.
- C. The contractor(s) shall inspect the entire building(s) with the Owner's representative prior to beginning any work and shall identify the exact locations and installation methods for all devices, conduit and wiring prior to beginning work.
- D. Typical details are shown for the installation of various devices. The details do not apply to all situations. Installation methods for all work shall be subject to the Owner's and construction manager's approval. Provide all work and equipment required for a professional, workman-like installation.

1.5 SECTION INCLUDES BUT IS NOT LIMITED TO:

- A. Removals – May include storage and reinstallation of some items.
- B. Provision of Theatrical lighting system and related work scope as indicated on drawings including controls for lighting fixtures.
- C. Furnishing some equipment for install by others.
- D. Wiring, setup, focus and commissioning.
- E. Training and closeout documents.

1.6 RELATED SECTIONS & DOCUMENTS:

- A. The contractor(s) shall examine the full set of construction drawings and specifications and ascertain all aspects of the scope of work described within this specification. The contractor will be responsible for cooperation with and adherence to the overall scope and intent of the project relative to the work being done by the contractor.
- B. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 0, 1 and 26 specification sections apply to work of this section (related specification sections may vary depending upon the particular CSI format being adhered to). All related drawings, contract conditions and general requirements found in the project manual that apply to the general contract will apply to the work described in this specification. Examine all referenced documents for general project requirements relating to the work in this specification. Contact the architects, engineers and/or construction manager for any clarification required to properly bid this project. It is the contractor's responsibility to obtain necessary clarification before bidding. No change orders will be allowed for existing project conditions and contractor requirements not properly investigated by the contractor.

1.7 RELATED WORK NOT INCLUDED:

- A. Electrical Removals Work: The electrical contractor shall be removing the existing dimming and architectural control systems, wiring, feeders, racks, etc. The TC will need to coordinate with the EC as it relates to these systems.
- B. Electrical: The electrical service for the lighting system will be provided by the EC/electrical contractor. The specialties contractor (TC) will need to coordinate his work with the availability of electrical service. The electrical requirements are detailed and extensive and are as noted on the contract drawings.
- C. Electrical: The EC shall be providing fairly extensive removals work as part of the lighting systems removals. The electrical removal requirements are detailed on the contract drawings.
- D. Houselighting, Worklighting and Stage Lip Lighting: These fixtures and related conduit & wiring shall be provided by the EC/electrical contractor. The theatrical contractor will need to coordinate his work with these fixtures & lamps and incorporate his controls into the lighting system as indicated.

1.8 GENERAL REQUIREMENTS:

A. ITEMS TO BE PROVIDED BY OTHERS:

- 1. Structural steel (some new by GC).
- 2. Structural steel (existing and to remain).
- 3. Electrical services by Division 26 Contractor. See drawings for more information.
- A. Removals - Offer all existing portable and removed equipment to the owner prior to legally disposing of these items. Obtain written permission from the owner for all existing removed items that they do not desire to retain prior to disposal.
- B. Provide all equipment outlined and described within this specification and assemble it into a complete, properly functioning system for use by the owner as described within this specification.
- C. It is the contractor's responsibility to clarify any misunderstandings or drawing-to-drawing/drawing-to-spec discrepancies prior to bid. In cases of a difference between stated quantities in drawings, specs or electrical drawings, the higher quantity will prevail.
- D. Check each component before installation as well as each portion of the project during installation to ensure that the intent of this specification is achieved.

1.9 BIDDER QUALIFICATIONS – SUBMITTALS:

- A. The bidder shall provide references of at least three (3) installations of comparable scope performed by the bidder, including location, system description, and name, address, and telephone number of the architects, consultants, and owners and the names of contract persons for each.
- B. The bidder must maintain service facilities and have service available on site within 24 hours. The bidder must be a factory authorized dealer for all products submitted and may be required to submit such proof of factory authorization in writing, or in the form of copies of authorized agreements with the various vendors.
- C. The bidder and all persons performing theatrical lighting system related work on this project must be certified (those performing low voltage terminations, system commissioning, programming, fixture focus/hang, DMX/RDM/Network addressing and other related areas). This will require the installer to either be a current ETCP (Entertainment Technician Certification Program) certified entertainment electrician or an equivalent factory trained and certified installer (from the equipment supplier) or a crew working under the direct supervision of a certified foreman (of either certification described above). This applies to all theatrical lighting equipment installation and any other assemblies indicated as being provided or installed by the contractor. Proof of current certification MUST be provided in the submittals package (this is typically in the form of a pdf copy of the current and active certification certificates from PLASA). Out of date or expired certifications shall not be recognized as meeting the requirements of ETCP certification.

1.10 INQUIRIES AND COMMUNICATIONS:

- A. All questions should be posed in writing as called for in the project manual.
- B. Direct communications to the consultant via phone are recommended for initial discussion about intent or site issues. (unless prohibited in the project manual). No action may be taken based on verbal communications, they must be followed up in writing as called for in the project manual.
- C. Where discrepancies occur, and pre-bid instructions have not been obtained by written request, the contractor will abide by the owner's decision at no additional cost to the owner.

1.11 COORDINATION:

- A. Cooperate with other trades to achieve well-coordinated progress at all times. Notify the owner and consultant as often as necessary with regards to job progress or changes in the installation schedule. No change orders for additional payment will be allowed based upon conflicts with other trades on the project site. All such conflicts will be reported to the architect, construction manager, owner, and consultant in writing. All reasonable attempts will be made to correct any difficulties.
- B. Staff the job site adequately at all times to maintain a progress in keeping with the total project progress. No allowances will be made for overtime required to maintain job progress.
- C. Provide all materials to be installed by others in a timely fashion based upon the related trades' schedules.
- D. The job site will be left in a clean safe condition at the end of any workday. All cleanup and debris removal to a site designated by the owner will be the responsibility of the bidder on a daily basis.
- E. All storage of tools and materials will be done by the contractor. No on-site storage security will be provided by the owner.
- F. The contractor will attend regular meetings with the architect, owner, general contractor, and the consultant when requested by any of the above, in order to achieve project coordination and progress.

1.12 DELIVERIES:

- A. It is each contractor's responsibility to receive all device shipments, equipment, deliveries, etc. for their own equipment on/at the job site personally. Each contractor shall be responsible to arrange

for storage of all received materials on site until the appropriate time when they shall either turn them over to installing contractor or install them.

- B. If the contractor chooses to allow a third party to receive shipments on his behalf the contractor bears sole responsibility for any missing and/or damaged parts.
- C. Any equipment that is furnished by the contractor for installation by others shall be turned over to the installing contractor at a time that fits into their production schedule and the project's overall construction schedule.

1.13 STANDARDS REFERENCES:

- A. The contractor is responsible for the provision of material and methods installation of equipment conforming to the currently applicable standards of:
 - 1. ADA - Americans with Disabilities Act
 - 2. AISC - American Institute of Steel Construction
 - 3. AISI - American Iron and Steel Institute
 - 4. ANSI - American National Standards Institute
 - 5. ASME - American Society of Mechanical Engineers
 - 6. ASTM - American Society for Testing Materials
 - 7. AWS - American Welding Society
 - 8. EIA - Electronic Industries Association
 - 9. ESTA - Entertainment Services and Technology Association
 - 10. FCC - Federal Communications Commission
 - 11. IEC - International Electronics Commission
 - 12. IEEE - Institute of Electrical and Electronics Engineers
 - 13. IFI - Industrial Fasteners Institute
 - 14. ISO - International Organization for Standardization
 - 15. NACM - National Association of Chain Manufacturers
 - 16. NEC - The National Electric Code
 - 17. NEMA - National Electrical Manufacturers Association
 - 18. NFPA - National Fire Protection Association
 - 19. OSHA - Occupational Safety and Health Association
 - 20. SAE - Society of Automotive Engineers
 - 21. SMPTE - Society of Motion Picture and Television Engineers
 - 22. TIA - Telecommunications Industry Association
 - 23. UL - Underwriters Laboratories (Electrical components, devices and accessories shall bear a UL label where applicable. UL listed and labeled as defined by NFPA70, article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.)
 - 24. USITT - United States Institute for Theater Technology "Recommended Guidelines for stage rigging and stage machinery-specifications and practices".
- B. Provide certification and labels where applicable. Comply with federal, state and local regulations and applicable union regulations where required. Provide all equipment with proper labels for sale and use within New York State.
- C. Provide only equipment that is standard, new equipment, the latest model of regular stock product and is supplied with all parts regularly used with the equipment offered for the purpose intended. The contractor guarantees that no modification of the equipment has been made contrary to the manufacturer's regular practice.
- D. Review all materials and equipment prior to installation and notify owner as to any changes or discrepancies between published specifications and the actual material and equipment to be installed, including discontinued product updates, etc.

1.14 EQUIVALENTS:

- A. The successful bidder shall submit any product equivalents prior to award of the contract. When requested, the successful bidder shall also submit information, describing in specific detail, how the equivalent bid material differs from the appearance, quality and performance required by the base specification. Submittal of the manufacturer's advertising cut sheets alone is not acceptable for proof of equivalency.
- B. Proof of equivalency may require the bidder to provide physical samples, a full-sized mockup or specific manufacturer information detailing technical equivalency. Proof of equivalency shall be the burden of the submitting contractor/bidder and not that of the consultant. Proof of equivalency relates to all pertinent functions of the specified equipment, regardless of if that information is reflected on any manufacturer's issued cut sheets.
- C. If proposing equivalents that affect the system design as shown on the drawings, the bidder must submit flow charts, and any other drawings necessary to show differences in the system operation from the primary referenced system.
- D. The bidder will pay for any and all changes to related work scope required by the equivalent products.
 - 1. This includes electrical, architectural, structural and other changes that might be needed to implement an equivalent product.
 - a. Some products with virtual identical functions have varying power requirements, physical dimensions, etc.
- E. The risk of whether bid equivalents will be accepted is borne by the contractor. See section 2.1 "Performance Requirements" for more information.
- F. No equivalents will be considered after the Contract award unless specifically provided in the Contract Documents.
- G. Final judgment as to equality will be solely that of the consultant, architect, construction manager and owner.
- H. The costs for any changes by other trades required to implement the equivalents proposed will be borne by the contractor.

1.15 SUBMITTALS:

- A. Equipment: After bid award but before ordering any equipment or starting any work submit to the owner for approval a list of all equipment to be furnished showing types, models, quantities and manufacturer. Attach catalog sheets for all items submitted.
- B. The quantity and form (paper and/or electronic copies) of all submittal material required shall be provided by the contractor to the appropriate parties as is indicated in the contract front end documents (in addition to any requirements listed below). If there are no indications in the contract front-end documents, then the contractor shall submit (1) electronic copy of each area, category, etc. of items as listed below. All submissions are understood to be intended for approval by the construction manager, the architect, owner, general contractor and the consultant prior to any fabrication or installation of any devices.
- C. Submit a schedule for submission of drawings for fabrication and site work.
- D. Submit a complete submission package with all required paperwork.
- E. Submit each of the following as each pertains to this project. Provide a copy for each related person performing indicated work who holds these certifications:
 - 1. Current training certifications.
 - 2. Current ETCP certification.
 - 3. Current manufacturer certifications.

- F. Submit material schedules and shop drawings for approval by the architect, consultant and owner prior to any fabrication or installation as follows:
 - 1. The full set of submitted drawings and data sheets must be presented in a professional manner.
 - 2. All drawings for submission must be CADD drawn (created with a computer aided drafting program). Hand drawings are not allowed. Illegible drawings shall not be acceptable.
 - 3. All cut sheets for submission must be high-resolution electronic (pdf) copies of the manufacturer's actual data sheets. Mark up each sheet with highlights or boxes around submitted products, options, etc. No data sheets shall be acceptable that are illegible, poorly photocopied or hand marked up with scribbles, etc.
 - 4. Drawings of proposed mounting methods for all equipment.
 - 5. Samples of proposed marking systems for wire and equipment labeling.
 - 6. Rack layouts, panel layouts and proposed labeling.
 - 7. Schedule for submission of drawings for fabrication and site work.
- G. Quality Assurance
 - 1. The Basis of design for the dimming and control system shall be manufactured by Electronic Theater Controls, Inc., 3030 Laura Lane, Middleton, Wisconsin. The equipment is described in complete technical data available from the manufacturer.
 - 2. Fabrication shall begin only after approved drawings and a written notice to proceed have been delivered to the manufacturer at the manufacturer's place of business.
 - 3. A qualified engineering representative employed by the manufacturer shall visit the job site after installation is complete and prior to the energization of the system to inspect, test and adjust the system.
 - 4. This representative shall terminate & connect all control wiring, verify all load and line wiring, and energize the system. The factory representative will also program architectural control presets.

1.16 GENERAL SYSTEM DESCRIPTION:

- A. Theatrical Lighting System:
 - 1. Architectural Lighting Controls
 - 2. Performance Lighting consoles
 - 3. Incandescent dimming
 - 4. Relay panels
 - 5. Integrally dimmed LED lighting
 - 6. Emergency Lighting Interfaces
 - 7. Hang and focus of luminaires
 - 8. Integration of house/work lighting into overall system architecture
 - 9. Commissioning, Training and closeout documentation

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

- A. The requirements of the referenced equipment are not generic in nature. Specific performance, control and routing capabilities are necessary for any alternate or substituted equipment. The details set forth herein and within the functional descriptions of each system are the critical criteria for the selection of each piece of equipment.
- B. In bidding equipment from manufacturers other than those referenced be aware that all functional information included in this specification as well as the manufacturer's specifications, physical size, serviceability, acoustic output, warranty terms, product availability and other non-technical issues may be determining factors in product equivalency. Final judgment as to equality will be solely that of the owner, architect and consultant.

- C. If the contractor substitutes a piece of equipment that does not meet with all of the critical device functionality of the specified equipment (functionality and feature set as detailed below, inherent in the specified equipment, available as provided option and/or required based upon the intents of the contract documents), then he will have to replace all substandard equipment or substituted equipment that does not meet, match or exceed the specified equipment with either the specified equipment or an alternate piece(s) of equipment that meets/exceeds the specified equipment's feature set and shall provide all reprogramming, installation, conduit, wire, etc. as is required.
- D. All lighting must meet these minimum requirements:
 - 1. Minimum Foot Candle Requirements: See Section S804 of the New York State Education Department's Manual of Planning Standards – 2014 Draft. Reference Table S804-1.
 - 2. All luminaires must meet or exceed the minimum initial NEMA LE5 Target Efficacy Rating (TER). See Section S804 of the New York State Education Department's Manual of Planning Standards – 2014 Draft. Reference Tables S804-2 & S804-3.
 - 3. All LED fixtures shall feature power factor correction (PFC) in their circuitry and/or meet a minimum power factor (PF) of .9. Active PFC is preferred, although passive PFC is acceptable, if the fixtures meet the minimum PF.
- E. Equivalent Criteria:
 - 1. Relay rack substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Product warranty period
 - b. Physical rack size
 - c. Relay density
 - d. dB noise output of rack
 - e. Rack noise frequency response curve
 - f. 0-10 Volt control capabilities
 - g. DMX routing and control capabilities
 - h. Relay rack's acoustic output and tonality
 - i. No field modifying the rack itself by the contractor in order to meet spec.
 - j. No operational capabilities limitations in order to meet spec.
 - 2. Dimmer rack & dimmer module substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Product warranty period
 - b. Physical rack size
 - c. Dimmer density
 - d. dB noise output of rack
 - e. Rack noise frequency response curve
 - f. Form factor
 - g. Availability of sound suppression devices to quiet rack
 - h. Dimmer module rise time
 - i. Dimmer module types, configurations, etc.
 - j. Quiet fan kit.
 - k. Sound attenuating hood.
 - l. Dimmer rack's acoustic output and tonality
 - m. No field modifying the rack itself by the contractor in order to meet spec.
 - n. No operational capabilities limitations in order to meet spec.
 - 3. Lighting control system device substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Product warranty period
 - b. Physical device size
 - c. Device installation options (rack mount, DIN rail mount, etc.)
 - d. Physical quantity of inputs, outputs, sourcing & sinking
 - e. Output modes (0-10V, 0-15V, 0-2.5V, 0-5V, etc.)
 - f. Current rating per channel
 - g. RDM discoverability and remote manipulation capabilities

- h. Selectable starting addresses
 - i. Signal isolation and fault protection limits
 - j. Voltage step selections (.05V, .1V, etc.)
 - k. Quantity of DMX universe control
 - l. Protocol conversion and compatibility with alternate control schemes (sACN, DMX, RDM, 0-10V, DALI, etc.)
 - m. Display, programming buttons & configuration limitations
 - n. Panic controls interface
4. DMX/0-10V Data Emergency Bypass device substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Physical device size
 - b. Device installation options (rack mount, DIN rail mount, etc.)
 - c. Physical quantity of inputs, outputs, sourcing & sinking
 - d. Physical quantity of emergency, UL924, contact, panic or other inputs
 - e. Output modes (DMX, 0-10V, 0-15V, 0-2.5V, 0-5V, etc.)
 - f. Current rating per channel
 - g. Snapshot ability of a DMX "look" into the device's non-volatile memory
 - h. Signal isolation and fault protection limits
 - i. Quantity of DMX universe control
 - j. Protocol conversion and compatibility with alternate control schemes (sACN, DMX, RDM, 0-10V, DALI, etc.)
 - k. DIP switches, programming buttons & configuration limitations
 - l. Panic controls interface
 - m. UL924 controls interface
 - n. UL924 capabilities
 - o. No operational capabilities limitations in order to meet spec.
 - p. Required (or not required) device backbox quantities & sizes
 - q. Emergency control system topology
 - r. Device quantity, lack of need for additional power/control conduits, wiring, etc.
 - s. LED indicator light for device emergency status, etc.
 - t. Form factor
 - u. No required, additional or "buried" accessories or devices in order to obtain system performance requirements.
5. Lighting control console substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period and advanced replacements policies
 - b. Physical console size
 - c. Console fader wing attachment locations and options as well as how these devices interconnect with the console and the monitor mounts, clearances in low-profile rolltop units, ability to configure as the specified system, etc.
 - d. Quantity of individual faders
 - e. Moving light knobs/wheels
 - f. Remote focus unit device interface without the need for remote or multiple wireless access points, etc.
 - g. Ability to output to an external monitor
 - h. Quantity and type of physical external monitor outputs
 - i. Ability to interface with touch screen monitors
 - j. Control channel count capacity
 - k. DMX universe count control capacity
 - l. Built in touch screen control
 - m. Drag and drop features on console touchscreen
6. Architectural control system substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period
 - b. Physical device size

- c. Required device backbox sizes
 - d. Architectural control system topology
 - e. Preset recall by button stations and LCD displays.
 - f. LCD display size, color & programming options
 - g. LED indicator light on individual control station devices
 - h. Form factor
 - i. No required, additional or "buried" accessories or devices in order to obtain system performance requirements.
 - j. No spare wire requirements
 - k. Ability for each pushbutton station button to trigger the unique preset desired and not simply manufacturer determined or hardware/software restrictive preset order recalls.
 - l. Ability for architectural control system to read console snapshots and recall them via presets.
 - m. No "room" restrictions in system topology or functionality.
 - n. Proximity detector on LCD stations
 - o. For all 0-10V, DMX, network or RDM devices the equipment provided must meet or exceed all programmatic, voltage options, etc. of the specified equipment.
7. Lighting fixture substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period and advanced replacements policies
 - b. Physical fixture size
 - c. Form factor
 - d. Light output pattern
 - e. Light output intensity in FC distribution
 - f. Wattage of lamps
 - g. Expected and average lamp life
 - h. Ability of fixtures to fit/hang in intended locations and with all physical limitations of surrounding structure.
 - i. Ability of theatrical fixtures to side-hang on tormentor or Shakespeare pipe assemblies.
 - j. Ability of theatrical style fixtures to be oriented "base up" for houselighting applications.
8. LED fixture substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period and advanced replacements policies
 - b. Physical LED strip size, flexibility & durability
 - c. PF (power factor)
 - d. Light output pattern
 - e. Efficacy (lumens per watt)
 - f. CRI
 - g. PWM frequency adjustability (to high rates)
 - h. Light output intensity in FC distribution
 - i. Form factor
 - j. Wattage of LED's
 - k. Expected and average LED & related drive electronics lifespan
 - l. Total length of runs powered by a single, dimmable LED driver/power supply shall meet or exceed specified products.
 - m. LED driver/power supply(ies) and their ability to dim the LED's smoothly and down to 1% is critical.
 - n. Ability of LED fixtures/strips to fit in intended locations and with all physical limitations of surrounding structure.
 - o. Binning tolerances & LED quality control must match or exceed specified product.
 - p. LED drivers, interfaces, mounting options, etc. shall meet or exceed specified product.
 - q. No rope lighting or similar products (not even LED rope lighting) shall be considered as an equal to the specified LED strip lighting products nor shall any rope lighting equivalents be approved.
 - r. Lumen outputs at deep colors

- s. Visual representation of white light output of fixture - color temperature variants
 - t. Power draw requirements.
 - u. Beam spread characteristics
 - v. Fixture power supplies must have inherent brown-out protection built in, such as a switching power supply, that shall be self-resettable, not fuse driven and shall not require human interaction in order to operate.
 - w. Color mixing capabilities without excessive rainbowing effects at beam edges
 - x. Fixture lens options
 - y. Total numbering and visual quality of distinct renderable colors
 - z. Critical accessories and mounting options.
 - aa. Cooling requirements – convection cooled vs. fan cooled and including fan noise, tonality of fans, etc.
9. LED houselighting fixture substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period and advanced replacements policies
 - b. Physical LED strip size, flexibility & durability
 - c. PF (power factor)
 - d. Available light output patterns
 - e. Lumen package options
 - f. Efficacy (lumens per watt)
 - g. CRI
 - h. PWM frequency adjustability (to high rates)
 - i. Light output intensity in FC distribution
 - j. Form factor
 - k. Wattage of LED's
 - l. Expected and average LED & related drive electronics lifespan
 - m. LED driver/power supply(ies) and their ability to dim the LED's smoothly and down to <1% is critical (dim to black capabilities). Some general house/work lighting fixtures need only dim down to approx. 10%, based upon specified manufacturer's product.
 - n. Ability of LED fixtures/strips to fit in intended locations and with all physical limitations of surrounding structure.
 - o. Binning tolerances & LED quality control must match or exceed specified product.
 - p. LED drivers, interfaces, mounting options, etc. shall meet or exceed specified product.
 - q. No rope lighting or similar products (not even LED rope lighting) shall be considered as an equal to the specified LED strip lighting products nor shall any rope lighting equivalents be approved.
 - r. Visual representation of white light output of fixture - color temperature variants.
 - s. Absence of visual anomalies during static and/or dimmed states (i.e. no flickering, ghosting, jitters, popcorning, etc.)
 - t. Overall acoustic output of fixture during static and/or dimmed states (i.e. fixtures must not create any discernable acoustic output or tonality of acoustic output while in use)
 - u. Absence of RF interference during use/standby state
 - v. Power draw requirements.
 - w. Beam spread characteristics
 - x. Critical accessories and mounting options.
 - y. Cooling requirements – convection cooled vs. fan cooled and including fan noise, tonality of fans, etc.
 - z. Fixture installation requirements (installable from below, retrofittable into existing ceiling and holes, etc.)
10. Connector strip substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Physical connector strip size
 - b. Connector strip bracket type, style, size and required frequency of suspension locations.
 - c. Form factor
 - d. Load rating of connector strip brackets

11. Outlet box substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Physical outlet box size
 - b. Outlet box bracket type, style, customization extents and required frequency of suspension locations.
 - c. Form factor
 - d. Load rating of outlet box brackets
 12. Connector strip substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Physical connector strip size
 - b. Connector strip bracket type, style, size and required frequency of suspension locations.
 - c. Form factor
 - d. Load rating of connector strip brackets
 13. Wire substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Jacket Type
 - b. Number of Conductors
 - c. Jacket Shape – i.e. round, twisted, etc.
 - d. Number of strands and gauge
 - e. Flexibility
 - f. Overall physical size of wire
 - g. Capacitance and resistance conductor-to-conductor as well as single conductor.
- F. No contractor-manufactured products shall be acceptable in place of referenced items except for those items enumerated in this specification as "custom."
- G. The current manufacturer's data sheet, user's manual and actual technical specifications/capabilities/feature set for each referenced piece of equipment in force at the date of printing of this specification shall be the basis for the specifications of the referenced equipment.
- H. Any necessary product accessories such as additional duplex power outlets, power supplies, rack mount kits, connectors, adapters or other small items are the responsibility of the contractor to provide, whether or not they are called out in detail within these specifications. This may include additional electrical work, depending upon the differences between substituted and specified equipment and shall be the sole responsibility of the contractor to provide at no additional cost to the owner.
- I. Specification details are provided only for the features required for current and intended future uses of the products.
- J. Quantities:
1. Where no quantity is indicated in the written specifications, the contractor shall supply quantities as indicated on drawings.
 2. Items not indicated on drawings but necessary for project completion shall be provided as required for project execution at no additional cost.

2.2 STANDARDS:

- A. Intentions of standards:
1. This document establishes the minimum standards required for the specified lighting and related equipment installed in this facility as part of this specification and related drawings; however, the proper installation and operation of this equipment are equally important. Equipment shall be operated and maintained by (or under the supervision of) a competent person (trained and experienced personnel with the proper knowledge and training to understand theatrical lighting systems and to recognize all of the imposed hazards and functional requirements that these devices involve as it relates to this particular installation). Failure to adhere to these minimum standards could result in serious injury to operators or bystanders and/or death.

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2. These standards apply to theatrical lighting hardware only and not to the building or related structure from which these components are supported/suspended.
- B. All lighting system equipment shall conform (as a minimum) to the standards set forth in ANSI standards that deal with luminaires, control protocols for lighting, photometrics and electrical power (or the current version of the most recent standard revision).

2.3 THEATRICAL LIGHTING CONSOLE: REFERENCED PRODUCT ETC ION XE 20

A. General

1. The lighting control console shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems. The console shall be the Ion Xe 20 as manufactured by Electronic Theatre Controls, Inc., or equal.
2. The system shall provide control of either 2,048 or 12,288 outputs on a maximum of 32.768 control channels, which may be any number from 1 to 99,999. Systems that require external co-processing to control 12,288 outputs shall not be acceptable. Output shall be distributed over a 10/100 MB Ethernet network using Net3/ACN, ETCNet2, Avab and/or Artnet (multi-cast) protocols. The user shall be able to control the application of protocols at an individual address level.
3. The system shall support full bi-directional RDM communication with compatible devices via Net3 DMX/RDM Gateways. RDM communication shall adhere to ANSI standard E1.20-2006 Entertainment Technology – RDM – Remote Device Management Over DMX512 Networks. Supported RDM features shall include:
 - a. Discovery and Identification of RDM capable devices
 - b. Setting of start addresses, operating modes and additional settings as exposed by connected devices and controllable via RDM
 - c. Viewing of Sensor data as provided by connected devices
 - d. Error reporting as provided by connected device
4. A maximum of 10,000 cues, 1000 groups, 1000 presets, 4 x 1000 palettes (Intensity, Focus, Color and Beam), 99,999 macros, 1000 effects, 1000 curves, 1000 Color Paths and 1000 snapshots may be contained in non-volatile electronic memory and stored to an onboard solid-state hard drive or to any USB storage device.
5. Recorded cue lists may be played back simultaneously on a maximum of 200 faders. Channels shall respond to cue information by last instruction with discrete rate control provided for all cues. The console may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required. HTP/LTP intensity flags, assert, proportional, intensity master or manual master fade control. Priority and Background Priority may be placed on each cue list. It shall also be possible for a cue list to contribute to playback background states or to withhold such contributions.
6. A Master Playback fader pair shall be provided. The 100mm motorized fader pair may execute crossfades or all-fades, with IFCB cue level timing,
7. 20 45mm faders shall be user configurable across 100 pages and provide additional playback faders (up to 200), additive or inhibitive submasters (up to 999), and grand master control. Associated displays provide content identification. Presets and IFCB palettes may be loaded to faders for playback control, either individually or in user-defined lists. Virtual fader control is also provided.
8. A high-resolution level wheel shall be provided to control intensity for selected channels and scrolling within selected displays. Four pageable encoders shall be provided for control of non-intensity parameters. Non-intensity encoders toggle between coarse and fine control. The expand function for frame table devices shall provide a graphic representation of all images and colors in the associated device for instant selection. A graphic shutter representation shall provide additional control of shutter parameters. The display shall also provide an indication of the current value for the associated parameter, based on channel selection. A high-resolution rate wheel, which may also be used for fader paging shall be provided.

9. Control surface buttons shall be backlit. This backlighting provides indication of functional states. Backlight intensity shall be user controllable, and shall automatically dim after a defined period of inactivity.
10. Control and programming features for automated fixtures shall also include: a standard library of fixture profiles, the ability to copy and edit existing profiles and create new profiles, patch displays including channel and output addressing, 16-bit fade resolution, color characterization allowing color mixing and storing in Hue and Saturation or native device values.
11. System information, including playback status, live output and blind values for all record targets shall be displayed on a maximum of two external high resolution monitors, which may also be multi-touch touch-screens. All displays may also be routed to the integral touch screen. Every display shall support three user-definable workspaces. Each of these workspaces shall provide individually configured frames, with size/scaling controls. Any Windows 7 compatible display may be used.
12. A context sensitive on-line Help feature shall explain and provide an example of the operation of each feature of the system.
13. A fully integrated Virtual Media Server feature shall allow user to map images and animations to a rig array. 40 such maps may be created, each with 12 layers. System that rely on external hardware or software for this functionality shall not be acceptable.
14. User-definable, interactive displays may be created. These displays, which can be used in live and blind operating modes, allow graphical layout of channels, desk buttons and programming tools. Standard symbols are provided, and the user may import their own symbols or graphics. Each symbol may be individually defined with data feedback characteristics. Non-interactive status information, such as a mirror of other user's command lines, may also be included in the display. A graphical browser is provided for fast selection of these views. Multiple zoom factors and placements may be stored and recalled for each display.
15. A detachable alphanumeric keyboard shall be provided. The keyboard shall allow labeling of all show content. The central touch screen shall also repaint to access an integrated virtual alphanumeric keyboard.
16. Console software upgrades shall be made by the user via flash drive. It shall be possible to install software updates in all consoles, processor units and remotes from one device over the network.
17. The console operating software shall be loaded into program execution memory from the internal hard drive when the console is powered. In the event of an uncontrolled shutdown, the console shall return to its last output state when power is restored. Devices requiring a UPS to provide such protections shall not be acceptable.
18. Integrated dimmer monitoring features shall be provided to allow indication of dimming system status, error states and dimmer load monitoring. Adjustment of dimmer configuration from the console shall also be supported. Communications with the dimming system shall utilize ANSI E1.17 2006 - Entertainment Technology - Architecture for Control Networks.
19. Integrated RDM device features shall be provided. The console shall discover and patch RDM devices. The console shall monitor RDM devices to allow indication of RDM device online/offline status error states. The console shall be capable of changing settings of RDM devices such as the DMX start address. Communications with the RDM devices shall utilize ANSI E1.20 2006 – Remote Device Management.
20. Network configuration tools shall be provided from within the desk.
21. Show data may be created and modified on a personal computer, using either Windows 7 or higher or a Macintosh platform running OS 10.11 or later via a free offline editing application. The program shall run natively on Apple operating systems. Applications requiring PC emulation programs shall not be acceptable.
22. A PC, using either Windows 7 (or higher), or a Macintosh running OS 10.11 (or later) using the offline software application shall be able to connect to a control system via the network and view or modify current show data in an independent display environment, using an ETCnomad key. When connected without the key, the computer shall operate in Mirror Mode, with the device to be mirrored selectable by the user.

23. Synchronized backup shall be provided via another full console on the network, an ETCnomad/Puck, or by use of a remote processor unit. The backup console/RPU shall maintain synchronized playback with the master and shall take over control of the lighting system upon loss of communication with the master. Use of two RPUs to service and backup system output is also supported.
24. A maximum of 99 users may access and interact with show data simultaneously. Each user shall have an individual workspace. User identification may be assigned to more than one control device, allowing users to work in tandem, or allowing a designer/ALD to mirror the current display format, mode and command line of the associated programmer. Partitioned control allows discrete control of channel/parameter groupings by user. Partitioned control may be easily enabled and disabled with no need to merge show data from multiple users.
25. The system shall support up to 32 individual simultaneous Time Code inputs or Event lists using Show Control Gateways.
26. Systems that do not provide the above capabilities shall not be acceptable.

B. Controls and Playback

1. Manual Control and Programming Section

- a. The console keyboard shall be grouped by function. Major groupings shall be record target functions, numeric keys, level assignment functions, display navigation functions and controls, as well as non-intensity parameter controls.
- b. The command keypad shall be fully interactive with direct selects and other virtual controls, which provide "one touch" selection of channels, groups, palettes, presets, effects, snapshots and macros.
- c. Non-intensity parameters may be set numerically via an extensible keypad on the central LCD. This control shall be fully interactive with the moving light encoder controls and the virtual controls. The LCD touch screen associated with the encoders shall display the current encoder function. The touch screen shall also access available modes for each parameter type, min and max values for each parameter as applicable, as well as home position on a parameter basis. Each encoder shall support shift functions for fine control. The range of motion of coarse control may be set by the user. Tactile feedback shall indicate full and half frame positioning of certain controls.
- d. Only those parameters available for control in the active lighting system shall be displayed for control. Displays shall condense or lowlight parameters not available to selected channels. Alternatively, the encoders may be placed in a state allowing parameters not applicable to the current selection to be suppressed.
- e. Lamp controls provide direct access to luminaire functions such as striking and dousing arc lamps and calibrating entire fixtures or individual mechanisms of fixtures, as provided by the luminaire manufacturer. User access to these features is normalized across all manufacturers for ease of use. Use of a "control channel" for accessing these functions shall not be required and systems requiring use of control channels for these functions shall not be acceptable.
- f. Fan functions shall be provided both via command line operation and through encoder controls.
- g. Highlight shall be supported, with user definable highlight values. Lowlight conditions may be defined for selected, but not specified channels. Rem Dim commands, at specific levels by channel, may be optionally and automatically called with the highlight command.
- h. Advanced color control functions provide color mixing in any of six different color spaces. Gel matches are provided via gel picker or by command line control. Tinting tools allow adjusting the color mix irrespective of the native mixing system. Spectrum tools support adjusting the output of additive color systems with more than three emitter types, allowing the X/Y coordinate to be held while adjusting the recipe that achieves that mix. Color Path tools allow the user to control the live fade of fixtures through the color space.
- i. The Virtual Media Server function shall allow the user to create layouts of devices, identified as pixel maps. Media content (images, movies, text and procedurally generated effects) may then be applied, manipulated and stored. Stock content is provided and the user may import his own imagery and animations.

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- j. Macros may be set to run as default. Default macros called manually shall post to the command line, but executed via cue lists shall run in the background. The user may override this behavior by defining the macro to always execute in the foreground or background, regardless of the recall method. Startup, Shutdown and Disconnect macros may also be defined.
- 2. Playback Section
 - a. The playback faders shall consist of a motorized 100mm Master Fader pair and 20 45mm additional playbacks.
 - b. Up to 200 cue playback faders may be defined on the fader array. Each playback shall have an associated 60mm motorized potentiometer and definable buttons.
 - c. Faders may be grouped for playback, with sliders and button action defined by the user.
 - d. It shall be possible to instantaneously halt an active cue, back to the previous cue, manually override the intensity fade or manually override the entire fade.
 - e. It shall be possible for a cue list to contribute to the background state or for the contents of each cue list to be withheld from such.
 - f. Playback faders shall have the following associated controls:
 - 1) Freeze, which halts the output of the fader
 - 2) Stop Effect, which stops the action of an effect
 - 3) Filter, to assign filter states to a fader
 - 4) Go To Cue 0, to reset a cue list
 - 5) Off, to turn off the contents of a playback, releasing control to the background state or to set to null.
 - 6) Assert, to replay an active cue
 - 7) Release, to release control to the background and reset the cue list.
 - 8) Timing disable, channel filters, parameter filters, priority and background priority status may also be defined.
 - 9) The potentiometer shall be configurable as a proportional master, an intensity master, or manual master. Support for rate, effect rate, effect size and Master Only controls is also provided. Filtered manual timing masters may be configured.
 - 10) Rate override and fader paging are supported with a wheel encoder and associated controls.
- 3. Submasters
 - a. Up to 999 proportional, fully overlapping additive or inhibitive submasters may be defined. Submasters shall have colored LEDs to indicate submaster status. Each submaster may have fade up, dwell and down fade times. Submasters may be set to priority and background priority status.
 - b. Submasters may be set to HTP or LTP intensity. Non-intensity parameters on submasters shall be LTP only.
 - c. Exclusive mode for a submaster shall prohibit the live contribution of that submaster from storing to cues or other submasters. Shield mode prohibits access of associated channels from any other playback or manual control operations.
 - d. A submaster potentiometer may be defined as proportional, master only or intensity master. When set as an intensity master, a mark and unmark feature is supplied.
 - e. Motorized faders shall set submasters to required positions as fader pages are changed.
 - f. The submaster blind buffer shall be linked directly to live playback.
 - g. It shall be possible to set submaster values directly from the command line.
 - h. Submasters may be set to fade to background or to minimum value when the fader is returned toward zero.
 - i. Submaster values may contribute to the background state or withheld from such.
- 4. Grand Master Faders
 - a. The location of the Grand Master shall be user definable. The grand master shall have associated blackout and blackout enable buttons.
 - b. Blackout shall send all associated intensity outputs to zero. Non-intensity outputs shall not be affected.

- c. Motorized faders shall set grand masters to required positions as fader pages are changed.
- C. Display Controls
 1. Format shall change the view of selected displays.
 2. It shall be possible for the user to choose which parameter categories or parameters (s)he wishes to display.
 3. Flexichannel shall change which channels are viewed in selected displays, as follows:
 - a. All channels
 - b. Patched channels
 - c. Show channels
 - d. Active/Moved channels
 - e. Selected channels
 - f. Manual Channels
 - g. View channels (user identified list)
 - h. Channels with discrete timing
 4. Expand shall extend the selected view sequentially across connected displays.
 5. [Time] depressed shall display discrete timing data. [Data] suppressed shall display absolute values of referenced data. These functions may be latched.
 6. Displays may also be toggled to show stored data currently manually overridden, the source of the current parameter data, output level, patch assignment, part structure and referenced marking data.
 7. Playback status displays are provided with a variety of different formats. Indications are provided per cue for live moves (lights fading from zero and also moving non-intensity parameters) and dark moves (inactive lights which have stored non-intensity parameter moves).
 8. Display content including which of the workspaces is in focus on any of the three monitors and what views are docked in those workspaces may be instantly recalled using snapshots.
- D. Operating Modes
 1. Live Mode
 - a. Channel lists may be constructed using the +, -, and Thru keys as well as the direct selects. Channel selection and deselection is fully interactive, regardless of the method used.
 - b. Levels may also be set with the keypad, level wheel and non-intensity encoders. "Selected" channels shall be those last addressed and under keypad control. Controls are provided for single button access to the last selected channel list, all channels with manual levels and all active channels.
 - c. Channels may be set at a user defined default level using the Level key. +% and -% keys adjust channels quickly by user definable values.
 - d. Channels and/or channel parameters may be captured. Capture mode shall allow the user to selectively capture channel data at specific levels. Captured data shall be indicated on the Live display.
 - e. Sneak shall be used to restore specified channels to background states, default values, or to send them to specified values, in user specified times.
 - f. Selected channels may be set at a level or held to current values while all other channels are set to zero using Rem Dim. Toggling Rem Dim shall restore all unselected channels to original levels. The Rem Dim level shall be user definable via the command line or with a default setup value.
 - g. Channels may be recorded into groups for fast recall of commonly used channels. 1000 groups shall be available. Groups shall store selection order. The Offset function supports rapid creation of ordered groups, including reverse and random order.
 - h. Parameter settings may be stored to Intensity, Focus, Color and Beam Palettes and to Presets. All referenced data may be stored to whole numbers or to up to 99 decimal places between each whole number.

- i. The following conditions may be placed on a channel or channel parameter to be included with a cue record action.
 - 1) Discrete fade time and/or delay
 - 2) Block flag
 - 3) Assert flag
 - 4) IFCB Filters, which may be set at a parameter level.
 - 5) Release and Restore
- j. 999 cue lists may be stored. Cues may be recorded in any order. Up to 99 decimal cues may be inserted between any two whole number cues. Each cue may contain a maximum of twenty parts.
- k. It shall be possible to record cues and cue parts with the following information:
 - 1) Any collection of channel data, as determined by the use of "Record", "Record Only" or selective store commands, combined with parameter filters.
 - 2) Cue Level timing and delays for Intensity Up, Intensity Down, Focus, Color and Beam.
 - 3) Follow or hang time
 - 4) Link instruction
 - 5) Loop value
 - 6) Block, Assert, Preheat, and/or Mark Flag
 - 7) Curve
 - 8) Allfade
 - 9) Label and note
 - 10) Execute list to trigger other activity
- l. Non-intensity channel parameters may be marked (preset), in two ways. Automark presets any parameters transitions in the cue just prior to intensity becoming active. Automark may be disabled on a cue or cue part basis, enabling a "live" move. Alternatively, non-intensity parameters may be marked to a specific cue with a single command instruction. It shall not be necessary to store these parameters directly into the cue in which the movement is to occur.
- m. Any channel parameter may be stored with an effect instruction. These effects may contain relative offsets from current value, or absolute instructions. Effects may be progressive action or on/off states. Entry and exit behaviors shall modify the channel parameters activity when beginning and ending the effect.
- n. Update may be used to selectively add modified parameter data quickly to that parameter's current source. Update may be specified to modify referenced data content or break the link to that content. A dialogue informs the user of the content that will be updated. A trace command may be used to modify the data to the original source of its move instruction. It shall be possible to update inactive record targets.
- o. Recall From quickly pulls specified data from record targets or other channels into the current view.
- p. Copy To quickly copies selected data to specified channels or other record targets.
- q. Address and channel check functions shall be provided.
- r. Channel parameters may be "parked" at levels. Those levels are not added to any live record operations, nor may they be changed until the parked element is "unparked". Scaled park provides real time proportional adjustment of stored intensity values. Address Park shall also be provided.
- s. About shall provide detailed status of selected channels or specified record targets. This shall include current source, current value, discrete timing, parked value, marked to and for indications. Background levels and current DMX output are also displayed. Channel usage indicates submaster and cue information and also provide a "dark moves" report on a per channel basis.
- t. 1000 snapshots may be stored which instantly recall specified front panel and display configurations.
- u. Live data may be displayed in a summary view or detailed table orientation.

- v. Query shall allow selection of channels by their current or possible state. Keywords and fixture types shall allow quick access to fixtures.
 - w. User definable home positions, on a per channel basis, may be defined.
 - x. Channel level offset commands provide channel ordering and sub-grouping functions.
 - y. Undo shall be used to sequentially step back through manual operations or to undo record and delete actions. It shall be possible to undo multiple commands in one action.
 - 2. Blind
 - a. The Blind display allows viewing and modification of all record targets without affecting stage levels.
 - b. Record target data may be displayed in a summary view, a detailed table orientation or a spreadsheet view, which allows quick data comparisons, move and replace functions.
 - c. Changes to blind data shall be automatically stored. Range selection of both record targets and channels shall be supported.
 - 3. Patch Display
 - a. Patch shall be used to display and modify the system control channels with their associated library data.
 - b. Each channel may be provided with a proportional patch level, curve, label, swap and invert functions, as well as keywords to service Query.
 - c. Accessing library data to patch multiple parameter fixtures may be accomplished entirely from the command line. Use of a pointing device to patch to moving lights shall not be required.
 - d. Offset functions in patch shall allow selection of channel ranges and shall allow the user to establish a "custom" footprint for any device output.
 - e. Custom color wheels, color scrolls and gobo wheels shall be defined in patch. These devices shall be created with a simple table and graphical user interface supported by images of major manufacturers.
 - f. RDM discovery and device monitoring shall be supported.
 - g. Copy to and Move functions shall be supported in patch.
 - 4. Setup/Browser
 - a. Setup shall access system, show and desk configurations.
 - b. It shall be possible to partially import Eos show files. Users shall be able to select as much or as little of the show file as required, with renumber tools.
 - c. It shall be possible to import ASCII and Lightwright data files. It shall be possible to export as ASCII or .csv.
 - d. Setup shall also access show data storage, import, export, print to .pdf and clear functions, as well as show data utilities.
 - e. The system shall support programming and playback of real time clock events, including cue, submaster and macro execution at specific times of specified days or at a time based on astronomical events.
 - f. A control screen shall be provided for network configuration, selecting date/time, software update controls, selecting functional language and/or keyboard for labeling option, as well as other system level tools.
 - g. Available languages for prompts, advisories and help messages shall include English, Bulgarian, German, Spanish, French, Italian, Japanese, Korean, Russian, Chinese, simplified and Chinese, traditional.
 - h. Supported keyboards shall include American, United Kingdom, French, German, Italian, Korean, Norwegian, Russian, Slovakian, Turkish, Swiss, Swedish, Finnish and Bulgarian.
- E. Dimmer Monitoring and Configuration
 - 1. The lighting control system shall provide communication with an ETC Sensor+, Sensor3 or FDX dimming system for remote monitoring and configuration of show specific functions from within the software application.
 - 2. Circuit level configuration and monitoring functions shall include but not be limited to:
 - a. Control mode (dimnable, switched, latch-lock, always on, off or fluorescent).
 - b. Curves
 - c. Control threshold

- d. Min and Max Scale Voltage
 - e. Preheat
 - f. Scale load
 - 3. Rack status messages shall include but not be limited to:
 - a. State of UL924 panic closure
 - b. DMX port error/failure
 - c. Network error/failure
 - d. A, B, C Phase below 90 or above 139 volts and headroom warning
 - e. Ambient temperatures out of range
 - 4. Circuit status shall include but not be limited to:
 - a. Module type and location
 - b. Output level
 - c. Control Source
 - d. Overtemp
 - 5. Advanced circuit feedback shall include but not be limited to:
 - a. Load higher or lower than recorded value
 - b. DC detected on output
 - c. SCR failed on/off
 - d. Breaker trip
 - e. Module has been removed
 - f. Load failure
 - g. Shutdown due to Overtemp
- F. Interface Options
 - 1. The console shall support a variety of local interfaces.
 - a. AC input
 - b. USB (five ports for items such as alpha-numeric keyboard, mouse, touch screens, USB Flash drive...)
 - c. Ethernet (two ports)
 - d. Two Display Port output connectors, supporting Windows 7 compliant monitors as 1280x1024 resolution minimum. Touchscreen/multi-touch support of any/all of these monitors is provided.
 - e. Contact Closure trigger via D-Sub connector
 - f. 4 DMX/RDM ports
 - g. Alternative Contact Closure trigger through Gateway
 - h. OSC Transmit/Receive
 - i. MIDI In/Out, MSC and MIDI Notes through Gateway
 - j. SMPTE Timecode through Gateway
- G. Accessories
 - 1. Touch Focus Remote
 - 2. iRFR and iRFR Preview (applications for iPhone, iPod Touch and iPad units)
 - 3. aRFR (application for Android devices)
 - 4. Net3 Remote Video Interface 3
 - 5. 20 Fader or 40 Fader non-motorized fader wings
 - 6. 10 Fader or 20 Fader motorized fader wings
 - 7. Gateways
 - a. Net3/ETCNet 2 to DMX/RDM Gateways (one to four ports)
 - b. MIDI/SMPTE Gateway
 - c. I/O Gateway with 12 analog inputs, 12 SPDT contact outputs, RS-232 interface
- H. Synchronized Backup
 - 1. An optional Backup system shall consist of one of the following combinations of devices:
 - a. Two networked Consoles.
 - b. One (or more) Console with one Remote Processor Unit (RPU)
 - c. One (or more) Consoles with two Remote Processor Units (RPUs)

d. ETCnomad/Puck

I. Physical

1. All operator controls and console electronics for a standard system shall be housed in a single desktop console, not to exceed 30" wide, 15" deep, 4.5" high, weighing 16.6 pounds. Console power shall be 90 – 240V AC at 50 or 60Hz, supplied via a detachable locking power cord.

J. Accessories: Provide the console with the following (see drawings for models and quantities, if required):

1. Eos Client Software Kit
2. Touchscreen monitors
3. LCD Monitor
4. Chief Manufacturing Monitor Mounts
5. Portable Network Cables (Gepco CT Series Heavy-Duty Tactical Style Cables)
6. Edison To Edison Extension Cord
7. SL Waber-By-Tripp Lite Deluxe Style Multiple Outlet Strip
8. DVI Cables
9. USB Cables
10. Back up UPS - To Power Lighting Console, Monitors & Related Equipment)
11. Littlelight Work Lights
12. USB Extended Keyboard - Black
13. USB 2-Button Laser Mouse - Black
14. Heavy-Duty Keyboard/Mouse Drawer
15. Multi-Port USB Hub
16. USB Memory Stick (Thumb Drive for saving backup, configs and show files)
17. Any other miscellaneous cables needed to complete the system. See TL series drawings for more information. Note that all loose lighting or power cables & wiring must be dressed neatly with tie wraps & eyes or ring runs & tucked up against underside of countertop. Drill clean passthrough holes as necessary & provide black grommets as needed.

2.4 LIGHTING CONSOLE WIDESCREEN TOUCHSCREEN DISPLAY: REFERENCED PRODUCT DELL S2240T 21.5" FULL HD 16:9 BLACK MULTITOUCH LED TOUCHSCREEN MONITOR

A. Display:

1. Viewable image size (diagonal): 54.6 cm (21.5 inches)
2. Horizontal/Vertical: 476.64 mm (18.77 inches); 268.11 mm (10.56 inches)
3. Maximum resolution: 1920 x 1080 at 60 Hz
4. Aspect ratio: 16:9
5. Pixel pitch: 0.248 x 0.248 mm
6. Brightness (typical): 250 cd/m²
7. Color gamut (typical): 84%
8. Color depth: 16.7 million colors
9. Contrast ratio (typical): 3,000:1
10. Dynamic contrast ratio (max): 8 million:1
11. Viewing angle (typical): (178° vertical / 178° horizontal)
12. Response time (typical): 12 ms with overdrive
13. Panel type: VA
14. Panel Backlight: LED
15. Tilt: Up to 60°
16. Flat Panel Mount Interface: VESA Mount 100mm x 100mm (Wall Mount sold separately)

B. Touch specifications:

1. Touch technology: Projected capacitive system
2. Sensor stack thickness: 1.1 mm
3. Cover glass thickness: 1.1 +/- 0.2 mm
4. Touch method: Fingers and thin gloves
5. Touch point: 10 touch-points

6. Response time: 25 ms
 7. Supporting OS: Windows 8 Certified
 - C. Connectivity:
 1. Connectors (S2240T):
 - a. DVI-D (HDCP)
 - b. HDMI
 - c. VGA
 - d. USB 2.0 upstream port (for touch enablement)
 - e. Audio line-out
 - D. Security: Security lock slot
 - E. Physical:
 1. Dimensions:
 - a. Height (extended): 370.8 mm (14.60 inches); Width: 522.5 mm (20.57 inches); Depth: 205.7 mm (8.10 inches)
 2. Weight:
 - a. Weight with packaging: 6.9 kg (15.20 lbs)
 - b. Weight without packaging: 5.80 kg (12.78 lb)
 - c. Weight of monitor only (without stand): 3.4 kg (7.49 lb)
 - F. Service and warranty: 1 year limited hardware warranty and advanced exchange service.
 - G. Power:
 1. AC input voltage/frequency/Current (typical): 100 VAC to 240 VAC / 50 Hz or 60 Hz + 3 Hz / 1.2 A (typical)
 2. Power consumption (normal operation, typical): 20 W
 3. Power consumption (active off mode): <0.5W
- 2.5 INTELLIGENT BREAKER SYSTEM: REFERENCED PRODUCT ETC SENSOR IQ RELAY PANEL/RACK
- A. General
 1. Intelligent breaker system shall be 120V Sensor IQ as manufactured by ETC, Inc., or equal
 2. Breaker Panels shall be UL508, UL67, and UL924 Listed, and shall be so labeled when delivered
 3. Breakers shall be UL489 listed and shall be labeled when delivered
 4. Breaker Panels shall consist of a main enclosure with 12, 24, or 48 pole breaker subpanels, integral control electronics for low voltage terminations and provision for accessory cards
 - a. Up to two accessory cards shall be supported per breaker panel
 - B. Mechanical
 1. The panel shall be constructed of 16-gauge galvanized steel. All panel components shall be properly treated or finished in fine-textured, scratch resistant paint
 2. Breaker panels shall be capable of being mounted on the surface of a wall or recessed mounted
 3. Breaker panels shall be available in 12, 24, and 48 pole configurations
 - a. 12 pole MLO (No provision for main Breaker)
 - 1) 31 inches high, 14.25" wide and 4" deep (with front panel attached)
 - b. 12 pole (with provision to add main breaker)
 - 1) 40.25 inches high, 14.25" wide and 4" deep (with front panel attached)
 - c. 24 pole (with provision to add main breaker)
 - 1) 50.25 inches high, 14.25" wide and 4" deep (with front panel attached)
 - d. 48 pole (with provision to add main breaker)
 - 1) 64 inches high, 20" wide and 5.25" deep (with front panel attached)
 4. Choice of panel covers shall be available for surface or recess mount applications. This outer panel shall ship complete with a locking door to limit access to electronics and breakers

- a. Optional center-pin reject security screws shall be available for all accessible screws
 - b. Optional recess mount doors shall extend 1" beyond all panel edges to hide wall cut-out
 - 5. The unit shall provide interior cover over the control electronics and accessory cards to allow access only to class 2 wiring and prevent direct access to class 1 line voltage components
 - 6. The panel shall support up to twelve, twenty-four, or 48 single pole branch circuits
 - a. Branch circuits shall range from 15A to 30A capable of holding full rated load for minimum of three hours continuously
 - b. Two and three-pole circuits shall be supported at decreased density where each pole constitutes one of the available single-pole circuits. Mixing of circuits in any combination shall be supported
 - 1) Breakers shall provide manual switching control while power is unavailable to the panel such that critical lighting can be set to an on state, without the need for power to the panel
 - 2) Breaker output lugs shall accept 10-14 AWG dual conductor wire
 - 3) Breaker output lug shall support solid or stranded 6-14 AWG class B, C, or K copper wire
 - 4) Control wiring for DMX, station bus, and Emergency input terminations shall land on a removable headers for contractor installation
- C. User Interface
 - 1. The user interface shall contain an LCD display with button pad to include 0-9 number entry, up, down back arrow navigation and enter
 - 2. Test shortcut button shall be available for local activation of preset, sequence and set level overrides
 - 3. The user interface shall have a power status LED indicator (Blue), a DMX status LED indicator (Green), a network status LED indicator (Green) and an LED indicator (red) for errors
 - 4. Interface shall allow the backlight to timeout and shall provide user editable options to shut off backlight completely as well as adjust screen contrast
 - 5. Ethernet interface shall default to automatic IP through link local and DHCP. Upon receiving IP address, the address of the Network Interface Card (NIC) shall display in the about menu. Static address and settings shall also be possible
 - 6. The control interface shall support a USB memory stick interface for uploads of configurations and software updates
 - 7. The user interface shall support power input from an external Uninterruptible Power Supply (UPS) supplying 800W-2400W AC power
- D. Functional
 - 1. Panel setup shall be user programmable. The control interface shall provide the following breaker setup features (per circuit):
 - a. Type (1 pole, 2 pole, or 3 pole)
 - b. Name
 - c. Circuit Number
 - d. DMX address
 - e. sACN address
 - f. Space Number
 - g. Circuit Modes
 - 1) Normal (priority and HTP based activation and dimming)
 - 2) Latch-lock
 - 3) Fluorescent
 - 4) DALI
 - h. On threshold level
 - i. Off threshold level
 - j. Include in UL924 emergency activation
 - k. Allow Manual

2. Breaker panels shall support discrete addressing of each breaker. Panels that are restricted to use of start address with sequential addressing, and cannot assign each 0-10V output control to any internal circuit shall not be acceptable
3. The panel shall be capable of switching 6 poles on or off at once, or in a user-selectable delay per breaker using a period of 0.1 to 60 seconds, in 0.1 second increments
4. An Ethernet connection shall provide advanced control of relays over streaming ACN (sACN) and transmit status, control override, and measured energy usage per branch circuit via an internal Web UI or central monitoring interface
 - a. Control electronics shall report the following information per branch circuit.
 - 1) Breaker state (On/Off)
 - 2) Breaker state (Open/Closed)
 - 3) Current draw (In Amps)
 - 4) Voltage
 - 5) Energy usage
 - b. Panels that do not report this information shall not be acceptable.
5. Built-in Control shall include:
 - a. Ability to record up to 16 presets in each space from the control panel, connected control stations, or timed events
 - b. Presets shall be programmable by recording current levels (as set by DMX or connected control stations), by entering levels on the control panel directly, manually selecting breaker state on each breaker, or a combination of these methods. From the control panel, stations, or timed events it shall be possible to record values for up to 16 zones per space
 - c. Up to 8 spaces in a single rack for total of up to 16 spaces shall be supported per system or system subnet
 - d. Indication of an active preset shall be visible on the control panel display
 - e. One 16-step sequence per space for power up and power down routines
 - f. The panel shall have a UL924-listed contact input for use in Emergency Lighting systems. The panel shall respond to the contact input by setting included breakers to "on", while setting non-emergency breakers "off". Each breaker can be selected for activation upon contact input
 - g. Upon Data loss the system shall provide options to hold last look infinitely or hold for a configured time period set by the installing technician then fade/switch to the input of the next available priority
 - h. Control electronics shall respond directly to control stations for zone, preset, and sequence control. Systems that require secondary control systems for this functionality are not acceptable
 - i. After power loss, electronics shall be capable of holding the system in its previous state until new level data (DMX, architectural presets, sequences and zones, or local overrides) is received to make each breaker change state
6. The control of lighting and associated systems via timed and Astronomical clock controls
 - a. The breaker panel shall allow the activation of presets, sequence, and zone programming of up to 50 time clock events via a built in real and astronomical time clock
 - b. System time events shall be programmable via the control panel
 - 1) Time clock events shall be assigned to system day types. Standard day types include: everyday, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday
 - 2) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event
 - 3) System shall automatically compensate for regions using a fully configurable daylight saving time
 - 4) Presets shall be assigned to events at the time clock
 - c. The time clock shall support event override
 - 1) It shall be possible to override the timed event schedule from the face panel of the time clock

- d. The time clock shall support timed event hold
 - 1) It shall be possible to hold a timed event from the face panel of the processor
 - 2) Timed event hold shall meet California Title 24 requirements
- 7. The panel shall receive ESTA DMX512-A control protocol. Addressing shall be set via the user interface button keypad with any circuit patched to any DMX control address
 - a. 2,500V of optical isolation shall be provided between the DMX512 inputs and the control electronics as well as between control and power components
 - b. The breakers shall respond to control changes (DMX or Stations) in less than 25 milliseconds. DMX512 update speed shall be 40Hz
 - c. Setting changes shall be able to be made across all, some, or just one selected breaker in a single action from the face panel
 - d. DMX data loss shall allow for levels/breakers to be held for ever or for a specified time before switching to a lower priority source
 - e. Initial Panel setup
 - 1) The breaker panel shall automatically detect the type of breaker or dimmer installed in each location without need for manual configuration of the physical arrangement
 - 2) Quick rack setup shall be available to apply address settings across all circuits for rack number, DMX Start Address, sACN universe, and sACN start address
 - 3) Emergency Setup Menu shall provide optional delays when emergency is activated or deactivated, and option to turn off non-emergency circuits shall be available. Record function shall allow circuits that are turned on to be added to the emergency setting

E. Electrical

- 1. Breaker Panels shall be available to support power input from:
 - a. 120/208V three phase 4-wire plus ground
 - b. 120/240V single phase 3-wire plus ground
- 2. Conduit Entry:
 - a. Feeders:
 - 1) Top or upper 6" of either side
 - 2) Bottom or lower 6" of either side
 - 3) Feeders shall enter through the top or bottom according to the orientation of the enclosure.
 - 4) Feeder entry shall be nearest to the location of the feeder lugs or main breaker.
 - b. Load:
 - 1) Load wiring shall enter through the top or bottom of the enclosure through the surface nearest to the breaker sub panel
 - 2) Load wiring may also enter through left and/or right side provided a low voltage chase is not required through the same area. If class 2 chase is required, a field installable barrier panel shall be provided upon request. The side of the panel where the barrier has been installed shall not permit load wiring
 - c. Low Voltage:
 - 1) Top or upper 6" of either side
 - 2) Bottom or lower 6" of either side
 - 3) For low voltage conduit entry at the breaker end of the cabinet, conduits shall be located at the outer 3" of the top/bottom panel
- 3. Breaker
 - a. Bus connection type: Stab on
 - b. 1, 2, or three poles
 - c. UL489 listed
 - d. 15 amp, 20 amp, or 30 amp
 - e. 22,000 SCCR; 65,000A series rated with main breaker
 - f. High inrush trip curve (matches all Sensor breakers)
 - g. Maintains trip curve through entire thermal range
 - h. Guaranteed not to trip at full load
 - i. Load lugs accept 6-14awg load wiring

- j. Multi-conductor listed output terminal
- k. Integral mechanically held air gap relay
- l. Manual control of relay state using breaker handle w/o power
- m. Integral current sensing
- n. Integral position and trip sensing
- o. Control and status provided by contact pads directly at bottom of the breaker case
- p. No external wires or connections required for control or feedback
- q. The breaker shall be capable of switching up to 30A
- 4. The breaker panel shall support a maximum feed size
 - a. 100 Amps at 12 circuits
 - b. 200 Amps at 24 circuits
 - c. 400 Amps at 48 circuits
 - 1) Breaker panels shall support main circuit breaker options:
 - 2) Main breaker options shall be optional and available for purchase upon request
 - 3) Main breakers shall be field installable
 - 4) Main breakers shall be available in up to 100 Amps for 12 circuit panels, up to 200 Amps for 24 circuit panels, and up to 400A for 48 circuit panels at 120V
 - 5) Series SCCR ratings apply as follows with appropriate main breaker:
 - 6) 22,000A or 64,000 at 120/208V
 - 7) Main breakers shall allow the following range of wire sizes:
 - 8) Up to 300kcmil at 100A and 200A
 - 9) Up to 2x250kcmil at 400A
 - 10) Main Lug input shall support up to 2x250kcmil
 - 11) Breaker panel shall support a 500kcmil main lug option for 48-circuit panels
- F. Breaker remote switching ratings
 - 1. Mechanical 1,000,000 cycles
 - 2. 24A Resistive 100,000 cycles
 - 3. 16A Ballast (HID) 75,000 cycles
 - 4. 15A Electronic (LED) 100,000 cycles
 - 5. 15A Tungsten 45,000 cycles
 - 6. 30FLA; 180 LRA Motor Load 50,000 cycles
 - 7. Tested duty cycle: 12 operations (6 cycles) per minute
 - 8. Decreasing duty cycle significantly increases switch life
 - 9. Isolation: 4000V RMS
 - 10. Current reporting accuracy: 5%
 - 11. Latching state mechanical relay
- G. Breaker Panel Accessories (provide all accessories as is required for this project)
 - 1. A low voltage 0-10V dimming option shall provide up to 24 0-10v control outputs that are linked to relay circuits within the panel. Each output shall support up to 400mA of current sink per output
 - 2. A contact input option shall provide 24 dry contact inputs to be linked for direct or group relay control, to activate a preset, or to activate a sequence. Controller software shall allow for normally open maintained, normally closed maintained, or momentary toggle
 - 3. A DALI control option shall provide 24 control loops of broadcast DALI control, with each loop controlling up to 64 DALI devices
 - 4. A RideThru option shall provide short-term power backup of control electronics by automatically engaging when power is lost, and recharging when normal power is present
 - 5. An Isolated Ground option shall provide each circuit in the panel with a ground terminal that is electrically isolated from the equipment ground
 - 6. Main Breaker options shall be available as shown in Section E.4
- H. Thermal
 - 1. The panel shall be convection cooled. Panels that require the use of cooling fans shall not be acceptable

2. The panel shall operate safely in an environment having an ambient temperature between 32°F (0°C) and 104°F (40°C), and humidity between 5-95% (non-condensing)

2.6 DIMMER RACK: REFERENCED PRODUCT ETC SENSOR 3 DIMMER RACK

A. General

1. The installation rack shall be the Sensor3 120V as manufactured by Electronic Theatre Controls, Inc., or equal. The Power Control System enclosure shall consist of up to 48 module spaces.

B. Electrical

1. Sensor3 racks shall operate at 120V, three phase, four wire + ground, 47-53 or to 57-63 Hz at 800 amps max. Other voltage and phase options are available upon request. Sensor racks shall automatically compensate for frequency variations during operation. Provisions shall be made for optional amp trap devices for fault current protection. Standard SCCR fault current protection shall be 100,000A.
2. All load and neutral terminals shall accept up to #4 AWG (25mm²) wire. Systems providing smaller terminals do not allow contractor wire sizing flexibility and shall be deemed unacceptable.
3. Load terminals shall be located at the front of the wiring cavity. Front access racks having terminals located at the back of the rack or on the side near the back of the rack such that adjacent load cabling may block terminal access shall not be acceptable.

C. Electronics

1. Power control electronics (CEM3) shall be contained in a single module that can be plug-in capable without use of tools. Power control and dimming systems that require tools for removal of control electronics shall not be acceptable.
2. All data and power input for CEM3 control electronics shall be located on a separately removable/pluggable termination connector on the backplane such that backplane can be replaced without removal and discrete secondary conductor terminations. Systems that require discrete termination of DMX, Ethernet, power input, and dimmer control output directly on terminals on the control module or pluggable backplane shall not be permitted.
3. The power controller shall directly support the following network protocols:
 - a. Net3 protocol suite including ANSI E1.31 Streaming ACN (sACN)
 - b. ANSI E1.17 Architecture for Control Networks (ACN)
 - c. Systems that do not support the above listed industry standard ACN protocols for Ethernet setup, control and feedback integrated directly between the power system and control system shall not be deemed acceptable.
4. The power controller shall directly support 2 ports of control input using ANSI E1.11 USITT DMX512-A
5. Control signals shall be sent between control module and dimmer/power modules using flat ribbon cables. Systems using cat5 cable and rj45 connections or discrete hand wired conductors as sole physical communication media between control module and dimmer/power modules shall be considered long term unreliable and shall be not be acceptable.

6. System shall provide an optional low voltage connection to maintain power of control electronics through brown out, instantaneous, and sustained power outages. Systems that do not provide optional low voltage backup power connection to the power controller shall not be acceptable.
7. Control electronics shall be housed in a formed steel body with cast-aluminum face panel.

D. Physical

1. The Sensor3 rack shall be a free-standing, dead-front switchboard, substantially framed and enclosed with 16 gauge, formed steel panels. All rack components shall be properly treated, primed and finished. Exterior surfaces shall be finished in fine-texture, scratch-resistant, epoxy paint. Removable top and bottom panels shall facilitate conduit termination on the 48 module rack. Knockouts shall serve the same purpose on 12 and 24 module racks.
2. Sensor3 racks shall be available in three sizes, with the following dimensions.
 - a. SR3-12 (12 module) 25.8"H x 14.8"W x 13.3"D
 - b. SR3-24 (24 module) 45.8"H x 14.8"W x 16.8"D
 - c. SR3-48 (48 module) 83.1"H x 14.8"W x 22.8"D
3. Racks shall be designed for front access to allow back-to-back or side-by-side installation.
4. Racks shall be designed to allow easy insertion and removal of all modules without the use of tools. Supports shall be provided for precise alignment of modules into power and signal connector blocks. With modules removed, racks shall provide clear front access to all load, neutral and control terminations. Racks that require removable panels to access load, neutral or control terminations shall not be acceptable.
5. An optional bus bar kit shall be available from the factory to allow adjacent racks to be powered by a single line feed. No soft buss rack-to-rack wiring shall be required. Racks that require discrete cabling to connect adjacent racks shall not be acceptable.
6. Module spaces shall be mechanically keyed to accept only the 20A or below, 50A, or 100A module specified for that space. Racks that allow modules of varying wattages to plug into the same space shall not be acceptable. The rack shall be configurable to accept mixed dimmer types and sizes throughout the rack.
7. Each rack shall provide a lockable full-height door containing an integral electrostatic air filter that shall be removable for easy cleaning. A single low-noise fan shall be located at the top of each rack. Design of the rack and modules shall draw all cool air intake air through the integral electrostatic air filter at the front of the rack, discretely through each module housing and directly out the top of the rack such that exhausted hot air from adjacent modules does not heat the module(s) above, below, or to the side of each other. System designs that draw the same heated air through multiple modules shall not be acceptable.
8. The fan shall maintain the temperature of all components at proper operating levels with dimmers under full load, provided the ambient temperature of the dimmer room does not exceed 40°C/104°F. Racks that do not employ both locking doors and electrostatic air filters shall not be acceptable.

9. The fan shall turn on whenever any circuit in the system is activated. In the event of an over-temperature condition, only the affected dimmer module(s) shall shut down and a message shall appear on the control module LCD. The fan shall remain on during thermal shutdown of individual dimmer modules. Systems that do not include over-temperature sensing and preventative thermal shutdown shall not be acceptable.
10. A fan sensor shall be provided. In the event of momentary fan failure, error message will be displayed and sent remotely over Ethernet to optional logging systems. Systems that do not provide optional system event logging shall not be deemed acceptable.
11. If the ambient room temperature drops below 0°C/32°F or rises above 40°C/104°F, a warning shall appear on the dimmer rack LCD. If the temperature rises above 46°C/115°F, the rack shall shut down until the condition is corrected.
12. A 3 x .5-inch LED status indicator (beacon) shall be mounted in the rack door. The beacon shall be visible throughout a wide viewing angle. In normal operating conditions, this LED is illuminated. If the rack's control module senses an error condition, the beacon shall flash until the error is corrected. An optional indicator shall be available for remote locations. Racks have no external means of visually showing that an error is present shall not be acceptable.

2.7 DIMMER RACK CONTROLS BATTERY BACKUP: REFERENCED PRODUCT ETC SENSOR BATTERY PACK OPTION

A. General

1. The BatteryPack Option installs in a separate enclosure from the Sensor3 rack and keeps the processor energized in the event of power loss or interruption to the system. One of two Sensor3 PowerSupport options, the BatteryPack option is designed for applications where CEM3 Power Control Processor must remain online during power loss providing power for several minute or more. Each CEM3 requires its own battery pack. The enclosure can hold up to two battery packs.
2. Provides power for a single CEM3 Control processor for a minimum of 30 minutes.
3. UL and cUL LISTED.
4. CE Marked.

B. FEATURES

1. Designed for use with Sensor3 Power Control System.
2. Long term power back-up of control electronics for at least 30 minutes.
3. Automatically engages when power is lost.
4. Automatically recharges from power feed during normal power conditions
5. Two-hour recharge time from full discharge

C. FUNCTIONAL

1. Designed for use with Sensor3 Power Control Systems.
2. Compatible with CEM3 Power Control.
3. Seamless transfer from charge to power output without user intervention.
4. Prevents CEM3 from rebooting when power returns.
5. Allows for immediate control of the full system as soon as normal power is present

D. MECHANICAL

1. 18-gauge formed steel construction.
2. Fine-texture, scratch resistant, epoxy paint.
3. Field installed without tools.
4. Visible indicator lights clearly identify when the battery is providing power and if maintenance is required.
5. Installs using factory provided wire harness.

THEATRICAL LIGHTING & CONTROL SYSTEMS

E. ELECTRICAL

1. Seamless transfer to battery power upon loss of normal power.
2. Provides 24vDC power for control processor during power loss.

F. THERMAL

1. Ambient room temperature: 0-40°C / 32-104°F Ambient humidity: 10-90% non-condensing.

G. PHYSICAL

BatteryPack Option Dimensions*

MODEL	HEIGHT		WIDTH		DEPTH	
	inches	mm	inches	mm	inches	mm
SR3-BPO	13.9	353.1	10	254	4.1	104.1
SR3-BPO2	13.9	353.1	10	254	4.1	104.1

BatteryPack Option Weights*

MODEL	WEIGHT		SHIPPING WEIGHT	
	lbs	kgs	lbs	kgs
SR3-BPO	10	4.5	13	5.9
SR3-BPO2	12.2	5.5	15.2	7.4

*Weights and dimensions typical

2.8 DIMMER RACK CONTROL ELECTRONICS MODULE: REFERENCED PRODUCT ETC CEM3

A. Replacement/Upgrade

1. If this control module is an upgrade from an older version of this module to the newest version, then the contractor shall provide this module as well as all required reconfigurations of the rack, reprogramming, imported programming, cleaning, setup and all required manufacturer procedures, warranty, etc. and in order to give the owner a new, system-wide 5-year warranty.

B. General

1. The Power Control electronics shall be contained in one plug-in Power Controller. Each power controller shall plug into a dimming cabinet with no need for tools or discrete wire connections. A simple user interface shall be provided for group configuration, testing and diagnostics. The Power Control System shall be Sensor 3 as manufactured by Electronic Theatre Controls, Inc.
2. Power control shall be UL/cUL Listed and CE Marked. Power and dimming control that require tools for removal of control electronics shall not be acceptable.

C. Physical (Control Interface)

1. The control electronics shall be contained in one plug-in module, housed in a formed steel body with cast-aluminum face panel, and self-retaining ejection handles to ease removal from the rack.
2. A backlit eight-line by 20-character graphical LCD shall be provided for system configuration, live control and status display.
3. The following features shall be available in power control to reduce setup and tech times:

- a. Full number pad shall be provided for quick access to dimmers. Power Control that does not provide 0-9 number pad and logic keys for AND, THRU, and AT for fast access, selection, and control of circuit/dimmer numbers shall not be acceptable.
 - b. Power control shall provide NEXT and LAST buttons to progress through individual circuits/dimmers during pre-show lighting checks for lamp burnouts.
 - c. Shortcut buttons for Setup, About and live control shall be provided. These functions shall be separated in such a way that user intending to check status or settings does not accidentally render their system unusable. These buttons shall also serve to reduce maximum time to access any feature or setting on a single dimmer, range of dimmers or an entire rack.
 - d. Power control that does not include the above features shall not be acceptable.
 4. The front panel shall have five status LED indicators: power, network activity, DMX A, DMX B, and panic state.
- D. Control Signals and Physical Communications Media ports
 1. The power control shall be provided with an Ethernet control signal input. This input shall be fully configurable with a range of patching and priority programming capabilities. The Ethernet signal shall supply seamless integration between the dimmer racks and both the entertainment and architectural lighting control systems. The Ethernet signal shall also enable remote configuration, playback, file storage and monitoring features on a personal computer on the network. Dimming systems that require Ethernet to DMX translation devices for control of critical show lighting introduce a potential failure point and shall not be acceptable.
 2. All data and power input for control electronics shall be located on a separately removable/pluggable termination connector on the backplane such that backplane can be replaced without removal and discrete secondary conductor terminations. Systems that do not support tool-less replacement or that require removal of wires connected directly to the control electronics shall not be acceptable.
 3. Dimming systems that require discrete termination of DMX, Ethernet, power input, and dimmer control output directly on terminals on the power control or pluggable backplane shall not be acceptable.
 4. DMX connections shall be available with option for pluggable screw or punch-down type terminal. Systems that do not allow this option do not support both DMX over CAT5 and mule-strand conductors shall not be acceptable.
 5. Ethernet connection shall be available via standard Cat5 RJ45 connection. System requiring punch down direct to rack or controller cannot be Cat5 system certified and shall not be acceptable.
 6. Power Control shall provide a convenience Ethernet uplink to the lighting network at the front face of the control module. Network capable 3rd party control and monitoring devices shall be provided full access to control, editing and real time feedback.
 7. The following options shall be available to backup all controller setup UL924 Panic configuration, and recorded presets:
 - a. Automatic backup in non-volatile backplane memory
 - b. Automatic backup in non-volatile Controller memory
 - c. 3rd party FTP server
 - d. USB storage device pluggable on the controller face panel
 - e. Data shall also be transferable to and from library storage on a personal computer on a per-rack basis
1. Power Controller shall support Class 2 EchoConnect control communications
 - f. The control network shall utilize unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit). Use of Category 5, or better, control network wiring shall also be supported.

- g. The control network wiring may be bus, loop, home run, star or any combination of these
 - 1. The control network wiring may be bus, loop, home run, star or any combination of these
 - 2. The power controller shall directly support the following network protocols:
 - h. Net3 protocol suite including ANSI E1.31 Streaming ACN (sACN)
 - i. ANSI E1.17 Architecture for Control Networks (ACN)
 - j. Systems that do not support the above listed industry standard ACN protocols for Ethernet setup, control, and feedback integrated directly between the power system and control system shall not be deemed acceptable.
 - 3. The power control shall directly support 2 optically isolated ports of ANSI E1.11 USITT DMX512-A for control input. Minimum 2,500V of optical isolation shall be provided between the DMX512 inputs and the electronics. Systems that do not have optical isolation on a prewired factory plug-in device shall not be acceptable.
- E. Power Control Features
- 1. The power control shall automatically compensate for frequency variations during operation.
 - 2. Dimmer outputs shall exhibit no oscillating or hunting for levels. Dimmers with the same choke type set to the same level shall output within $\pm 1V$ of each other, regardless of phase or input voltage.
 - 3. Power control shall maintain proper dimming performance for all line feed frequencies from 47-53Hz and 57-63Hz without flicker or misfire. Shifts in frequencies up to 3 Hz shall not result in flicker or loss of dimming timing. Systems that cannot perform to these frequency tolerances and shifts shall not be acceptable.
 - 4. Dimmer output levels shall be regulated for incoming line voltages. The regulation shall adjust for both RMS voltage changes and deformations in the incoming AC waveform. The power control shall monitor and adjust each dimmer's output to maintain a constant power to the load. Regulation shall maintain the desired output voltage $\pm 1V$ for the entire operating range (91-139V and 181-259 VAC) with the exception that the maximum output will be no greater than the line voltage minus dimmer insulation loss. The regulation shall compensate for dips and anomalies in the AC waveform on a dimmer-by-dimmer basis. There shall be no interaction between dimmers in the system or any other equipment. The output shall be nominally regulated to 115V/230V appropriate for the market, but shall be field adjustable on a dimmer-by-dimmer basis to allow for varying cable length. Systems that cannot maintain perform to the above stated voltage regulation shall not be acceptable.
 - 5. Power control shall support a rack filled with different types and sizes of dimmer modules. The properties of each dimmer shall be configurable, including dimmer name, output curve, dimmer firing mode, and scale voltage values.
 - a. The output curve selections shall include IES Modified Square, Square, Linear, Modified Linear and a Sensor v2.0 output curve. The power control shall also have the capability of storing up to three custom curves as well as an adjustable preheat level, assignable on a per-dimmer basis.
 - b. Circuit control modes shall include: Always on, Dimmable, Dimmer Doubled, Switched (unregulated on/off with adjustable on-at level), Fluorescent with adjustable threshold and Off.
 - c. Power Control shall support forward or reverse phase firing of appropriate modules.
 - d. Dimmers set as Dimmer Doubled shall allow a single dimmer to set two different levels on one dimmer circuit by splitting the AC power into positive and negative half cycles with no resultant DC line current.

- e. Power Control that does not support all above listed adjustments to dimmers on a per circuit basis shall not be acceptable.
- 6. User programmable parameters shall support onsite setup via the local interface in the rack. These parameters shall include, but not be limited to, defining module type, scale voltage for each dimmer, firing mode, curve, dimmer numbering, and DMX512/sACN network port assignments. Systems requiring factory programming shall not be acceptable.
- 7. Hardware settings for rack type, available module types, availability of AF features, and operating voltage shall be configurable at the factory or in the field, and shall not require secondary setup after system commissioning even in the event of power controller replacement.
- 8. Controller shall support two methods of automatic configuration during controller replacement in a rack.
 - a. Use backplane configuration: The backplane shall retain full setup and preset data in. In this recovery mode, when a new power control is inserted, the controller shall automatically come on-line fully functional without any manual intervention.
 - b. Use controller configuration: Override backplane configuration such that replacement modules automatically use the configuration resident in nonvolatile memory of the power control.
- 9. Controller shall be capable of changing rack setup for multiple shows for an entire system with a single update command from a remote PC.
- 10. In the event of data loss each rack shall maintain the last level for a user-programmable time (zero to five minutes or indefinitely) or may be programmed to fade out or to play a specific preset. Systems that do not offer this feature shall not be acceptable.
- 11. The power control shall contain diagnostic routines to allow the user to test and troubleshoot the system. The power control shall also contain a Test/Bypass switch to turn all dimmers on to full for testing. This switch shall bypass all electronics and shall force the fan on. Systems that do not include local control, "all on" control bypass, and diagnostic routines shall not be deemed acceptable.
- 12. The power control shall be able to record up to 64 presets in a rack. Presets shall be user programmable by recording a snapshot of current dimmer levels (as set by the all control sources), by entering dimmer levels on the power control directly or by a combination of both methods. The system shall have the ability to program and activate group-wide presets from the power control, remote station, console, networked computer or handheld device. Presets shall be activated in the default fade time of 2 seconds, but shall be have a user-programmable fade time between 0 and 60 minutes.
- 13. A system-wide panic (emergency UL924) activation circuit shall be provided. Any dimmer in any rack may be assigned to the panic circuit. The panic closure shall be maintained. Upon activation the system shall:
 - a. Force all circuits selected to be included in panic to a master level between 80-100%
 - b. Optionally force all non-panic dimmers to zero
 - c. Provide configurable fade time to and from "emergency" state
 - d. Provide configurable delay to and from "emergency" state
- 14. DMX A and B as well as the Ethernet DMX (EDMX) data may be patched using a rack start address - assigned sequentially from a starting control channel or patched individually on a per-dimmer basis. Priority may be set per universe for the DMX inputs, and set per universe by the control source for Ethernet input. Each dimmer may have up to six network control inputs with either a highest takes precedence or priority patch. Each dimmer may also then be assigned to one of 16 spaces for additional specific preset control. Each preset shall have a separate priority for maximum flexibility of prioritization. Systems that do not support prioritization of multiple Ethernet sources beyond HTP shall not be acceptable. Systems that do not support the above listed flexibility in control source prioritization shall not be acceptable.

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15. Power control shall provide the ability to set a single circuit, all circuits or a range of circuits to a level at the control interface in the rack. Systems that cannot locally control dimmers through local control override shall not be acceptable.
16. The power control shall be capable of monitoring and displaying incoming line voltage for all three phases on the LCD. With installed current sensors, the same display shall show amperage on each phase.
17. The power control shall support security protected access. The user shall be able to program passwords that restrict access, preventing unauthorized use of higher-level functions by unauthorized personnel. Systems that do not provide security protected access to features that can render the system unusable shall not be acceptable.
18. Advanced Features (AF) option shall add an additional sensor in the individual dimmer modules. This option shall allow monitoring of current and output voltage on a dimmer-by-dimmer basis and provide information on lamp burnouts, dimmer status and input voltages.
19. Power control shall allow the user to record the loads of all AF dimmers in the system. The power control shall, during operation, test each AF dimmer, determine its load and compare it to the recorded load. Any change from recorded loads of configured tolerance shall display an error on the power control and any monitoring device on the network. If a dimmer is driven on with no load, an optional message shall be available to notify the console operator and electrician that there is no load.

F. Connect to Console Communications

1. The Ethernet network shall provide an integral link to connect all racks in the system for remote rack-to-console and rack-to-network device communication of the below listed features of real-time control, configuration, and status/feedback using industry standard ANSI E1.17 ACN lighting protocol. Power control and dimming systems that do not use this protocol shall not be permitted. Reported system errors shall be given ACN access to be cleared remotely at the console with exception of system critical errors that require a person to go directly to the rack to manually clear the existing fault.
2. Control
 - a. E1.31 sACN control
 - b. Activate/Deactivate rack presets
 - c. Set/Unset circuit levels as overrides to Preset, DMX, and sACN control
 - d. Lock relays into On/Off/Remote switching states without patching to a console.
 - e. Lock dimmers into non-dim mode with On/Off/Remote switching states without patching to a console.
3. Remote console configuration shall include, but not be limited to, real time reporting and editing the following:
 - a. Circuit's control mode
 1. Dimmable
 2. Switched
 3. Latch-lock
 4. Always on
 5. Off
 6. Fluorescent
 - b. Curves
 - c. Control threshold
 - d. Min Scale Voltage
 - e. Max Scale Voltage
 - f. Preheat
 - g. Scale load
4. Standard rack feedback - Rack status messages shall include, but not be limited to, real time reporting of the following:
 - a. Identification

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7. Rack type
8. Rack name
9. Rack number
- b. State of UL924 panic closure
- c. DMX port A or B has an error or has failed
- d. Network has an error or has failed
- e. Phase A, B or C is below 90 volts
- f. Phase A, B or C is above 139 volts
- g. Phase A, B or C did not start because it was outside of allowable voltage ranges at power up
- h. Phase A, B or C voltage headroom warning
- i. Frequency is not 50 or 60 Hz
- j. Ambient temperature is below 0°C/32°F
- k. Ambient temperature is above 40°C/104°F
- l. System Critical-Ambient temperature exceeds 46°C/115°F
- m. Configuration memory error
- n. Run hours remaining before rack filter needs to be cleaned
- o. IP address of the controller in the rack
- p. Software version of the controller in the rack
5. Standard branch circuit feedback - Ethernet console access of the following circuit status shall be provided:
 - a. Module type
 - b. Circuit location
 - c. Patched circuit addresses
 - d. Output level
 - e. Control Source
 - f. Overtemp
6. Advanced branch circuit feedback - Dimmer Specific status messages shall include, but not be limited to, the following:
 - a. Load has dropped below recorded value
 - b. Load has raised above recorded value
 - c. DC detected on dimmer output
 - d. One SCR has failed on/off
 - e. Dimmer has failed off or circuit breaker has tripped
 - f. Dimmer has been removed
 - g. Dimmer load has failed
 - h. Dimmer has shut down due to over temperature

1.01 ACOUSTIC SUPPRESSION DEVICE: REFERENCED PRODUCT ETC SENSOR SOUND SUPPRESSION HOOD (SSSH)

G. GENERAL

1. The Sensor Sound Suppression Hood shall reduce the sound produced by the Sensor Installation Rack's ventilation fan by surrounding it with an enclosure lined with sound absorbing foam.

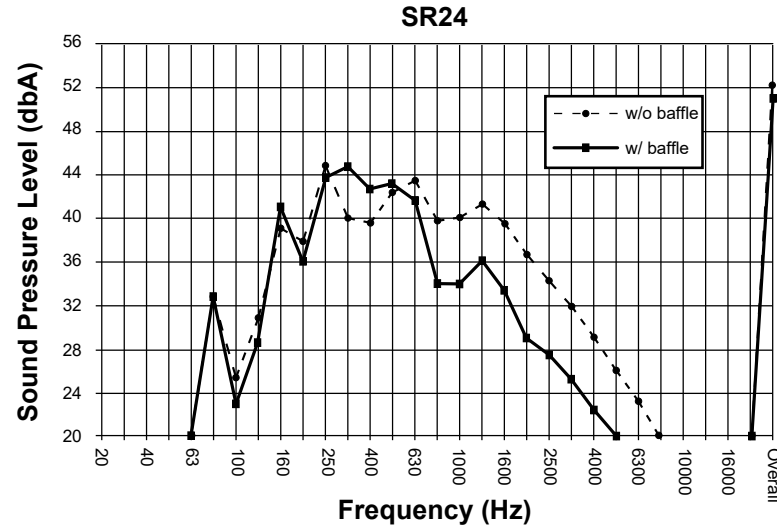
H. MECHANICAL

1. The hood shall be constructed of steel and finished in a light gray (5C) fine-textured baked powder coat
2. The interior of the hood shall be fitted with a 1.25 (32mm) Soundmat PB-embossed foam insulation
3. The hood shall be designed to be installed without the use of tools
4. A Velcro or adhesive strip shall be used to adhere the hood to the top of the installation rack.

I. PERFORMANCE

ETC Sensor SR24 Acoustic Output

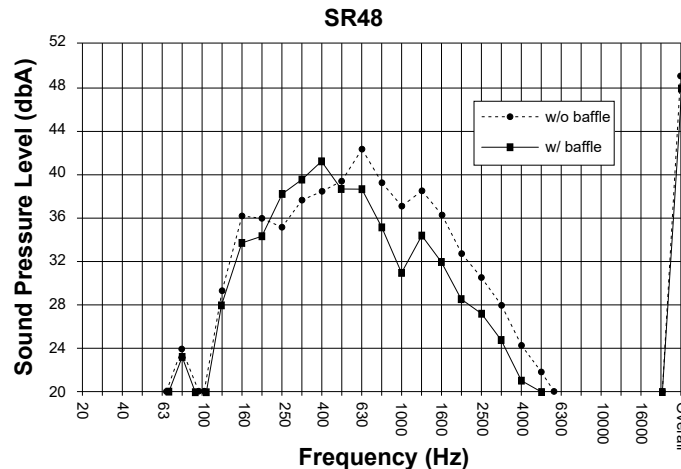
Cumulative Noise Level, dbA @ 1 Meter = 52.0 dbA Without SSSH Hood; 51.5 dbA With SSSH Hood. SSSH Hood Is Understood To Be The Baffle Indicated Below.



(Note: Acoustic Output For Dimmer Rack(s) Cannot Exceed Levels Indicated On This Chart. All Racks Must Be Provided With Acoustic Baffling Kits.)

ETC Sensor SR48 Acoustic Output

Cumulative Noise Level, dbA @ 1 Meter = 49.0 dbA Without SSSH Hood; 47.7 dbA With SSSH Hood. SSSH Hood Is Understood To Be The Baffle Indicated Below.



(Note: Acoustic Output For Dimmer Rack(s) Cannot Exceed Levels Indicated On This Chart. All Racks Must Be Provided With Acoustic Baffling Kits.)

2.9 DIMMER MODULES: REFERENCED PRODUCT ETC D20E ENHANCED DIMMER MODULES

A. General:

1. The dimmer modules shall be the Unison dimmer modules as manufactured by Electronic Theater Controls, Inc., or equal. Unison dimmer modules shall be designed for dependable, economical service in theatrical and video applications.

B. Electrical:

1. Each dimmer shall provide, but not be limited to, the following:

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- a. Each dimmer module shall contain one or two single-pole circuit breakers, a solid state switching module, associated toroidal filters, and power and control connectors.
 - b. Modules shall not have any protruding pins subject to physical damage when the module is not installed.
 - c. Modules shall be keyed so that dimmer modules of different capacity shall not be interchangeable.
 - d. Circuit breakers shall be fully magnetic so the trip current is not affected by ambient temperature. Circuit breakers shall be rated for tungsten loads having an inrush rating of no less than 20 times normal current. Circuit breakers shall be rated for 100 percent switching duty applications.
- C. SCR assembly:
1. Each dimmer module shall use a solid state module (SSM) consisting of two silicon-controlled rectifiers (SCR's) in an inverse parallel configuration, and all required gating circuitry on the high voltage side of an integral, opto-coupled control voltage isolator. Rectifiers, copper leads and a ceramic substrate shall be reflow soldered to an integral heat sink for maximum heat dissipation. The SSM shall also contain a control LED, a thermistor for temperature sensing, and silver-plated control and load contacts. The Advanced Features version of the SSM shall include an integral output LED, output voltage sensors and current sensors for feedback to the control module. The entire SSM shall be sealed in a plastic housing requiring only a screwdriver to replace. Dimmers employing triac power devices, pulse transformers, or other isolating devices not providing at least 2,500V RMS isolation, shall not be acceptable. Dimmer modules requiring disassembly, heat sink grease or additional tools for repair shall not be acceptable.
 2. All electronic components (current/voltage sensors and indicators) shall be contained in a single, field-replaceable housing. Modules requiring discrete wiring of electronic components shall not be acceptable.
 3. SCR power switching devices shall have the following minimum ratings:
- | | | | |
|----------------------------------|-------|--------|--------|
| Module Size: | 20A | 50A | 100A |
| Single cycle: Peak surge current | 625A | 1,200A | 2,300A |
| Half cycle: 12T | 1,620 | 4,150 | 22,000 |
| Transient over voltage | 600V | 600V | 600V |
- D. Filtering
1. Dimmer modules shall include toroidal filters to reduce the rate of current rise time resulting from switching the SCR's. The filter shall limit objectionable harmonics, reduce lamp filament sing and limit radio frequency interference on line and load conductors. Modules shall be available with a 500 ms. filter rise time. Rise time shall be measured at the worst-case slew rate (about 50 percent) from 10 to 90 percent of the output wave form with the dimmer operating at full load.
- E. Performance
1. Power efficiency for standard dimmers shall be at least 97 percent at full load with a no-load loss of 3V RMS. The dimmer shall accept hot patching of a cold incandescent load up to the full rated capacity of the dimmer.
- F. Physical

1. Dimmer modules shall be fully plug-in and factory wired. Dimmer modules shall consist of a heavy duty, die-cast aluminum chassis with integral face panel. No tools shall be required for module removal and insertion. All parts shall be properly treated, primed and finished in fine-texture, scratch resistant, gray epoxy powder coat. With the exception of the circuit breaker, the module shall contain no moving parts. Each module shall be labeled with the manufacturer's name, catalog number and rating. Modules constructed of molded plastic for structural support are not equivalent and are not acceptable. Dimmer modules shall be UL recognized.

2.10 DIMMER MODULES: REFERENCED PRODUCT ETC CC20 CONSTANT CURRENT MODULES

A. General

1. The Constant modules shall be the Sensor Constant modules as manufactured by Electronic Theatre Controls, Inc., or equal. Sensor modules shall be designed for dependable, economical service in theatrical and video applications for use with theatrical lighting and theatrical motorized equipment.
2. Constant module configuration shall be dual channel, 100/140V, 15A or 20A, as noted on the Electrical Drawings.
3. Constant modules shall be fully plug-in and factory wired. The modules shall consist of a heavy duty, die-cast aluminum chassis with integral face panel. No tools shall be required for module removal and insertion. All parts shall be properly treated, primed and finished in fine-texture, scratch resistant, gray epoxy powder coat. With the exception of the circuit breaker, the module shall contain no moving parts. Each module shall be labeled with the manufacturer's name, catalog number and rating. Modules constructed of molded plastic for structural support are not equivalent and are not acceptable. Constant modules shall be UL and cUL Listed power control devices with a minimum AIC rating of 10,000A.

2.11 DIMMER MODULES: REFERENCED PRODUCT ETC R20AF RELAY MODULES

A. General

1. The Relay modules shall be the Sensor Relay modules as manufactured by Electronic Theatre Controls, Inc., or equal. Sensor dimmer modules shall be designed for dependable, economical service in theatrical and video applications for use with theatrical lighting and theatrical motorized equipment.
2. Relay module configuration shall be dual channel, 100/140V, 15A or 20A, as noted on the Drawings.
3. Relay modules shall be fully plug-in and factory wired. The modules shall consist of a heavy duty, die-cast aluminum chassis with integral face panel. No tools shall be required for module removal and insertion. All parts shall be properly treated, primed and finished in fine-texture, scratch resistant, gray epoxy powder coat. With the exception of the circuit breaker, the module shall contain no moving parts. Each module shall be labeled with the manufacturer's name, catalog number and rating. Modules constructed of molded plastic for structural support are not equivalent and are not acceptable. Relay modules shall be UL and cUL listed power control devices with a minimum AIC rating of 10,000A.
4. Modules shall have a fully magnetic circuit breaker for each channel. Relay modules shall be rated for a minimum of 100,000 full load activations.
5. Modules shall have Signal and Load LED indicators for each channel.
6. Relay modules shall provide ETC Advanced Features systems with load level information.

2.12 WI-FI ROUTER/INTELLIGENT WIRELESS MESH SYSTEM: REFERENCED PRODUCT LINKSYS VELOP INTELLIGENT MESH WI-FI SYSTEM ACXXXX

A. Overview:

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1. System incorporates an Intelligent Mesh Technology Wi-Fi system that delivers seamless connectivity with the ability to mix and match nodes in order to modify performance.
 2. Each node provides a powerful Wi-Fi signal throughout the entire coverage area by continuously self-organizing and optimizing to find the fastest path to the Internet for seamless Wi-Fi.
 3. Provides an ultra-simple and powerful system that uses only one Wi-Fi network name and password for secure Wi-Fi. Leading-edge security allows content blocking. System is compatible with all Internet service provider supplied equipment and speeds. Setup is via an app-based interface.
 4. The system self-heals and self-optimizes to consistently deliver fast, hassle-free Wi-Fi.
 5. Software updates are automatic.
- B. What's in the Box:
1. Linksys Velop Dual Band Node
 2. Power supply
 3. Ethernet cable
- C. Technical Specifications:
1. Wi-Fi Technology:
 - a. Dual-Band AC1300 (867 + 400 Mbps) $\pm$ with MU-MIMO and 256 QAM
 2. Key Features:
 - a. Dual-Band Wi-Fi Mesh System
 - b. Seamless Wi-Fi
 - c. Easy App Controls
 - d. Intelligent Mesh™ Technology - Self-Organizing, Self-Optimizing and Self-Healing
 - e. One Wi-Fi Network
 - f. Auto Firmware Upgrade
 - g. Parental Control
 - h. Guest Access
 - i. Auto sensing WAN/LAN Ports
 - j. Wired/Wireless Backhaul
 - k. AP/Bridge Mode Mesh Wi-Fi System
 - l. Spot Finder- Mesh system uses signal strength, throughput, and latency to determine the optimal placement during set-up and post set-up.
 - m. Auto Wi-Fi Channel
 - n. Bluetooth 4.1 embedded
 - o. Speedtest support
 - p. Amazon Alexa support
 - q. 3-Year Warranty and Support
 3. Network Standards:
 - a. 802.11b
 - b. 802.11a
 - c. 802.11g
 - d. 802.11n
 - e. 802.11ac
 4. Wi-Fi Speed:
 - a. AC1300 (867 + 400 Mbps)
 5. Wi-Fi Bands:
 - a. 2.4Ghz + 5GHz
 6. Wi-Fi Range:
 - a. up to 1500 sq ft
 7. Number of Ethernet Ports:
 - a. 2x WAN/LAN auto-sensing Gigabit Ethernet ports
 8. Other Ports:

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- a. power jack
 - b. power switch
 - c. reset button
- 9. Antennas:
 - a. 3x internal antennas and high-powered amplifiers
- 10. Processor:
 - a. 716 MHz Quad Core
- 11. Memory:
 - a. 256 MB NAND Flash and 256 MB DDR3
- 12. LEDs:
 - a. One LED indicator
- 13. Wireless Encryption:
 - a. WPA2 personal
- 14. Easy Setup:
 - a. Simple and secured App based set-up
 - b. Required for set-up:
 - i) Internet connection with Modem.
 - ii) Mobile device with Android 4.4 or iOS 9 and higher, Bluetooth preferred.
- 15. Minimum System Requirements:
 - a. Required for set-up - Simple and secured App based set-up: Mobile devices with Android 4.0.3 or iOS 8 and higher
- 16. Dimensions (L x W x H):
 - a. 3.1" x 3.1" x 5.55" per Node
- 17. Weight:
 - a. 2.076 Lbs.
- 18. Security Features:
 - a. WPA2 personal
- 19. Regulatory Compliance:
 - a. FCC class B
- 20. Additional Information:
 - a. Bluetooth 4.0/LE for secure and easy App based set-up
- 21. Power Supply:
 - a. Input: 100-240V ~ 50-60Hz; Output: 12V, 1.0A
- D. Warranty:
 - 1. Three-year limited

2.13 ARCHITECTURAL CONTROL SYSTEM RACK ENCLOSURE: REFERENCED PRODUCT ETC
UNISON ERN SERIES CONTROL ENCLOSURES

- A. Control Enclosures
 - 1. The control Enclosure shall be the Unison ERn Series Control Enclosure as manufactured by Electronic Theatre Controls, Inc., or equal.
- B. Mechanical
 - 1. The ERn Control Enclosure shall be a surface mounted panel constructed of 18 gauge formed steel panels with a hinged, lockable full-height door containing an integral electrostatic air filter.
 - a. The Enclosure door shall have an opening to allow limited access to the control module face panel.
 - b. Enclosures shall be convection cooled without the use of fans.
 - 2. Control Enclosures shall be sized to accept one or two Control Processors and one or two Station Power Modules, including various options and accessories.
 - a. The two-space Control Enclosure (ERn2) shall support a single Station Power Supply module

- b. The four-space Control Enclosure (ERn4) shall support two Control Processors, and two Station Power Supply modules, or, one Control Processor, one Station Power Supply Module and one Station Bus Repeaters module, or one control processor and one dual Station Bus Dual Repeater module.
3. All Enclosure components shall be properly treated and finished.
 - a. Exterior surfaces shall be finished in fine textured, scratch resistant, powder-based epoxy paint.
4. Enclosure(s) shall also be available in a 19" rack mounted (RM) version.
 - a. Rack-mounted version shall have an independent Enclosure suspension kit, with a full height, locking door/cover attached to the kit.
 - b. Rack-mounted version shall have an opening to access the control module face panel, and openings to view indicators on option modules.
5. Enclosure dimensions and weights (without modules) shall not exceed:
 - a. ERn2 - 15" W x 9" H, 10" D, 15 lb.
 - b. ERn2-RM - 19" W 11"H 10" D, 20 lb.
 - c. ERn4 - 15" W x 14" H x 10" D, 20 lb.
 - d. ERn4-RM - 19" W x 16" H x 10" D, 25 lb.
6. Top, bottom, and side knockouts shall facilitate conduit entry.
7. Enclosures shall be designed to allow easy insertion and removal of all control and option modules without the use of tools.
 - a. Supports shall be provided for precise alignment of modules into power and signal connector blocks.
 - b. With modules removed, Enclosures shall provide clear front access to all power and control wire terminations.
8. Option Modules
 - a. Ethernet Switch (ENET - Surface Mount ERn only)
 - 1) The Control Enclosure shall support an optional 5-port Ethernet Switch, with at least 4 ports supplying Power over Ethernet (PoE).
 - 2) The Ethernet Switch module shall be 10/100BaseTX, auto MDI/MDIX, 802.3af PSE compliant.
 - 3) The Ethernet Switch module shall contain power, status, and activity indicators. All indicators shall be visible when the Enclosure door is open for wall mounted ERn.
 - b. Redundant Power Supply (RRPS)
 - 1) The Control Enclosure shall support an optional redundant power supply which shall automatically provide power to the control electronics upon failure or removal of the primary power supply.
 - 2) The redundant power supply shall assert itself seamlessly without a loss of power to the control electronics.
 - 3) The redundant power supply shall seamlessly remove itself when the primary power supply is reengaged.
 - 4) The redundant power supply shall provide visible indication that it is active.
 - c. Station Bus Repeaters (ERn4 only)
 - 1) The Control Enclosure shall support an optional module to expand the station bus length an additional 400 meters, and the station count an additional 30 stations (62 maximum per processor/Enclosure)
 - 2) Wall-mount and 19" Rack-Mount versions of the Station Bus Repeaters shall also be available to support mid-span insertion away from the Control Enclosure.
 - d. Station Bus Dual Repeaters (ERn4 only)
 - 1) The Control Enclosure shall support an optional module to expand the station bus length to two additional 400-meter segments (a total of 1200 meters from a single Enclosure, and the station count to 62 stations (62 maximum per processor/Enclosure).
 - 2) Wall-mount and 19" Rack-Mount versions of the Station Bus Dual Repeaters shall also be available to support mid-span insertion away from the Control Enclosure.
9. Provide the following accessories

- a. RideThru Option (RTO)
 - 1) The Control Enclosure shall support an optional, short-term back-up power source for the control electronics installed inside the Enclosure.
 - 2) RideThru Option (RTO) provides power for control electronics during brief power outages or drop outs.
 - 3) The short-term back-up power source shall automatically engage upon the loss of normal power, seamlessly transitioning the supply power for the control electronics power to itself.
 - 4) The short-term back-up power supply shall detect the return of normal power, and seamlessly return the control electronics to normal power.
 - 5) The short-term back-up power source shall support the control electronics for at least 10 seconds.
 - b. BatteryPack Option (BPO – Surface Mount ERn Only)
 - 1) The Control Enclosure shall support an optional, long-term back-up power source for the control electronics installed outside the Enclosure.
 - 2) The long-term back-up power source shall automatically engage upon the loss of normal power, seamlessly transitioning the supply power for the control electronics power to itself.
 - 3) The long-term back-up power source shall supply power to the control electronics for at least 90 minutes.
 - 4) The long-term back-up power supply shall detect the return of normal power, and seamlessly return the control electronics to normal power.
 - 5) A test switch/indicator shall be available without opening the rack door or removal of any modules/components.
- C. Electrical
- 1. Control Enclosures shall be available in 100, 120, 230 and 240 volt, single-phase configurations.
 - 2. Control Enclosures shall be completely pre-wired by the manufacturer. The contractor shall provide input and control wiring.
 - 3. Control Enclosures shall be designed to support the following wire terminations:
 - a. AC (single phase)
 - b. Echelon link power (Belden 8471 or equivalent)
 - c. 24Vdc (2- 16AWG Wire)
 - d. DMX512A Port A (In or Out) (Belden 9729 or equivalent)
 - e. DMX512A Port B (In or Out) (Belden 9729 or equivalent)
 - f. RS232 Serial In/Out (Belden 9729 or equivalent)
 - g. Unshielded Twisted Pair (UTP) Category 5 Ethernet
 - h. Contact Closure In (14AWG to 26AWG Wire)
 - i. Contact Closure Out (14AWG to 26AWG Wire)
 - 1) Contact Closure Out shall provide 1A @ 30vDC
 - 4. Station Power Modules
 - a. Station power supply modules shall provide LinkPower for at 32 stations and 1.5A@24VDC of Auxiliary (AUX) power.
 - b. Station power repeater modules shall provide LinkPower for 30 stations and 1.5A@24VDC of Auxiliary (AUX) power.
 - c. Station power module shall support over-current/short protection for LinkPower and Aux. LinkPower shall support fault detection on each leg of the balanced data bus.
 - 5. All control wire connections shall be terminated via factory provided connectors.
- D. Thermal
- 1. Ambient room temperature: 0-40°C / 32-104°F
 - 2. Ambient humidity: 30-90% non-condensing.

2.14 ARCHITECTURAL CONTROL PROCESSOR: REFERENCED PRODUCT ETC UNISON PARADIGM
CONTROL PROCESSOR MODULES

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- A. The Architectural Control Processor shall be the Unison Paradigm P-ACP Series Control Processor as manufactured by Electronic Theatre Controls, Inc.
- B. Mechanical
 - 1. The Architectural Control Processor (ACP) assembly shall be designed for use in DRd Series Dimming Enclosures and ERn Series Control Enclosures.
 - 2. The processor shall utilize microprocessor based, solid state technology to provide multi-scene lighting and building control.
 - 3. ACP module electronics shall be contained in a plug-in assembly.
 - a. The module shall be housed in a formed steel body and contain no discrete wire connections.
 - 1) No tools shall be required for module removal or insertion.
 - 4. The ACP shall be convection cooled.
 - 5. User Interface
 - a. The ACP shall utilize a backlit liquid crystal display capable of graphics and eight lines of text.
 - b. The ACP shall provide an alpha-numeric keypad for data entry and navigation.
 - c. The ACP shall provide a touch-sensitive control wheel for navigation.
 - d. The ACP shall provide shortcut buttons to assist in navigation, selection, and data entry.
 - e. The ACP keypad, buttons, and wheel shall be backlit for use in low-light conditions.
 - 1) The backlight shall have a user selectable time out, including no time out.
 - 6. The ACP shall provide a front-panel RJ45 jack for Ethernet connection to the processor for configuration, live control, and web-browser-based system access.
 - a. The Ethernet port shall be secured behind the locking door.
 - 7. The ACP shall provide a Secure Digital (SD) Removable Media slot on the front panel for transfer of configuration data.
 - a. The SD slot shall be secured behind the locking door.
 - 8. The ACP shall provide a Universal Serial Bus (USB) port on the front panel for transfer of configuration data.
 - a. The USB port shall be secured behind the locking door.
 - 9. Architectural Lighting System configuration and program information shall be stored in flash memory, which does not require battery backup.
 - a. The ACP shall provide a Compact Flash (CF) Card as backup flash memory and storage.
 - b. The CF Card is stored in the back of the ACP, and can be accessed only by removing the ACP.
 - c. The ACP data can be exchanged by inserting the CF card into another ACP.
- C. Electrical
 - 1. The ACP shall require no discrete wiring connections; all wiring shall be terminated into Dimming or Control Enclosure.
 - 2. The ACP shall require low-voltage power supplied by the Dimming or Control enclosure.
 - 3. The ACP shall be hot-swap capable.
 - 4. The ACP shall support Echelon LinkPower communications with remote devices, including button stations, button/fader stations, Touchscreen stations, sensors, and third party LonMARK compliant products.
 - a. The LinkPower network shall utilize polarity-independent, low-voltage Class II twisted pair wiring, type Belden 8471 (unshielded) or Belden 8719 (shielded) or equivalent. One # 14 AWG drain wire will be required for system not using grounded metal conduit. Touchscreen stations, interface stations and portable stations connectors will also require (2) #16 AWG wires.
 - b. The LinkPower network shall be topology free. Network wiring may be bus, loop, home run, star or any combination of these.
 - c. Link power wiring shall permit a total wire run of 1640 ft. (500m) without a repeater. Repeater option modules shall be available to increase wiring maximums in increments of 1640 ft. (500m).
 - d. Link power wiring between stations shall not exceed 1313 ft. (400m).

5. The ACP shall support 10/100BaseTX, auto MDI/MDIX, 802.3af compliant Ethernet networking using TCP/IP, ESTA BSR E1.17 Advanced Control Networks (ACN) and ESTA BSR E1.31 (sACN) Protocols for internal communication and integration with third-party equipment.
6. The ACP shall support EIA-RS232 serial protocol for bi-directional command and communication with third-party equipment.
7. The ACP shall support two discrete ESTA DMX512A ports, configurable as input or output ports.
 - a. °When used in a Dimming Enclosure, the second port is always an output port.
8. The ACP shall provide four onboard dry contact closure inputs for integration with third-party products.
9. The ACP shall provide four onboard contact closure outputs, rated at 1A@30VDC, for integration with third-party equipment.

D. Functional

1. Capacity
 - a. Shall support 1024 channels of control
 - b. Shall support 2 physical DMX ports, each of which may be configured as an input or output
2. System
 - a. Runtime application shall utilize support Net3 system interoperability
 - b. System shall support the use of Network Time Protocol for real time clock synchronization
 - c. System shall support remote firmware upload an over Ethernet connection from a connected PC running the Light Designer software or another connected processor.
 - d. System shall support local firmware upload from removable media (SD Card, USB Flash Drive)
3. Diagnostics
 - a. Shall output an Event log
 - b. Standard log shall store a fixed-length history of recent activity
 - c. Separate critical log shall only store important messages (such as boot-up settings)
4. Configuration Data
 - a. Configuration Data can be uploaded over an Ethernet connection from a PC running Light Designer application
 - b. Configuration Data can be retrieved from another Paradigm Processor
 - c. A Paradigm Processor shall make its configuration data available for retrieval by another Processor as a backup/recovery mechanism
 - d. Configuration Data shall be stored on solid-state media that can be removed to facilitate transfer between Processor units
 - e. Configuration Data may be loaded to and from removable media access provided on front panel
 - f. Configuration Data for the entire System shall be available for download from any single Processor
 - g. Shall store configuration data for Dimming enclosure processors and shall make available for download
5. Scalability
 - a. Adding additional Processors to a System shall proportionately increase its overall capabilities up to a maximum System size
 - b. The maximum number of Processors configured as a System shall be at least 12.
 - c. Multiple Processors shall utilize the Ethernet network to remain time synchronized and share control information
 - d. Multiple Processors shall utilize the Ethernet network to maintain configuration data synchronization as modifications are made
 - e. Failure of a single Processor shall not prohibit continuing operation of the remaining Processors
 - f. It shall be possible for multiple Systems to coexist on the same physical network with logical isolation between Systems
6. Local User Interface
 - a. Shall provide access to Processor setup (IP address)

- b. Shall provide access to Processor status and diagnostics
 - c. Where the Processor is installed within a Dimming enclosure, shall provide access to Dimming enclosure setup, status and diagnostics
 - d. Shall provide control functionality for Control Channels, Zones, Fixtures, Groups, Presets, Macros, Walls and Sequences within the current configuration.
 - e. Shall provide functionality to schedule astronomical and real time events (add/edit/delete)
 - f. Shall allow for display of local DMX information
 - g. Shall allow for transfer of log files to local removable media
 - h. Shall allow to perform firmware upgrades for connected Dimming enclosures
 - i. Shall allow for transfer of configuration to and from Dimming enclosures using removable media
 - j. Shall allow for transfer of configuration to and from LCD Stations using removable media
 - k. Shall allow for binding of Stations
7. Access Controls
- a. There shall be 2 user accounts - Administrator, and User with separate password protection
 - b. Account and password settings shall be local to each Processor
 - c. Access Controls shall be applied to certain areas of the Paradigm Local User Interface and Web Interface
8. Web User Interface
- a. Shall be an internal web server accessible via Ethernet port
 - b. Shall support common web browsers on Windows and Mac platforms
 - c. Shall provide functionality to Activate and Deactivate Presets
 - d. Shall provide functionality to schedule timed events (add/delete)
 - e. Shall display status information
 - f. Shall display log files
 - g. Shall allow for configuration of Processor settings (date, time)
 - h. Shall allow for upload and download of configuration data
 - i. There shall be links to other web-enabled devices in the System, including other Paradigm Processors
9. Stations
- a. Stations shall be connected to a Paradigm Processor via a LinkPower network or Ethernet
 - b. Station discovery and binding shall be accomplished from the Local User Interface or Light Designer
10. Net3 and ACN Devices
- a. Net3 Devices shall be connected to and controlled from Paradigm Processors via Ethernet
 - b. Paradigm Processors shall provide DMX-Net3 gateway functionality
 - c. It shall be possible to send and receive Macro triggers defined within the System configuration via Net3
 - d. There shall be support for Streaming ACN on up to 24 universes per Processor
11. Operation
- a. When contained in an dimming enclosure, a snapshot of the dimming enclosure output data shall be stored in persistent memory so that hardware can access it for immediate output on boot
 - b. DMX output refresh rate shall be configurable
 - c. There shall be support for 16-bit DMX Attributes
 - d. DMX inputs may be patched to DMX and Streaming ACN outputs as external sources
 - e. Streaming ACN inputs shall be patched to DMX outputs (gateway) as external sources
 - f. Where there are multiple external sources then priority and HTP shall be used to perform arbitration
 - g. External and internal sources shall be arbitrated based on user-selection of standard or custom rules
 - h. On Preset Record, the values of Attributes within the Preset shall be updated to reflect the current output

- i. The total output may be the combination of many different Presets running concurrently
 - j. There shall be no hard limit on number of concurrent cross fades
 - k. Multiple Presets controlling the same Attribute shall first interact based on priority and second based on Latest Takes Precedence(LTP) or Highest Takes Precedence (HTP)
 - l. LTP and HTP operation shall be supported simultaneously and interact (at the same priority) using HTP
 - m. Settings due to LTP Presets may be automatically discarded from operation when overridden
 - n. It shall be possible to specify that a Preset or Attribute Control will persist when overridden
 - o. A Preset may be designated as an HTP Override and shall cause HTP values to be discarded
 - p. It shall be possible to modify the rate of a Preset (Cross fades, Effects) from a Control within the System
 - q. Each Preset shall have a status that can be Activated, Deactivated or Altered
 - r. Preset status may be set based on matching levels in the current output as an option
 - s. On startup the System shall be capable of automatically executing timed events within the previous 24 hours to synchronize its initial output state with the current time of day
12. Serial Input/Output
- a. RS232 shall support 8-bit word length, parity selection and 1 or 2 stop bits
 - b. RS232 shall support baud rates from 4800 to 115,200 bps
 - c. Serial input and output messages are fully customizable
 - d. Serial output messages can be generated by any Control or Event

2.15 ARCHITECTURAL CONTROL PROCESSOR: REFERENCED PRODUCT ETC UNISON STATION POWER MODULE

A. Station processor Modules

- 1. The Station Power Module shall be the Unison Paradigm P-SPM Series Station Power Module as manufactured by Electronic Theatre Controls, Inc., or equal.

B. Mechanical

- 1. The Station Power Module (SPM) assembly shall be designed for use in DRd Series or ERn Rack Enclosures.
- 2. The SPM shall convert input power into low-voltage (Class II) power with data line and a secondary auxiliary low-voltage line to energize button, button/fader, touchscreen, and interface devices for multi-scene lighting and building control.
- 3. SPM module shall be contained in a plug-in assembly.
 - a. The module shall be housed in a formed steel body and contain no discrete wire connections.
 - 1) No tools shall be required for module removal or insertion.
- 4. The SPM shall be convection cooled.
- 5. User Interface
 - a. The SPM shall utilize light emitting diodes (LED's) to indication function, status and fault.
- 6. The SPM shall be secured behind the locking door.
- 7. Wall-mounted, direct wire and 19" rack-mount, connectorized repeater and dual-repeater variants shall be available from the same manufacturer where required on the project.

C. Electrical

- 1. The SPM shall require no discrete wiring connections; all wiring shall be terminated into the dimming enclosure, unless required by a variant.
- 2. The SPM shall require line-voltage power supplied by the contractor, terminated inside the dimming or control enclosure.
- 3. The SPM shall be hot-swap capable.
- 4. The SPM, in conjunction with a matching Architectural Control Processor (ACP), shall support Echelon LinkPower communications with remote devices, including button, button/fader,

touchscreen and interface stations, and shall interoperate with LonMARK-approved third-party devices.

- a. The LinkPower network shall utilize polarity-independent, low-voltage Class II twisted pair wiring, type Belden 8471 (unshielded) or Belden 8719 (shielded) or equivalent. One # 14 AWG drain wire will be required for system not using grounded metal conduit.
 - b. The LinkPower network shall be topology free. Network wiring may be bus, loop, home run, star or any combination of these.
 - 1) Link power wiring shall permit a total wire run of 1640 ft. (500m)
 - 2) Repeaters allow an additional wire run of 1640 ft. (500m)
 - c. Dual-repeaters allow two additional wire runs of 1640 ft. (500m)
5. Link power wiring between stations shall not exceed 1313 ft. (400m).
6. The SPM shall support auxiliary power for certain remote devices, including touchscreen and interface stations, as required by the device.
- a. The auxiliary power network shall utilize polarity-dependent, low-voltage Class II wiring, consisting of two # 16 AWG wires.
 - b. Auxiliary wiring shall permit a total wire run of 1640 ft. (500m)
 - 1) Repeaters allow an additional wire run of 1640 ft. (500m)
 - 2) Dual-repeaters allow two additional wire runs of 1640 ft. (500m)
 - c. The SPM shall supply 1.25 amps at 24v DC continuously.
- D. Functional
1. Capacity
 - a. Each SPM shall:
 - 1) Supply power for up to 32 button and button/fader stations.
 - a) Repeaters and dual-repeaters allow 30 additional stations, 62 total
 - b. Supply auxiliary power for a similar number of interface stations.
 - c. Shall supply auxiliary power for up to four Touchscreen stations, when a like number of other stations are deducted from the total.
 - 1) Repeaters and dual-repeaters allow two additional Touchscreens (six total) when a like number of other stations are deducted from the total.
 2. Operation
 - a. The SPM shall not require configuration or programming.
 - b. The SPM shall automatically detect faults in the wiring, indicate the fault, including the fault polarity, and shut down the output power.
 - 1) The SPM shall automatically reset when the fault is clear, and can be manually reset by removing and re-inserting the module.

2.16 LIGHTING SYSTEM PORTABLE ACCESS DEVICE: REFERENCED PRODUCT ETC PAD

A. General

1. The portable access unit shall be remote control device that allows access to console or architectural programming and playback functions. The device shall be an 8-inch, Android-based industrial tablet with a capacitive multi-touch display that supports both wired and wireless connections. The unit shall be the ETCpad as manufactured by ETC, Inc., or equal.
2. The ETCpad is compatible with the following products
 - a. Eos Family products, including RVIs, RPUs, ETCnomad and ETCnomad Puck.
 - b. Paradigm P-ACPs
 - c. Echo Expansion Bridges
 - d. Sensor CEM3 Modules
3. The ETCpad connects hardware to an ETC networked system using an RJ45 and wirelessly via a WAP (provided separately).

B. Features

1. The unit provides a power switch and power/battery indicator

THEATRICAL LIGHTING & CONTROL SYSTEMS

2. One Micro HDMI, one USB 2.0 and one Micro SIM are provided.
3. The operating temperature is 14-122 F (-10 thru 50C). Charging temperature range is 32-104F (0 thru 40C).
4. The unit is 5.59" (142mm) H x 9.44" (240mm) W x .63" (16mm) D and weighs 1.32 pounds (0.6 kg).
5. The device ships with a charging/cable adaptor and hand strap.

C. Accessories

1. The ETCpad shall be available with the following optional accessories (provide with all as indicated on drawings):
 - a. Shoulder Strap
 - b. EETI Stylus Pen
 - c. Battery Pack with Meter
 - d. Multi-Tablet Charger
 - e. Office Dock
 - f. VESA Dock

2.17 GENERAL NETWORK:

A. General

1. The Electronic Theatre Controls Net3 network shall provide data distribution over a TCP/IP network. Data shall be layer 3 routable over the Ethernet network. Systems using proprietary formats or formats other than TCP/IP or non-layer 3 routable networks shall not be accepted.
2. Connections shall be made between consoles, facepanels, architectural processors, computers and Net3 Gateways over standard Ethernet distribution systems using 10/100BaseT wiring and/or 10/100BaseFL. All installations shall conform to established Ethernet wiring practice and installation shall be performed by contractors qualified to do this type of work. All wiring shall be tested at Category 5 or higher for full bandwidth operation to the appropriate IEEE standard.
3. The Lighting Control system must be supplied by a single manufacturer and must have seamless integration over Ethernet between the Entertainment and Architectural lighting control.

B. Capacities

1. The network shall provide DMX routing, patching, and prioritization for choice of up to 32,910,848 DMX addresses. Each address may be input or output from any port on any DMX Gateway in the system. DMX input, routing and output shall be specifically supported on the system from multiple sources and locations up to the maximum number of Gateways supported by the Ethernet topology.
2. The network shall support multiple consoles, computers, file servers, printers, and architectural processors with discrete command lines and control. The Net3 network shall support multiple venues/systems on the same network.
3. Network configuration shall be via ETC Gateway Configuration Editor (GCE) software. The software shall permit complete user flexibility allowing the system operator to patch DMX data over Ethernet DMX (EDMX), assign Gateway labels for easy identification, assign DMX offsets and provide choice of DMX port prioritization. Each Gateway shall have a specific IP address provided automatically by the software. The user may edit this IP address. Systems that do not support simple Windows configuration, or systems that do not allow complete reconfiguration of the above mentioned features over Ethernet shall not be acceptable.
4. All configuration data for each network device shall be held at the device and system operation shall not require continuous on-line operation of the network configuration software.
5. Architectural and Entertainment systems connected to the same Net3 network shall be capable of arbitrating control over EDMX data. The system shall be capable of alternating control of individual dimmer data between architectural and entertainment systems without intervention by the user. The user shall dictate the conditions under which system shall automatically take

control and the network shall allow user override of the user selected defaults. Systems which require direct user intervention to allocate control of dimmers between architectural and entertainment lighting systems shall not be allowed.

6. The Net3 network shall allow multiple DMX inputs assigned to the same EDMX range to be set at different priorities. This shall allow the user to assign high or low priority to each DMX input port in the network on a port by port basis. The network shall require a valid DMX signal present at the input to initiate prioritization. Systems that do not allow for prioritization shall not be allowed.

C. Operational Features

1. The video monitor outputs at any Net3 Remote Video Interface (RVI) shall be able to monitor the video output of any Net3 console connected to the network.
2. Each DMX Gateway shall control up to 512 DMX addresses per port, within the confines of up to 64,279 DMX (32,910,848 address) "universes". The specific DMX data input or output by the Gateway shall be freely configurable by the user. Duplicate outputs of DMX lines (DMX splitter) and discrete outputs shall be fully supported.
3. Any number of DMX universes may be configured with any length up to 512 addresses as long as the total does not exceed 32,910,848. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX input may have its own universe and offset address for ease of use.
4. DMX ports shall be configurable for either input or output. Multiple DMX signal routing patches and multiple facilities shall be specifically supported and limited only by the file storage capacity of the computer with ETC Network Configuration Editor software installed.
5. File transmission, synchronization and access to software shall be supported.

2.18 DUAL BAND ENTERPRISE CLASS WIRELESS ACCESS POINT: REFERENCED PRODUCT CISCO AIRONET 1600 SERIES ACCESS POINT

A. FEATURES:

1. Sleek design with internal antennas
2. Extended operating temperature
3. Versatile RF coverage with optional external antennas
4. UL 2043 plenum-rated for above-ceiling installation options or suspended from drop ceilings
5. 802.11n performance with existing PoE switches
6. Locks for theft protection
7. Controller-based or standalone deployment options
8. Supports rogue access point detection and denial-of service attacks
9. Management frame protection detects malicious users and alerts network administrators
10. Cisco ClientLink 2.0 Beamforming
11. Support for all client types without any client requirements or dependencies
12. Cisco CleanAir Express Spectrum Intelligence
13. Identifies, classifies and provides automatic remedial actions for different types of interference
14. Locates and visualizes sources of interference
15. Cisco VideoStream Technology
16. Efficient multicast-to-unicast conversion
17. Video call admission control to prevent oversubscription
18. Queue prioritization to help ensure best user experience for corporate videos
19. Warranty: Limited Lifetime Warranty that provides full warranty coverage of the hardware for as long as the original end user continues to own or use the product. The warranty includes 10-day advance hardware replacement and ensures that software media is defect-free for 90 days.
20. Enterprise-class chipsets and optimized radios
21. 802.11n with 3x3 multiple-input multiple-output (MIMO) technology with two spatial streams, which sustains 300-Mbps rates
22. Radio resource management (RRM): Automated self-healing
23. CleanAir Express: detects RF interference and provides basic spectrum analysis capability

24. Cisco ClientLink 2.0 technology: Improves downlink performance to all mobile devices including 802.11n while improving battery life on mobile devices such as smartphones and tablets
25. Cisco BandSelect technology: Improves 5-GHz client connections in mixed-client environments
26. Cisco VideoStream technology: Uses multicast to improve rich-media applications
27. Can scale to up to 18,000 access points with full Layer 3 mobility across central or remote locations
28. Cisco Network Assistant: provides a centralized network view with a user-friendly GUI

SPECIFICATIONS:

Product Specifications

Table 1 lists the product specifications for Cisco Aironet 1600 Series Access Points.

Table 1. Product Specifications for Cisco Aironet 1600 Series Access Points

Item	Specification
Part Numbers	The Cisco Aironet 1600i Access Point: Indoor environments, with internal antennas <ul style="list-style-type: none">• AIR-CAP1602I-x-K9 Dual-band controller-based 802.11a/g/n• AIR-CAP1602I-xK910 Eco-pack (dual-band controller-based 802.11a/g/n) 10 quantity access points• AIR-SAP1602I-x-K9 Dual-band stand-alone 802.11a/g/n• AIR-SAP1602I-xK9-5 Eco-pack (dual-band stand-alone 802.11a/g/n) 5 quantity access points The Cisco Aironet 1600e Access Point: Indoor, challenging environments, with external antennas <ul style="list-style-type: none">• AIR-CAP1602E-x-K9 Dual-band controller-based 802.11a/g/n• AIR-CAP1602E-xK910 Eco-pack (dual-band 802.11a/g/n) 10 quantity access points• AIR-SAP1602E-x-K9 Dual-band stand-alone 802.11a/g/n• AIR-SAP1602E-xK9-5 Eco-pack (dual-band stand-alone 802.11a/g/n) 5 quantity access points

Item	Specification																																																																															
	<p>Cisco SMARTnet® Service for the Cisco Aironet 1600 Series Access Point with internal and external antennas</p> <ul style="list-style-type: none">• CON-SNT-C1602Ix - SMARTnet 8x5xNBD 1600i access point (dual-band 802.11 a/g/n, Controller-based), (e.g. CON-SNT-C1602IE for AP1600 internal antenna for E Domain, Controller based)• CON-SNT-C1602Ex - SMARTnet 8x5xNBD 1600e access point (dual-band 802.11 a/g/n, Controller-based), (e.g. CON-SNT-C1602EA for AP1600 external antenna for A Domain, Controller based)• CON-SNT-S1602Ix - SMARTnet 8x5xNBD 1600i access point (dual-band 802.11 a/g/n, Stand-alone), (e.g. CON-SNT-S1602IE for AP1600 internal antenna for E Domain, stand-alone)• CON-SNT-S1602Ex - SMARTnet 8x5xNBD 1600e access point (dual-band 802.11 a/g/n, Stand-alone), (e.g. CON-SNT-S1602EA for AP1600 external antenna for A Domain, Stand-alone) <p>Cisco Wireless LAN Services</p> <ul style="list-style-type: none">• AS-WLAN-CNSLT Cisco Wireless LAN Network Planning and Design Service• AS-WLAN-CNSLT Cisco Wireless LAN 802.11n Migration Service• AS-WLAN-CNSLT Cisco Wireless LAN Performance and Security Assessment Service <p>Regulatory domains: (x = regulatory domain)</p> <p>Customers are responsible for verifying approval for use in their individual countries. To verify approval and to identify the regulatory domain that corresponds to a particular country, please visit: http://www.cisco.com/go/aironet/compliance.</p> <p>Not all regulatory domains have been approved. As they are approved, the part numbers will be available on the Global Price List.</p>																																																																															
Software	<ul style="list-style-type: none">• Cisco Unified Wireless Network Software (available in Q4CY12)• Cisco IOS® Software Release (available in Q4CY12)																																																																															
802.11n	<ul style="list-style-type: none">• 3 x 3 multiple-input multiple-output (MIMO) with two spatial streams• Maximal ratio combining (MRC)• 20- and 40-MHz channels• PHY data rates up to 300 Mbps• Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Tx/Rx)• 802.11 dynamic frequency selection (DFS) (Bin 5)• Cyclic shift diversity (CSD) support																																																																															
Data Rates Supported	<p>802.11a: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps</p> <p>802.11g: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, and 54 Mbps</p> <p>802.11n data rates (2.4 GHz¹ and 5 GHz):</p> <table><tr><th rowspan="2">MCS Index²</th><th colspan="2">GI³ = 800ns</th><th colspan="2">GI = 400ns</th></tr><tr><th>20-MHz Rate (Mbps)</th><th>40-MHz Rate (Mbps)</th><th>20-MHz Rate (Mbps)</th><th>40-MHz Rate (Mbps)</th></tr><tr><td>0</td><td>6.5</td><td>13.5</td><td>7.2</td><td>15</td></tr><tr><td>1</td><td>13</td><td>27</td><td>14.4</td><td>30</td></tr><tr><td>2</td><td>19.5</td><td>40.5</td><td>21.7</td><td>45</td></tr><tr><td>3</td><td>26</td><td>54</td><td>28.9</td><td>60</td></tr><tr><td>4</td><td>39</td><td>81</td><td>43.3</td><td>90</td></tr><tr><td>5</td><td>52</td><td>108</td><td>57.8</td><td>120</td></tr><tr><td>6</td><td>58.5</td><td>121.5</td><td>65</td><td>135</td></tr><tr><td>7</td><td>65</td><td>135</td><td>72.2</td><td>150</td></tr><tr><td>8</td><td>13</td><td>27</td><td>14.4</td><td>30</td></tr><tr><td>9</td><td>26</td><td>54</td><td>28.9</td><td>60</td></tr><tr><td>10</td><td>39</td><td>81</td><td>43.3</td><td>90</td></tr><tr><td>11</td><td>52</td><td>108</td><td>57.8</td><td>120</td></tr><tr><td>12</td><td>78</td><td>162</td><td>86.7</td><td>180</td></tr><tr><td>13</td><td>104</td><td>216</td><td>115.6</td><td>240</td></tr></table>	MCS Index ²	GI ³ = 800ns		GI = 400ns		20-MHz Rate (Mbps)	40-MHz Rate (Mbps)	20-MHz Rate (Mbps)	40-MHz Rate (Mbps)	0	6.5	13.5	7.2	15	1	13	27	14.4	30	2	19.5	40.5	21.7	45	3	26	54	28.9	60	4	39	81	43.3	90	5	52	108	57.8	120	6	58.5	121.5	65	135	7	65	135	72.2	150	8	13	27	14.4	30	9	26	54	28.9	60	10	39	81	43.3	90	11	52	108	57.8	120	12	78	162	86.7	180	13	104	216	115.6	240
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¹ 2.4 GHz: 2 GHz does not support 40 MHz.

² MCS Index: The Modulation and Coding Scheme (MCS) index determines the number of spatial streams, the modulation, the coding rate, and data rate values.

³ GI: A Guard Interval (GI) between symbols helps receivers overcome the effects of multipath delays.

Item	Specification				
	14	117	243	130	270
	15	130	270	144.4	300
Frequency Band and 20-MHz Operating Channels	A Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.462 GHz; 11 channels• 5.180 to 5.320 GHz; 8 channels• 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz)• 5.745 to 5.825 GHz; 5 channels C Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.472 GHz; 13 channels• 5.745 to 5.825 GHz; 5 channels E Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.472 GHz; 13 channels• 5.180 to 5.320 GHz; 8 channels• 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz) I Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.472 GHz; 13 channels• 5.180 to 5.320 GHz; 8 channels K Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.472 GHz; 13 channels• 5.180 to 5.320 GHz; 8 channels• 5.500 to 5.620 GHz; 7 channels• 5.745 to 5.805 GHz; 4 channels		N Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.462 GHz; 11 channels• 5.180 to 5.320 GHz; 8 channels• 5.745 to 5.825 GHz; 5 channels Q Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.472 GHz; 13 channels• 5.180 to 5.320 GHz; 8 channels• 5.500 to 5.700 GHz; 11 channels R Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.472 GHz; 13 channels• 5.180 to 5.320 GHz; 8 channels• 5.660 to 5.700 GHz; 3 channels• 5.745 to 5.805 GHz; 4 channels S Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.472 GHz; 13 channels• 5.180 to 5.320 GHz; 8 channels• 5.500 to 5.700 GHz; 11 channels• 5.745 to 5.825 GHz; 5 channels T Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.462 GHz; 11 channels• 5.280 to 5.320 GHz; 3 channels• 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz)• 5.745 to 5.825 GHz; 5 channels Z Regulatory Domain: <ul style="list-style-type: none">• 2.412 to 2.462 GHz; 11 channels• 5.180 to 5.320 GHz; 8 channels• 5.500 to 5.700 GHz; 8 channels (excludes 5.600 to 5.640 GHz)• 5.745 to 5.825 GHz; 5 channels		
Note: This varies by regulatory domain. Refer to the product documentation for specific details for each regulatory domain.					
Maximum Number of Nonoverlapping Channels	2.4 GHz <ul style="list-style-type: none">• 802.11b/g:<ul style="list-style-type: none">◦ 20 MHz: 3• 802.11n:<ul style="list-style-type: none">◦ 20 MHz: 3		5 GHz <ul style="list-style-type: none">• 802.11a:<ul style="list-style-type: none">◦ 20 MHz: 24• 802.11n:<ul style="list-style-type: none">◦ 20 MHz: 24◦ 40 MHz: 11		
Note: This varies by regulatory domain. Refer to the product documentation for specific details for each regulatory domain.					
Receive Sensitivity	2.4 GHz 802.11b -101 dBm @ 1 Mb/s -99 dBm @ 2 Mb/s -92 dBm @ 5.5 Mb/s -89 dBm @ 11 Mb/s	2.4 GHz 802.11g -93 dBm @ 6 Mb/s -93 dBm @ 9 Mb/s -92 dBm @ 12 Mb/s -90 dBm @ 18 Mb/s -87 dBm @ 24 Mb/s -85 dBm @ 36 Mb/s -80 dBm @ 48 Mb/s -79 dBm @ 54 Mb/s	5 GHz 802.11a -92 dBm @ 6 Mb/s -91 dBm @ 9 Mb/s -91 dBm @ 12 Mb/s -89 dBm @ 18 Mb/s -86 dBm @ 24 Mb/s -83 dBm @ 36 Mb/s -79 dBm @ 48 Mb/s -78 dBm @ 54 Mb/s		

Item	Specification								
	2.4 GHz 802.11n (HT20) -93 dBm @ MCS0 -91 dBm @ MCS1 -89 dBm @ MCS2 -86 dBm @ MCS3 -83 dBm @ MCS4 -78 dBm @ MCS5 -77 dBm @ MCS6 -76 dBm @ MCS7 -93 dBm @ MCS8 -90 dBm @ MCS9 -88 dBm @ MCS10 -85 dBm @ MCS11 -81 dBm @ MCS12 -77 dBm @ MCS13 -76 dBm @ MCS14 -74 dBm @ MCS15			5 GHz 802.11n (HT20) -92 dBm @ MCS0 -89 dBm @ MCS1 -88 dBm @ MCS2 -85 dBm @ MCS3 -82 dBm @ MCS4 -77 dBm @ MCS5 -76 dBm @ MCS6 -75 dBm @ MCS7 -91 dBm @ MCS8 -88 dBm @ MCS9 -87 dBm @ MCS10 -84 dBm @ MCS11 -81 dBm @ MCS12 -76 dBm @ MCS13 -75 dBm @ MCS14 -73 dBm @ MCS15			5 GHz 802.11n (HT40) -88 dBm @ MCS0 -87 dBm @ MCS1 -85 dBm @ MCS2 -82 dBm @ MCS3 -79 dBm @ MCS4 -74 dBm @ MCS5 -73 dBm @ MCS6 -72 dBm @ MCS7 -88 dBm @ MCS8 -86 dBm @ MCS9 -84 dBm @ MCS10 -81 dBm @ MCS11 -78 dBm @ MCS12 -73 dBm @ MCS13 -72 dBm @ MCS14 -70 dBm @ MCS15		
	Maximum Total Transmit Power			2.4 GHz <ul style="list-style-type: none">802.11b<ul style="list-style-type: none">22 dBm (3 antennas enabled)802.11g<ul style="list-style-type: none">22 dBm (3 antennas enabled)802.11n (HT20)<ul style="list-style-type: none">22 dBm (3 antennas enabled)			5 GHz <ul style="list-style-type: none">802.11a<ul style="list-style-type: none">22 dBm (3 antennas enabled)802.11n non-HT duplicate mode<ul style="list-style-type: none">22 dBm (3 antennas enabled)802.11n (HT20)<ul style="list-style-type: none">22 dBm (3 antennas enabled)802.11n (HT40)<ul style="list-style-type: none">22 dBm (3 antennas enabled)		
	Note: The maximum power setting will vary by channel and according to individual country regulations. Refer to the product documentation for specific details.								
	Available Total Transmit Power Settings	2.4 GHz			5 GHz				
		Enabled antennas:			Enabled antennas:				
		1	2	3	1	2	3		
		17 dBm	20 dBm	22 dBm	17 dBm	20 dBm	22 dBm		
		14 dBm	17 dBm	19 dBm	14 dBm	17 dBm	19 dBm		
		11 dBm	14 dBm	16 dBm	11 dBm	14 dBm	16 dBm		
	8 dBm	11 dBm	13 dBm	8 dBm	11 dBm	13 dBm			
	5 dBm	8 dBm	10 dBm	5 dBm	8 dBm	10 dBm			
	2 dBm	5 dBm	7 dBm	2 dBm	5 dBm	7 dBm			
	Note: The maximum power setting will vary by channel and according to individual country regulations. Refer to the product documentation for specific details.								
	Integrated Antenna	<ul style="list-style-type: none">2.4 GHz, gain 4.0 dBi, horizontal beamwidth 360°5 GHz, gain 4.0 dBi, horizontal beamwidth 360°							
	External Antenna (Sold Separately)	<ul style="list-style-type: none">Certified for use with antenna gains up to 6 dBi (2.4 GHz and 5 GHz)Cisco offers the industry's broadest selection of 802.11n antennas delivering optimal coverage for a variety of deployment scenarios							
	Interfaces	<ul style="list-style-type: none">10/100/1000BASE-T autosensing (RJ-45)Management console port (RJ-45)							
Indicators	<ul style="list-style-type: none">Status LED indicates boot loader status, association status, operating status, boot loader warnings, boot loader errors								
Dimensions (W x L x H)	<ul style="list-style-type: none">Access point (without mounting bracket): 8.7 x 8.7 x 1.84 in. (22.1 x 22.1 x 4.7 cm)								
Weight	<ul style="list-style-type: none">1.9 lbs. (0.86 kg)								

Item	Specification
Environmental	<p>Cisco Aironet 1600i</p> <ul style="list-style-type: none"> • Nonoperating (storage) temperature: -22 to 158°F (-30 to 70°C) • Nonoperating (storage) Altitude Test -25°C, 15,000 ft. • Operating temperature: 32 to 104°F (0 to 40°C) • Operating humidity: 10 to 90% percent (noncondensing) • Operating Altitude Test -40°C, 9843 ft. <p>Cisco Aironet 1600e</p> <ul style="list-style-type: none"> • Nonoperating (storage) temperature: -22 to 158°F (-30 to 70°C) • Nonoperating (storage) Altitude Test -25°C, 15,000 ft. • Operating temperature: -4 to 122°F (-20 to 50°C) • Operating humidity: 10 to 90 percent (noncondensing) • Operating Altitude Test -40°C, 9843 ft
System Memory	<ul style="list-style-type: none"> • 256 MB DRAM • 32 MB flash
Input Power Requirements	<ul style="list-style-type: none"> • AP1600: 44 to 57 VDC • Power Supply and Power Injector: 100 to 240 VAC; 50 to 60 Hz
Powering Options	<ul style="list-style-type: none"> • 802.3af Ethernet Switch • Cisco AP1600 Power Injectors (AIR-PWRINJ4=, AIR-PWRINJ5=) • Cisco AP1600 Local Power Supply (AIR-PWR-B=)
Power Draw	<ul style="list-style-type: none"> • AP1600: 12.95 W <p>Note: When deployed using PoE, the power drawn from the power sourcing equipment will be higher by some amount dependent on the length of the interconnecting cable. This additional power may be as high as 2.45W, bringing the total system power draw (access point + cabling) to 15.4W.</p>
Warranty	Limited Lifetime Hardware Warranty
Compliance	<p>Standards</p> <ul style="list-style-type: none"> • Safety: <ul style="list-style-type: none"> ◦ UL 60950-1 ◦ CAN/CSA-C22.2 No. 60950-1 ◦ UL 2043 ◦ IEC 60950-1 ◦ EN 60950-1 • Radio approvals: <ul style="list-style-type: none"> ◦ FCC Part 15.247, 15.407 ◦ RSS-210 (Canada) ◦ EN 300.328, EN 301.893 (Europe) ◦ ARIB-STD 33 (Japan) ◦ ARIB-STD 66 (Japan) ◦ ARIB-STD T71 (Japan) ◦ AS/NZS 4268.2003 (Australia and New Zealand) ◦ EMI and susceptibility (Class B) ◦ FCC Part 15.107 and 15.109 ◦ ICES-003 (Canada) ◦ VCCI (Japan) ◦ EN 301.489-1 and -17 (Europe) ◦ EN 60601-1-2 EMC requirements for the Medical Directive 93/42/EEC • IEEE Standard: <ul style="list-style-type: none"> ◦ IEEE 802.11a/b/g, IEEE 802.11n, IEEE 802.11h, IEEE 802.11d • Security: <ul style="list-style-type: none"> ◦ 802.11i, Wi-Fi Protected Access 2 (WPA2), WPA ◦ 802.1X ◦ Advanced Encryption Standards (AES), Temporal Key Integrity Protocol (TKIP) • EAP Type(s): <ul style="list-style-type: none"> ◦ Extensible Authentication Protocol-Transport Layer Security (EAP-TLS) ◦ EAP-Tunneled TLS (TTLS) or Microsoft Challenge Handshake Authentication Protocol Version 2 (MSCHAPv2) ◦ Protected EAP (PEAP) v0 or EAP-MSCHAPv2

Item	Specification
	<ul style="list-style-type: none"> Extensible Authentication Protocol-Flexible Authentication via Secure Tunneling (EAP-FAST) PEAPv1 or EAP-Generic Token Card (GTC) EAP-Subscriber Identity Module (SIM) Multimedia: <ul style="list-style-type: none"> Wi-Fi Multimedia (WMM™) Other: <ul style="list-style-type: none"> FCC Bulletin OET-65C RSS-102

2.19 EMERGENCY LIGHTING TRANSFER SYSTEM: REFERENCED PRODUCT ETC ELTS2-1-M-120-XX

A. General

- The Emergency Lighting Transfer System (ELTS2) shall provide automatic transfer of branch circuits from normal to emergency (or to "other" normal power if no emergency power is available) power when normal power fails. Each system shall consist of power transfer switches and a control circuitry interconnected to provide complete, automatic protection.
- The ELTS shall transfer designated lighting load branch circuits from dimmers or secondary control outputs to a second power source in the event of a loss of power to the dimmer rack, a normal system failure, a panic condition, or activation of fire alarm.
- The system shall comply with ANSI / UL1008 Transfer Switch Equipment, ANSI/NFPA 110 Standard for Emergency and Standby Power Systems, and ANSI/NFPA 70 (NEC), including Article 700, 701 and 702 safety standards.
 - Satisfies requirements of the National Electrical Code (NFPA 70):
 - Article 700 – Emergency Systems
 - Article 701 – Legally Required Standby Systems
 - Article 702 – Optional Standby Systems
 - Section 518.3(C) – Assembly Occupancies
 - Section 520.7 – Theatres and Similar Locations
 - Section 540.11(C) – Motion Picture Projection Rooms
- The ELTS shall be a self-contained system for up to 24 circuits at 20 amps and available for single or three phase power (120/208V, 120/240V or 277/480V). The unit shall be available with either discrete emergency branch circuit feeds from an external circuit breaker panel (by others) or emergency main feed with built-in branch circuit distribution and over current protection.

B. Transfer Switch

- The switch shall be a UL 1008 LISTED, electrically operated and mechanically held (maintained) transfer switch. The electrical operator shall be a single-solenoid mechanism transfer switch unit.
- The switch shall be positively locked and unaffected by voltage variations or momentary outages so constant contact pressure is maintained and temperature rise at the contacts is minimized.
- The switch shall be mechanically interlocked to ensure only one of the two possible positions, either Normal or Emergency.
- All switch main contacts shall be silver-plated.
- Overload and endurance testing of the transfer switch shall comply with UL1008 Tables 25.1, 25.2, 27.1, and 27.2 for mixed loads.
- Built-in fuses shall provide 5000A Short Circuit Current Rating (SCCR) and insure compliance with NEC Section 700.27 Coordination – larger upstream breakers cannot be tripped by downstream branch circuit faults.
- Switch contacts shall withstand transfer without welding, with 180° phase displacement between Normal and Emergency power sources, both sources energized and with 80% load.
- Transfer switch contacts shall be rated for mixed loads, including electric discharge lamps and tungsten filament lamps.

C. Control Circuit

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1. The control circuitry shall direct the operation of the transfer switch.
 2. Interfacing relays shall be a covered industrial control grade plug-in type.
 3. Provisions for optional remote signal, fire alarm and other input signals shall be incorporated into the control circuit.
- D. Operation
1. The voltage of each phase of the normal source shall be monitored, with pickup adjustable from 85 to 100% and dropout adjustable from 75 to 98% of pickup setting. These settings shall be adjustable in increments of 1%. Repetitive accuracy of settings shall be 2% or better over a temperature range of -20°C to 70°C. Factory set to pickup at 90% and dropout at 85%.
 2. Single phase voltage sensing of the Emergency source shall be provided with a pickup adjustable from 85 to 100% and dropout fixed at 84 to 86% of pickup. Frequency sensing shall be provided with pickup adjustable from 90 to 100% and dropout fixed at 87 to 89% of pickup. Repetitive accuracy of settings shall be 2% or better over a temperature range of -20°C to 70°C. Factory set to pick up at 90% voltage and 95% frequency.
 3. The control module shall include four time delays that are field adjustable in increments of at least 13 steps over the entire range, as follows.
 - a. Time delay to override momentary Normal source outages, to delay all transfer switch and engine starting signals, adjustable from 0 to 6 sec., Factory set at 1 sec.
 - b. Transfer to Emergency time delay from 0 to 5 min. Factory set at 0 min.
 - c. Retransfer to Normal time delay. Time delay is automatically bypassed if Emergency source fails and Normal source is acceptable. Adjustable from 0 to 30 min. Factory is set at 1 min.
 - d. Emergency generator cool-down cycle. Adjustable from 0 to 60 min. Factory set at 5 min.
 - e. Contractor shall set all transfer cabinet delay settings as follows: "Normal to Emergency" – 170 ms. "Emergency to Normal" – 30 sec. Actual settings may, based upon field conditions and input from the AHJ, be different than those noted here. Obtain actual settings from the AHJ. Refer to the contract drawings for more information.
 4. Control power for all logic and transfer functions shall always seek the acceptable power source. This shall prevent the system from locking up in one position if either of the power sources is available, regardless of the sequence of failure events.
 5. A self-supervising isolated signal input shall be provided for connection to the facility fire alarm. The ELTS2 shall automatically transfer the loads to the Emergency power source when the facility fire alarm is activated.
 6. A key-operated double-throw, momentary test switch shall be provided to manually control the ELTS2. All automatic functions shall override this control. Two indicator lights shall be provided to show the position of the transfer switch.
 7. All automatic functions shall override remote control functions. Any combination of open or shorted wiring to remote stations shall not affect automatic functions, or disable the local switch.
- E. Remote Stations (Optional) – Provide only if specifically called out on the drawings.
1. Optional remote control stations shall be available for the ELTS2. Each remote control station shall contain a 3-position key switch. The left and right positions shall be momentary and the switch shall always return to the center position.
 2. The faceplate shall be labeled Normal for the left switch position, Emergency for the right switch position and Auto for the center position.
 3. The faceplate shall contain two LED's to confirm transfer switch position.
 4. Each remote station shall mount in a standard, two-gang wall box (4" x 4" x 3.5").
 5. Remote stations shall not be incorporated into or mounted onto other equipment.
 6. All wiring to remote stations shall be by 5-conductor, Class 2 wiring (12V DC). A terminal strip shall be provided for contractor wiring.
- F. Enclosure
1. The ELTS2 shall be mounted in a NEMA 1 type enclosure finished in textured warm gray. It shall be equipped with a hinged locking door. Material shall be no less than 14 gauge steel.

2. An enclosure containing no more than 24 transfer poles (up to twelve 20A circuits) shall be 36.3"H x 24.3"W x 8.7"D. An enclosure containing up to 48 transfer poles (up to twenty-four 20A circuits) shall be 48.3"H x 30.3"W x 8.7"D.
3. The enclosure shall provide power distribution and branch circuit protection for all emergency power circuits. Systems requiring external emergency power circuit protection shall not be acceptable.
4. The enclosure shall be separate and independent of all other equipment. In no instance shall the ELTS2 be enclosed in a dimmer rack or in an enclosure containing other equipment.
5. The system shall be provided with an approved overlay mounted on the front of the enclosure, stating, "EMERGENCY LIGHTING TRANSFER SYSTEM".
6. The enclosure shall be provided with an approved label indicating that the system is UL1008 LISTED.
7. The ELTS shall contain a key switch, two transfer position LED's, and a fire alarm status LED.

2.20 EMERGENCY DMX INTERFACE AND CONTROL: REFERENCED PRODUCT ETC DMX EMERGENCY BYPASS CONTROL (DEBC)

- A. Where required to trigger special-purpose lighting presets and bypass normal lighting controls during emergency or panic situations, the bypass means shall be the DMX Emergency Bypass Controller (DEBC) as manufactured by ETC, Inc., or equal
- B. Functional
 1. The DMX Emergency Bypass Controller shall be capable of overriding a single universe of ANSI E1.11-2008, USITT DMX512-A control signals from "Normal" to "Bypass" when a trigger signal is detected via a contact closure trigger input
 - a. The DMX Emergency Bypass Controller shall output to six optically-isolated DMX outputs
 - b. The DMX Emergency Bypass Controller shall poll the bypass trigger input after a power loss and react upon start up
 - c. The default or recorded preset shall be recalled immediately on restart if the trigger is also applied at restart
 - d. Controllers that do not support E1.11-2008 compliant DMX communication shall not be acceptable
 2. The DMX Emergency Bypass Controller shall be capable of recording a single DMX preset (snapshot) of 512 channels for recall during "Bypass" mode
 3. The DMX Emergency Bypass Controller (DEBC) shall have internally accessible, labeled DIP switches for configuration of:
 - a. DMX Record Mode
 - 1) All 512 channels (default)
 - 2) Selected channels, snapshot
 - b. Contact input type
 - 1) Normally open (default)
 - 2) Normally closed
 - c. Wait Time for Restore incoming DMX (bypass trigger removed)
 - 1) 0 Seconds (default)
 - 2) 10 Second Wait
 - 3) 30 Second Wait
 - 4) 10 Minute Wait
 4. The DMX Emergency Bypass Controller shall support a single bypass input using two input modes:
 - a. Bypass triggering shall be supported via a maintained contact input configurable for normally open (N.O.) or normally closed (N.C.) operation
 - b. The contact input shall support +12VDC wet input to provide interface with fire alarm or secondary triggering systems. Bypass controllers that do not support a fire alarm input shall not be acceptable.
- C. Mechanical

1. The DMX Emergency Bypass Controller (DEBC) enclosure shall be a surface mounted enclosure with a removable cover, constructed of 16-gauge, formed steel with a removable front cover
 - a. All components shall be properly treated and finished in fine textured, scratch-resistant, powder coat paint
 - b. DEBC enclosure shall have a minimum of four keyed mounting holes for wall attachment
 - c. DEBC enclosure shall have a visible label stating the product name, manufacturer name, indicator functions, control functions, ratings and listings
 2. The DMX Emergency Bypass Controller (DEBC) enclosure shall provide discrete high and low voltage wiring compartments with voltage barrier
 3. The DMX Emergency Bypass Controller (DEBC) shall have a single bi-color LED indicator visible from the exterior of the enclosure
 - a. LED shall indicate Normal state with a "green" color light
 - 1) Normal state illuminates steady green when Power and DMX are present
 - 2) LED Off indicates Power or DMX are not present
 - b. LED shall indicate Bypass state with a "red" color light
 - 1) Bypass state includes bypass input contact trigger or 'test' active
 4. The DMX Emergency Bypass Controller (DEBC) shall have a single test button accessible from the front of the enclosure without removing any panels
 - a. The test button shall immediately trigger bypass state for as long as it is held down, and release the bypass state immediately upon release of the button
 - 1) The test button shall be momentary only
 - 2) The test button shall be recessed to prevent accidental triggering
 5. The DMX Emergency Bypass Controller (DEBC) shall have a single, internally accessible button for DMX Record (snapshot) with an indicator LED for record action
 - 1) The record button shall be momentary only and held for at least 3 seconds before activation to prevent accidental recording
 - 2) The LED indicator will flash rapidly when record function is active
 - 3) The LED indicator will illuminate steady when record function is complete
 6. The DMX Emergency Bypass Controller (DEBC) dimensions and weights shall not exceed:
 - a. 9" H x 11" W x 2" D,
 - b. 8lbs (single output); 14.5lbs (multi-output)
- D. Electrical
1. The DMX Emergency Bypass Controller shall be completely internally pre-wired by the manufacturer
 2. The contractor shall provide input feed and control wiring to the provided terminals
 - a. DMX Emergency Bypass Controllers (DEBC) shall support 100 to 277 volt input power, 50/60 Hz, 150mA maximum current
 3. DEBC shall support labeled terminations for two 24 – 10 AWG solid or stranded power wires
 4. DEBC shall support one Grounding Lug for 24-14 AWG solid or stranded ground wire
 5. DEBC shall support labeled, socketed termination connections for DMX Input and DMX Output wiring
 - a. Terminations shall support Belden 9729 cable or equivalent
 - 1) DMX Termination kits for Belden 9729 shall be supplied with the controller
 - 2) Optional Termination kits for Belden 1583A (or equivalent Category 5 cable) shall be available from the manufacturer
 6. DEBC shall support labeled, socketed termination for the bypass contact input
 - a. Termination shall support two, 30-12 AWG low-voltage wires
 - b. The bypass input shall support a maintained normally open (N.O.) or normally closed (N.C.) dry contact input
 - c. A +12VDC wet contact input shall also be available for interface to fire alarm systems.
 - d. DEBC shall support socketed DMX transceiver chips
 - 1) A spare DMX transceiver chip shall be supplied in a labeled, inactive socket
 7. The DMX Emergency Bypass Controller (DEBC) shall internally switch from the normal DMX input (pass through) to the bypass DMX output using electromechanical relays when triggered
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- a. The DEBC shall have non-volatile memory for storage of a single recorded sequence of 512 channels
 - 1) The recorded sequence shall persist through power outages
 - 2) The default sequence shall have all 512 channels at "full" if no sequence is recorded
 - b. The DEBC shall have a DMX baud rate of "Slow" (20 packets per second) for increased compatibility during bypass DMX output
 8. The DEBC shall be available in two versions capable of output to a single DMX line or up to six optically-isolated DMX lines
 9. The DMX Emergency Bypass Controller shall be UL and cUL Section 924 LISTED for interaction with similarly listed products
 - E. Thermal
 1. Ambient room temperature: 0-40°C / 32-104°F
 2. Ambient humidity: 10-95% non-condensing
- 2.21 EMERGENCY BYPASS INTERFACE AND DETECTION: REFERENCED PRODUCT ETC EMERGENCY BYPASS DETECTION KIT (EBDK)
- A. Where required to detect the loss of normal power and trigger special-purpose lighting presets, the detection means shall be the Emergency Bypass Detection Kit as manufactured by Electronic Theatre Controls, Inc., or equal.
 - B. Mechanical
 1. The Kit Enclosure shall be a surface mounted, constructed of 16-gauge, formed steel panels with a removable front cover.
 2. The Emergency Bypass Detection Kit shall include a 3-pole, 10 amp breaker for local over-current protection and simulation of normal power loss.
 - a. The enclosure shall have a lockable door to allow limited access to the over-current protection breaker
 3. All components shall be properly treated and finished.
 - a. Exterior surfaces shall be finished in fine textured, scratch-resistant, powder coat paint
 4. The EBDK enclosure shall provide discrete high and low voltage wiring compartments with voltage barrier.
 5. EBDK dimensions and weights shall not exceed:
 - a. 10.5" H x 14" W x 4.2" D 11 lb.
 6. Accessories
 - a. Emergency Bypass Detection Tap Kit (EBDK-TAP)
 - 1) The Emergency Bypass Detection Kit shall support an optional tap kit for normally power loss sensing within an ETC Unison DRd Enclosure
 - 2) The Tap Kit shall provide fused over-current protection for sense feed wiring without the need for an external circuit breaker
 - 3) The Tap Kit shall install within an ETC Unison DRd Enclosure
 - b. Emergency Bypass Restore Switch (EBDK-SWITCH)
 - 1) The Emergency Bypass Detection Kit shall support an optional switch kit ,requiring manual override before allowing the EBDK to return to a normal power state
 - 2) The Restore Switch shall be a single-gang device, fully finished, and supplied with mounting holes.
 - a) The EBDK Switch Kit shall be clearly labeled identifying intended operation
 - b) The Switch shall be labeled Lighting System Restore
 - c) The Switch shall include a red indicator that is illuminated when bypass operation is active
 - 3) The EBDK Switch shall require two 16-gauge wires for connection to the Emergency Bypass Detection Kit
 - a) Up to two Bypass Restore Switches shall be supported per Emergency bypass Detection it
 - C. Electrical

1. Emergency Bypass Detection enclosures shall support 100 to 277 volt configurations
 - a. EBDK enclosures shall be field configurable for single-phase, bi-phase, and three-phase operation without the need for additional components.
 2. Phase Loss Detection circuitry shall provide 0.5 second delay to prevent nuisance tripping
 3. The EBDK shall provide an integrated circuit breaker for over-current protection and simulation of normal power loss
 4. The Emergency bypass detection Kit shall support isolated outputs for connection to multiple dimming products simultaneously
 - a. Three isolated contacts shall be provided
 - b. Each contact shall support connection of up to four dimming products.
 5. The Emergency Bypass Detection Kit shall be completely pre-wired by the manufacturer. The contractor shall provide input feed and control wiring.
 6. All control wire connections shall be terminated via factory provided connectors.
 - a. Factory provided connector shall support 12 to 22-gauge wiring
 - b. Emergency lighting input shall support load shedding
 7. The Bypass Detection Kit shall provide a normally-closed input for interface with fire alarm systems
 8. The Bypass Detection Kit shall be UL and cUL Section 924 Listed for interaction with similarly listed dimming and switching panels
- D. Thermal
1. Ambient room temperature: 0-40°C / 32-104°F
 2. Ambient humidity: 10-90% non-condensing

2.22 ARCHITECTURAL BUTTON, FADER & INTERFACE STATIONS: REFERENCED PRODUCT ETC UNISON HERITAGE STATIONS

A. Button Stations

1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
2. Mechanical
 - a. Unison Heritage Button stations shall operate using up to ten programmable buttons.
 - b. All button stations shall be available with white, cream, ivory, gray or black faceplates and buttons.
 - 1) Manufacturer's standard colors shall conform to the RAL CLASSIC Standard.
 - c. Stations shall have indicators lights at each button or fader.
 - 1) Indicators shall be comprised of red, green and blue LED's.
 - 2) Indicator color and state (steady On, Blink, Off) shall be configured in software, and shall operate relative to the button or fader it is associated with.
 - d. All faceplates shall be designed for flush or surface mounting.
 - e. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment.
 - f. Station faceplates shall be indelibly marked for each button or fader function.
 - g. The manufacturer shall supply back boxes for flush mounted half gang stations and for all surface mounted stations.
 - h. All Button and Button/Fader stations shall be designed to accept the infrared signal from a remote hand held IR transmitter.
 - 1) The stations shall have a 60° reception angle and shall operate reliably within a 45' distance.
 - i. IR Transmitters shall be available in seven or twelve button configurations. Custom transmitters may have up to 10 programmable buttons.
 - 1) IR transmitters shall be mounted in a hand-held black plastic controller. Transmitter dimensions shall be 1.875" wide, 6.625" long and 0.60" deep.
3. Electrical
 - a. Unison control station wiring shall be an Echelon® Link power network.

- 1) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - 2) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - 3) Network wiring may be bus, loop, home run, star or any combination of these.
 - 4) Network insulation displacement connectors shall be provided with all stations.
4. Functional
- a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Button, Button/Fader, and Interface or Astronomical time clock controls. System shall allow the programming of presets, sequences, macros and time clock events.
 - 1) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 1,000 hours with a resolution of one millisecond.
 - b) Presets shall be selectable via button, fader, IR transmitter, time clock event, macro activation or switch interface stations.
 - 2) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - 3) System time clock events shall be programmable via LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.
 - b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using a fully configurable daylight saving time.
 - b. Station Button, Button/Fader, and Interface control components shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via LightDesigner, the Windows-based configuration program.
 - 1) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate.
 - 2) Optional fader functions include manual master control, individual zone control, fade rate control or preset master control.
 - c. Stations (Button and Button/Fader) shall allow programming of station and component electronic lockout levels via LightDesigner.
- B. Button/Fader Stations
1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
 2. Mechanical
 - a. Unison Heritage Button/Fader Stations shall operate using up to sixteen programmable faders and twelve programmable buttons.
 - b. All button/fader stations shall be available with white, cream, ivory, gray or black faceplates, fader knobs, and buttons.
 - 1) Manufacturer's standard colors shall conform to the RAL CLASSIC Standard.
 - c. Fader stations shall utilize standard 45-millimeter slide potentiometers.
 - d. Stations shall have indicator lights at each button or fader.

- 1) Indicators shall be comprised of red, green and blue LED's
 - 2) Indicator color and state (steady On, Blink, Off) shall be configured in software, and shall operate relative to the button or fader it is associated with.
 - e. All faceplates shall be designed for flush or surface mounting.
 - f. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment.
 - g. Station faceplates shall be indelibly marked for each button or fader function.
 - h. The manufacturer shall supply back boxes for flush mounted half gang stations and for all surface mounted stations.
 - i. All Button and Button/Fader stations shall be designed to accept the infrared signal from a remote hand held IR transmitter.
 - 1) The stations shall have a 60° reception angle and shall operate reliably within a 45' distance.
 - j. IR Transmitters shall be available in seven or twelve button configurations. Custom transmitters may have up to 10 programmable buttons.
 - 1) IR transmitters shall be mounted in a hand-held black plastic controller. Transmitter dimensions shall be 1.875" wide, 6.625" long and 0.60" deep.
3. Electrical
- a. Unison control station wiring shall be an Echelon® Link power network.
 - 1) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - 2) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - 3) Network wiring may be bus, loop, home run, star or any combination of these.
 - 4) Network insulation displacement connectors shall be provided with all stations.
4. Functional
- a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Button, Button/Fader, and Interface, or Astronomical time clock controls. System shall allow the programming of presets, sequences, macros and time clock events.
 - 1) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 1,000 hours with a resolution of one millisecond.
 - b) Presets shall be selectable via button, fader, IR transmitter, time clock event, macro activation or switch interface stations.
 - 2) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - 3) System time clock events shall be programmable via LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.
 - b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using a fully configurable daylight saving time.
 - b. Station Button, Button/Fader, and Interface) control components shall be designed to operate standard default or custom system functions. Components shall operate default

functions unless re-assigned via LightDesigner, the Windows-based configuration program.

- 1) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate.
 - 2) Optional fader functions include manual master control, individual zone control, fade rate control or preset master control.
- c. Stations (Button and Button/Fader) shall allow programming of station and component electronic lockout levels via LightDesigner.

C. Connector Stations

1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
2. Mechanical
 - a. Unison connector stations shall provide an interface to portable Unison stations.
 - b. All connector stations shall be available with white, cream, ivory, gray or black faceplates, fader knobs, and buttons.
 - 1) Manufacturer's standard colors shall conform to the RAL CLASSIC Standard.
 - c. All faceplates shall be designed for flush or surface mounting.
 - d. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment.
 - e. Station faceplates shall be indelibly marked for each function.
 - f. The manufacturer shall supply back boxes for flush mounted half gang stations and for all surface mounted stations.
3. Electrical
 - a. Unison control station wiring shall be an Echelon® Link power network.
 - 1) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - 2) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - 3) Network wiring may be bus, loop, home run, star or any combination of these.
 - 4) Network insulation displacement connectors shall be provided with all stations.
4. Functional
 - a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Button, Button/Fader, and Interface or Astronomical time clock controls. System shall allow the programming of presets, sequences, macros and time clock events.
 - 1) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 1,000 hours with a resolution of one millisecond.
 - b) Presets shall be selectable via button, fader, IR transmitter, time clock event, macro activation or switch interface stations.
 - 2) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - 3) System time clock events shall be programmable via LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.

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- b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using a fully configurable daylight saving time.
 - b. Station Button, Button/Fader, and Interface control components shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via LightDesigner, the Windows-based configuration program.
 - 1) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate.
 - 2) Optional fader functions include manual master control, individual zone control, fade rate control or preset master control.
 - c. Stations (Button and Button/Fader) shall allow programming of station and component electronic lockout levels via LightDesigner.
- D. Contact Interface Station
 - 1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
 - 2. General
 - a. Unison Contact Interface shall provide direct interface (in and out) to external devices via contact closure. Interface enclosure shall consist of 16 input connections and 16 output connections.
 - 3. Mechanical
 - a. The surface mount enclosure and cover shall be constructed of 16- gauge (.08) steel and are finished in black smooth matte powder coat paint. The enclosure shall be 14" W x 10.5" H x 3" D.
 - b. Conduit access points shall be provided on the top and bottom of the unit.
 - c. The assembly shall consist of up to 16 connections; 8 inputs functionally coupled with 8 normally open relay contact outputs. Inputs and outputs may be configured as either maintained or momentary.
 - 4. Electrical
 - a. Unison control station wiring shall be an Echelon® Link power network.
 - 1) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - 2) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - 3) Network wiring may be bus, loop, home run, star or any combination of these.
 - 4) Network insulation displacement connectors shall be provided with all stations.
 - b. Ratings:
 - 1) The Input Rating shall be 5V@10mA (unit requires dry contact closure)
 - 2) Dry contact outputs shall consist of:
 - a) Normally-Open 2-pole contact closure outputs: 1A@30Vdc & .5A@120V.

2.23 TOUCHSCREEN CONTROL STATIONS: REFERENCED PRODUCT ETC UNISON PARADIGM TOUCHSCREEN

- A. The Touchscreen Control Stations shall be the Unison Paradigm Touchscreen P-LCD Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
- B. General
 - 1. Touchscreen stations shall support default and fully graphical control pages.
 - 2. The Touchscreen station shall operate using graphic buttons, faders and other images on at least 30 separate programmable control pages.
 - 3. Touchscreen stations shall also allow programming of page pass-code, lock out and visibility levels.

C. Mechanical

1. Touchscreen stations shall consist of a seven inch, backlit liquid crystal display (LCD) with a minimum resolution of 800 by 400 pixels and 12-bit color depth with a touch interface.
2. Touchscreen bezels shall be constructed of aluminum and shall have no visible means of attachment.
 - a. The bezel shall install and remove without the use of tools.
 - b. The bezel shall provide two working positions for the Touchscreen: service and operating.
3. The Touchscreen shall have a protective overlay over the display.
 - a. The overlay shall reduce wear
 - b. The overlay shall reduce glare
4. The manufacturer shall provide backboxes for all LCD stations.
 - a. Flush back box dimensions shall be 7.94" wide x 5.33" high x 3.25" deep
 - b. Surface back box dimensions shall be 8.3" wide x 5.6" high x 2.55" deep

D. Electrical

1. Touchscreens shall be powered entirely by the System network.
2. Touchscreens shall connect to the System using an Ethernet network with Power over Ethernet (PoE) or the Unison control station Echelon® Link power network.
 - a. Ethernet Network
 - 1) Ethernet network shall be 10/100BaseTX, auto MDI/MDIX, 802.3af compliant.
 - 2) Network shall utilize Unshielded Twisted Pair (UTP) Category 5 wiring.
 - b. Echelon® Link power network.
 - 1) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - 2) Touchscreen stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - 3) Network wiring may be bus, loop, home run, star or any combination of these.
 - 4) Network insulation displacement connectors shall be provided with all stations.

E. Functional

1. System
 - a. The Touchscreen shall support configuration firmware upload from a Paradigm Processor as proxy
 - b. The Touchscreen shall support configuration or firmware upload from local removable media
2. Setup Mode
 - a. There shall be a setup display that is separate from any user-defined configuration
 - b. It shall be possible to view and modify connectivity settings
 - c. It shall be possible to view status information
 - d. It shall be possible to view and modify LCD screen settings
 - e. It shall be possible to perform Touchscreen calibration
 - f. It shall be possible to view and modify audio settings
 - g. The appearance of the setup display shall be standard and not editable
 - h. The setup display may be invoked from within the user-defined configuration and/or physical button on the Touchscreen
 - i. There shall be a default protected method to invoke the setup display
3. Configurations
 - a. It shall be possible to have multiple configurations stored within an LCD Station
 - b. Only one configuration may be active on the LCD Station
 - c. It shall be possible for Touchscreen Stations connected via the Echelon® Link power network to select a configuration automatically based on the configuration of the physical connection.
 - d. Where multiple configurations are stored there shall be a boot menu to allow selection of a configuration
 - e. Each configuration shall be identified as a different Station within the System

4. Operation

- a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Touchscreen controls. System shall allow the control of presets, sequences, macros and time clock events.
 - 1) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 84,600 seconds with a resolution of one hundred milliseconds.
 - b) Presets shall be selectable via Touchscreen stations.
 - 2) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - 3) System time clock events shall be programmable via the Touchscreen, LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.
 - b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using a fully configurable daylight saving time.
- b. Touchscreen stations shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via LightDesigner, the Windows-based configuration program.
 - 1) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, and cue light, or room join/separate.
 - 2) Optional fader functions include master control, individual channel control, fade rate control or preset master control.
- c. Touchscreen stations shall allow programming of station and component electronic lockout levels via LightDesigner.
- d. It shall be possible to adjust LCD contrast and brightness.
- e. It shall be possible to program the station to dim during periods of inactivity.

- F. Contractor shall provide quantity and style of touchscreens as indicated on the bid documents (permanently installed wall mount, portable or wireless).

2.24 ARCHITECTURAL LIGHTING CONTROL SYSTEM CONFIGURATION & CONTROL SOFTWARE: REFERENCED PRODUCT ETC LIGHTDESIGNER

- A. The contractor shall program the architectural lighting control system via LightDesigner per the contract document intents and with owner input for initial system setup and basic operation.
- B. The contractor shall provide additional Paradigm programming services for the owner of (2) standard eight-hour work days (sixteen hours total in a maximum of two site trips) in adjusting the initial settings to system presets, misc. advanced programming, LCD touchscreen layout/operational changes, etc. (these are typically remote reprogramming services and are limited to the first 12-month period after the substantial completion date). If this additional programming is required on site, then the stated hours listed above would also include travel time. All additional programming time shall be tracked by the contractor with owner requests, sign-off sheets, cumulative hours, etc. up to the stated hours listed above. Any additional programming/reprogramming required either after the additional hours listed above or beyond the initial 12-month period shall be only at additional expense to the owner.

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- C. Unison Paradigm LightDesigner software has been included in the written specifications in order to reference a base standard for operational and programming capabilities of the system. Its inclusion neither intends to insinuate nor allows the owner to possess a loadable version of this software to be installed onto other computers or systems nor does it grant the owner any related training in using or manipulating this software or in personally making changes to the system configuration file. This software is intended only as part of the field service tech's toolkit in programming and configuring the architectural lighting control system (unless specific instructions are noted elsewhere on the contract documents to the contrary).
- D. System Configuration
1. The Architectural Control System Configuration software shall be the Unison Paradigm LightDesigner as manufactured by Electronic Theatre Controls, Inc., or equal.
 2. Definitions
 - a. A System is the configuration of one or more Paradigm Processors
 - b. A Fixture is a controllable entity with one or more Attributes
 - c. An Attribute is a parameter of control such as Intensity, Pan or Gobo select
 - d. A Group is a selection of Fixtures that can be stored and recalled
 - e. A Space is defined area where other System objects reside. A Space defines the scope of Control for other objects.
 - f. Room Combine is functionality enabling the scope of control to vary in a pre-defined way based on the current status of a moveable Wall or Walls
 - g. A Control is a single point of input to the System (e.g. Button, Fader, Serial Port)
 - h. An Indicator is a single point of feedback from the System (e.g. LED, Label on LCD)
 - i. A Station has an arrangement of Controls and Indicators
 - j. A Page stores the assignment of function to Controls and Indicators of a particular Station and their properties (e.g. lockout threshold)
 - k. Actions are items of functionality that can occur within a running Paradigm system in response to events (e.g. button presses, timed events)
 - l. Preset is a container of Attribute settings (levels) and timings that can be stored and recalled
 - m. A Sequence is a series of connected steps referencing Presets along with additional timing information
 - n. Effects are Attribute settings that result in continually varying levels following a specified curve and using additional timing parameters (e.g. period, offset)
 - o. Palette is a container of Attribute settings (levels) that can be referenced from Presets, allowing a change in the Palette to globally modify referenced Presets.
 - p. Macros are user-defined operations built up as a sequence of Actions that can be recalled
 - q. Binding is the process of associating a logical instance of a device within the configuration with a physical device discovered at runtime
 3. Environment
 - a. Shall be possible to work with multiple System configurations simultaneously
 - b. There shall be clipboard functionality (cut, copy, paste) for entire objects (e.g. Presets, Stations), settings (e.g. Attribute levels) and text
 - c. There shall be undo and redo functionality where persistent changes are made to the System configuration (but not application settings or playback state)
 - d. There shall be a auto-backup feature
 - e. The application interface shall be based around (i) a tree-view; (ii) a workspace area; (iii) a properties inspector; (iv) item selector.
 - f. It shall be possible to represent data about the workspace area graphically (plan) or in tabular form
 - g. Plan views shall support zoom
 - h. Plan views shall support a layout grid with user-defined spacing and color with associated snap-to-grid functionality

- i. The properties inspector shall be used to view and modify the properties of one or multiple objects
 - j. There shall be 2 modes of operation that expose progressively more in-depth functionality (Normal, Advanced)
 - k. It shall be possible to enter User-configurable names in any language supported by their operating system (e.g. encoded as UTF8)
 - l. User-configurable names shall be limited to 64 display characters each
 - m. There shall be provision for help functionality to be accessed from within the application
4. System Configuration
- a. It shall be possible to create Spaces
 - b. It shall be possible to add Fixtures by selecting a Fixture Template from the provided library and create custom Fixtures
 - c. It shall be possible to add Stations by selecting a Station Definition from the provided library and create custom Stations
 - d. It shall be possible to create a System based on data imported from a defined documentation format (e.g. CSV, XML)
 - e. It shall be possible to export System configuration data to a defined documentation format (e.g. CSV, XML)
 - f. There shall be a wizard to assist with the initial setup of a System including Project data entry, Space creation, network configuration, and zone creation.
 - g. There shall be a straightforward process for the assignment of Fixtures and Stations to particular Processors
 - h. There shall be a 2-dimensional plan view that displays the layout of Spaces
 - i. A Space shall be displayed as a user-configurable polygon with straight edges
 - j. The plan shall display Fixtures and Stations located within Spaces
 - k. The plan shall display Walls between Spaces and their current state (open, closed)
 - l. Items displayed on the plan may be arranged using standard graphical interaction methods (e.g. drag-and-drop)
 - m. It shall be possible to import images JPEG, BMP and GIF formats as a background image to the plan view
 - n. It shall be possible to create Walls that accomplish Room Combine between Spaces
5. Fixture Configuration
- a. There shall be functionality to patch Fixtures to DMX and Streaming ACN
 - b. There shall be support for Fixtures with split patches (e.g. VL5)
 - c. There shall be support for multiply-patching a Fixture
 - d. It shall be possible to swap pan and tilt axes for a moving-light Fixture
 - e. It shall be possible to specify a minimum and maximum value for an Attribute
 - f. It shall be possible to specify a minimum fade time for an Attribute
 - g. It shall be possible to invert the range of values for an Attribute
 - h. It shall be possible to specify a default value for an Attribute
 - i. It shall be possible to specify a dimmer curve for an intensity Attribute
6. Design and Simulation
- a. There shall be a tabular view of Fixture Attributes within Spaces
 - b. There shall be control of Zones (as a type of Fixture)
 - c. There shall be control of LED arrays (as a type of Fixture)
 - d. There shall be control of moving lights (as a type of Fixture)
 - e. There shall be independent control of every Attribute of a Fixture
 - f. Appropriate graphical controls shall be provided for non-intensity Attributes (e.g. color picker)
 - g. It shall be possible to create Groups as a selection shortcut
 - h. The plan shall show the current status of Room Combine
 - i. The plan shall show simulation feedback for Fixtures in a graphical form

- j. Feedback values for Attributes shall be displayed in terms of real-world units where an appropriate real-world unit and mapping is available (e.g. pan in degrees)
 - k. Control events may be simulated by clicking on a representation of the Station in at least the plan view
 - l. The simulation may be linked to the actual online System to synchronize playback and inject control events (live control)
7. Presets
- a. There shall be provision to record a Preset based on current Attribute settings
 - b. There shall be a display of Presets that affect Fixtures in the Space being worked with and their activation status
 - c. A Preset may store a reference to a Palette as an Attribute setting
 - d. Presets may be displayed and modified in tabular form (spreadsheet)
 - e. Timing in Presets may be set on an individual Attribute basis
 - f. Timing settings shall include a fade time, a delay time and a fade profile
 - g. All Presets may include split timing
 - h. Presets may be applied in an Latest Takes Precedence (LTP) or Highest Takes Precedence (HTP) manner
 - i. It shall be possible for all Presets to include Effects
 - j. Each Effect shall have a Curve and parameters (to include size, period, offset and repeat count)
 - k. There shall be support for a flicker effect
 - l. There shall be a provision to create Sequences from Presets
 - m. It shall be possible for a Sequence to be displayed and modified as a timeline display
 - n. It shall be possible for any step of a Sequence to trigger a defined Action
 - o. The end state of a Sequence shall be user configurable (e.g. release, loop, hold at end)
8. Stations and Events
- a. Can assign functionality (Actions) to Controls and Indicators on a Page for a particular Station
 - b. Stations may have multiple Pages that can be switched between at runtime
 - c. Controls shall have a configurable event handler (Script) that determines the nature of the control (e.g. momentary vs. maintained button)
 - d. Actions initiated from a Station shall, by default, be restricted to affecting the Space containing the Station
 - e. A Control may be configured so that the Actions it triggers behave as if initiated from a specified Space anywhere in the System
 - f. Controls shall have a priority that is used when performing operations (e.g. preset activation, fader attribute control)
 - g. It shall be possible to specify timed events (including repeat intervals hourly, daily, weekly, etc.)
 - h. It shall be possible to specify astronomical timed events
 - i. Serial (e.g. RS232, Ethernet) input data shall be treated as a Control event and shall be handled through use of Script (standard or custom)
 - j. There shall be support for Occupancy functions using proximity sensors connected via Echelon LonTalk or a Contact Interface
 - k. There shall be support for Daylight Harvesting functions using photo sensors connected via Echelon LonTalk or a Fader Interface.
 - l. There shall be Override functionality that can be applied to any Control or Event
 - m. There shall be Lock Out functionality for Controls using 3 distinct lockout variables
 - n. Direct control of Attributes can be assigned to Controls (e.g. buttons, faders)
 - o. Mastering of Intensity for Fixtures, Groups or Presets can be assigned to Controls

- p. There shall be extensible support for third-party LonMark devices
 - q. A physical Lon native Station that is portable may automatically bind to different logical Stations within the configuration based on an established physical LON connection
 - r. There shall be an option to assign default functionality to Controls and Indicators of a Station automatically when it is added to the configuration and update it as the configuration changes
 - s. There shall be an option to generate a graphical configuration for an Touchscreen automatically based on the current configuration and update it as the configuration changes
 - t. It shall be possible to import .ics files for display of holidays or other notable dates
9. Actions
- a. There shall be a standard Action for toggling the Intensity Attribute of a Fixture or Group (Fixture Toggle)
 - b. There shall be standard Actions for recalling Presets (Preset Recall)
 - c. There shall be a standard Action for recording a Preset (Preset Record)
 - d. There shall be standard Actions for controlling Sequences (Timeline Control)
 - e. There shall be standard Actions for changing Wall state (Wall Toggle)
 - f. There shall be a standard Action for raising or lowering the intensity setting of a Fixture or Group
 - g. There shall be a standard Action for raising or lowering the intensity setting of a Preset
 - h. There shall be a standard Action that activates Faders within its scope (Manual)
 - i. There shall be a standard Action that activates Faders on a target station and locks out other Stations within its scope (Take Control)
 - j. There shall be a standard Action for setting lock out variables for a Station, within a Space or System-wide (Lock Out)
 - k. There shall be a standard Action for enabling and disabling Overrides
 - l. There shall be a standard Action for recalling a Macro (Call Macro, Macro Toggle)
 - m. There shall be a standard Action for turning Off a particular Fixture, Group or Fixtures within a Space (Off)
 - n. There shall be a standard Action for controlling Fixture or Group Intensity levels from a Fader
 - o. There shall be a standard Action for controlling Preset Intensity levels from a Fader
 - p. There shall be a standard Action for mastering Fixture or Group Intensity levels from a Fader
 - q. There shall be a standard Action for modifying Preset fade times from a Fader
 - r. There shall be a standard Action for modifying Preset rate from a Fader
 - s. There shall be an equivalent standard Indicator behavior for every standard Action
 - t. Qualified users may create custom Actions
10. Macros
- a. Users can create, store and recall Macros that are sequences of Actions (standard or custom)
 - b. Macros may define separate sequences to occur when turned on and off (toggle)
 - c. Macros may incorporate conditional statements based on current status of the System (e.g. comparisons such as $x > y$)
 - d. Conditional statements may be combinations of several simpler statements using logical operators (AND, OR)
11. Script

- a. There shall be a mechanism for defining custom functionality using a scripting language
- b. The behaviors of Controls and Indicators may be customized through the use of Script
- c. Script may be used to define custom functionality (Actions) within the System
- d. Script shall allow new functionality to be defined in a manner that is reusable in different Systems
- e. Script shall support logical and arithmetic operations
- f. Script shall support direct access to System data using names
- g. Script shall support creating, reading and writing to persistent System-wide variables (registered variables)
- h. Script shall support timer functionality including the capability to cancel a running timer
- i. Script shall support logging functionality
- j. Standard functionality may be implemented as Scripts that will not be user modifiable
- k. A Custom Script may be copied from a suitable Standard Script to provide a starting point
- l. Script shall support reading data directly from connected interfaces (e.g. LON NVs, ACN properties, DMX inputs)
- m. Script shall support writing data directly to connected interfaces (e.g. LON NVs, ACN properties, DMX outputs, Serial ports)
- n. Script shall allow parsing of data (e.g. reading 8 contact inputs as individual bits from a byte of data)
- 12. Network
 - a. Shall display a topological view of Paradigm Processors and connected Stations
 - b. Can associate a particular Station with a Paradigm Processor
 - c. Shall report online status of Paradigm Processors and Stations
 - d. Shall allow for configuration of network properties (IP) of Paradigm Processors
 - e. Shall allow for upload of configuration data to all or individual Paradigm Processors
 - f. Shall allow for download of configuration data from Paradigm Processors
 - g. Shall allow for download of logging data from Paradigm Processors
 - h. Shall provide for performing firmware upgrades to Paradigm Processors
 - i. Shall allow to perform firmware upgrades for Dimming enclosures using Paradigm Processors as proxies
 - j. Shall allow for transfer of configuration to and from LCD Stations using Paradigm Processors as proxies
 - k. Shall allow for discovery and binding of Stations
 - l. There shall be a mode in which configuration changes are propagated to Processors as they occur without interrupting operation (live edit)
- 13. Reports
 - a. It shall be possible to generate tabular reports and customize their layout and appearance
 - b. It shall be possible to print reports
 - c. It shall be possible to export reports to file (e.g. CSV)
 - d. There shall be reports for Presets
 - e. There shall be reports for Fixtures
 - f. There shall be reports for Stations
 - g. There shall be reports for Processors
 - h. There shall be reports for Macros
- 14. Resources
 - a. The installed package shall include a set of LCD Design Themes

- b. Effect Curves, Fade Profiles and Dimmer Curves shall use a common format and allow custom variants to be generated by the user
 - c. Additional Fixture Templates may be defined by the user (custom Fixtures)
 - d. Additional Station Definitions may be defined by the user (custom Stations)
 - 15. Pharos
 - a. It shall be possible to add Pharos systems to the configuration for triggering and status monitoring
 - b. There shall be standard Actions and Indicator behaviors for Pharos integration via Ethernet
- E. Touchscreen Station Configuration
 - 1. The Architectural Control System Touchscreen Configuration software shall be the Unison Paradigm ControlDesigner as manufactured by Electronic Theatre Controls, Inc., or equal.
 - 2. The Unison Paradigm ControlDesigner software program shall be an application software package that facilitates off-line Unison Paradigm Touchscreen station configuration.
 - 3. Software setup shall include Configuration and Design Wizards, to create a graphical representation of a control environment.
 - 4. The software program shall be downloadable from the manufacturer's website free of charge.
 - 5. Functions
 - a. Provides functionality to create and modify Pages for display on a specific type of LCD Station
 - b. There shall be a wizard to assist with the creation of Pages
 - c. A single configuration for an LCD Station shall be defined as a set of one or more Pages
 - d. Each Page shall have a background that may incorporate multiple images or animations
 - e. Pop-ups can be shown/hidden over any Page in a Configuration and more than one Popup can be shown at once
 - f. Pages may have multiple design elements that may be Controls, Indicators or both
 - g. Design elements shall have a user-defined size, position and z-order that cannot be changed from within the System
 - h. Each design element shall have between 1 and 256 states, each of which can have a distinct appearance
 - i. The appearance of a state can be taken from a Theme or imported image file
 - j. There shall be support for import of at least JPG, PNG and GIF image formats
 - k. Transparency shall be supported
 - l. Animated images shall be supported
 - m. Transitions between states of design elements can be animated
 - n. Page transitions can be animated
 - o. Design elements shall have a visibility group and threshold
 - p. Design elements that are Controls shall have a lockout group and threshold
 - q. All text shall have a user-definable font family, size, color and alignment
 - r. There shall be at least the following types of design elements
 - i) Label
 - ii) Level Indicator
 - iii) Button
 - iv) Fader (straight and curved)
 - v) Clock (analogue and digital)
 - vi) Numeric Keypad
 - vii) Tab widget
 - s. Themes shall define a collection of consistent appearances and sounds for design elements

- t. It shall be possible to change the Theme used for a particular Station without modifying the underlying design elements
- u. There shall be tools to assist with the creation of new Themes
- v. Shall allow sounds to be associated with a particular Page
- w. Shall allow sounds to be associated with state transitions of particular design elements
- x. Sounds may be used to provide Touchscreen interaction feedback
- y. A Page can be designated as the Stations inactivity Page
- z. A Page can have a lockout group and threshold
- aa. A Tab can have a visibility group and threshold
- bb. There shall be a visualization interface for Page creation and editing
- cc. Standard graphical interaction methods (drag-and-drop) shall be used to arrange design elements on Pages
- dd. There shall be a layout grid with user-defined spacing and color with associated snap-to-grid functionality
- ee. It shall be possible to reuse the graphical layout of a configuration independent of any assigned functionality
- ff. The LCD Design functionality shall be part of a separate application that can be used alongside Light Designer
- gg. Pop-ups can be any fixed size up to the Page size
- hh. Pop-ups will have a fixed position on screen (but may move when being shown/hidden)

2.25 GRID IRON JUNCTION BOXES: REFERENCED PRODUCT ETC GRID IRON JUNCTION BOXES

- A. Gridiron Junction Boxes shall be fabricated from 16-gauge cold rolled steel with 14-gauge end panels. They shall be finished with fine-textured, scratch-resistant, black powder coat. For 30 circuits and less they shall be 14" H x 14" W x 4" D and for 31 to 60 circuits they shall be 14" H x 28" W x 4" D. Cover(s) shall be attached with machine screws and Tinnerman retainer nuts. Cover(s) shall be 16-gauge cold rolled steel. Cover(s) shall be hinged, and mounting should allow installer to orient the hinged door to open in any direction.

2.26 PURE SINE WAVE UNINTERRUPTIBLE POWER SUPPLY WITH SURGE SUPPRESSION AND POWER FILTRATION: REFERENCED PRODUCT MIDDLE ATLANTIC NEXSYS SERIES UPX-2000R-2 RACKMOUNT UNITERRUPTABLE POWER SUPPLY

A. GENERAL

- 1. Provide the specific model of backup UPS as listed on the contract documents (or most recent iteration or replacement model) and as is needed based upon the plugged equipment power requirements.
- 2. Provide expanded run time battery pack as indicated.

B. Specifications

1. Rackmount Uninterruptible Power Supply (UPS) shall be Middle Atlantic Products model # UPX-__R-2 or UPX-RLNK-__-__ (refer to chart). UPS shall be line interactive with AVR. Unit shall measure 19.00" W x 3.50" H x __.00" D (refer to chart for depth) and occupy 2 rack spaces. UPS shall have a rear mounting range of 20" to 36". UPS shall have slim rail mounting allowing mounting with a pair of middle rack rail. Unit shall operate on 120 VAC/60Hz current with a Power Factor of 0.9. Unit shall have a nominal output of 120V with optional selection for 110V or 127V. Unit shall have a capacity of __ VA and __ W (refer to chart). Unit shall have (8) NEMA 5-__ receptacles on the rear of the unit (refer to chart). Unit shall have all outlets controlled via 2 banks for selection of non-critical load shedding, or individual outlet control, depending on model. Unit shall be IP enabled, depending on model (RLNK models), or when used with optional RackLink™ Network card, model# UPX-RLNK-CARD. Rackmount UPS shall include an IEC-C13 detachable 6' (1.83m) SignalSAFETM power cord with NEMA __ (refer to chart) plug. UPS shall have all mode surge suppression and overload protection. Rackmount UPS shall have a hot swappable battery that allows for a __ minute run time at half load and a __ (refer to chart) minute run time at full load. Rear of unit shall have inputs that allow for the installation of up to 4 additional hot swappable batteries. Rackmount UPS shall utilize Middle Atlantic NEXSYS Power Management software. Rackmount UPS shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years; battery shall be warrantied for a period of 2 years. Rackmount UPS shall be tested to UL 1778 and CAN CSA-C22.2 standards in US and Canada. Rackmount UPS shall be FCC Class A certified and complies with Canadian ICES-003. Rackmount UPS shall be EnergyStar 2.0 certified.
- C. Expanded Battery Pack:
 1. Rackmount expandable run time battery pack shall be Middle Atlantic Products model# UPX-EXPANRUN-__-__ (refer to chart). UPX-EXPANRUN-10-15 shall be suitable for use with UPX-1_00R-2 and UPX-RLNK-1_00R-__ (refer to chart). UPX-EXPANRUN-20 shall be suitable for use with UPX-2000R-2 and UPX-RLNK-2000R-__ UPS-2200R. UPS-EBPR shall measure 19.00" W x 3.50" H x __" D (refer to chart for depth) and occupy 2 rack spaces. UPS-EBPR shall require __" useable depth (refer to chart). With __ hot swappable batteries connected to the unit, there is a __ minute run time at half load and a __ minute run time at full load (refer to chart). Rackmount expandable run time battery pack shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years; battery shall be warrantied for a period of 2 years. Rackmount expandable run time battery pack shall be tested to UL 1778 and CAN CSA-C22.2 standards for US and Canada. Rackmount UPS shall be FCC Class A certified and complies with Canadian ICES-003.
- D. Features:
 1. Pure Sine Wave technology with Automatic Voltage Regulation to improve the quality of power provided to the A/V system
 2. 8 outlets
 3. Bank Controlled option with (2) 4 outlet banks
 4. Individually Controlled options for all 8 outlets via RackLink™
 5. All NEXSYS UPSs have a Pure Sine Wave output and AVR (automatic voltage regulation) providing the cleanest power to your connected equipment, especially the most sensitive equipment
 6. Everything is assembled and connected right from the factory saving you time during your installations
 - a. Rack ears are pre-installed with the "4-Post" mounting brackets ready to be rack mounted even if you have a 3rd pair of rackrail
 - b. The battery is already connected so just plug it in

7. The NEXSYS Power Management Software on your PC allows you to customize and configure various settings and notifications
 8. The NEXSYS UPSs are RackLink compatible for remote monitoring and management and some are compatible right out of the box! Look for RLNK in the part number. Use the RackLink Discovery Tool on your on PC, Apple or Android devices and connect directly to the UPS
 9. Set reminders or notifications for things like battery replacement, etc. via email or on the UPS
 10. Front panel LCD screen shows UPS Device Name, Model Number, Serial Number
 11. Hot swappable battery from the front access panel for easy service without disrupting the system
 12. The IEC Input allows for better cable management of the power cord if shorter or longer cords are required
 - a. All UPSs include a 6' (1.8m) IEC power cord
 13. Energy Star Certified
 14. U.S. Department of Energy Compliant for energy efficiency
- E. Accessories (Provide with all accessories listed on the contract drawings):
1. UPS-IPCARD - Web based control shall be enabled on non-internet enabled Middle Atlantic Products UPS by UPS-IPCARD, which shall be installed into the Expansion Port on the rear of the UPS. This shall be compatible with UPS firmware v1.65 or greater, and provide full functionality when used on models with firmware v1.75 or greater.
 2. UPS-RLCARD - Remote shutdown of the UPS shall be enabled on non-internet enabled Middle Atlantic Products UPS by UPS-RLCARD, which shall be installed into the Expansion Port on the rear panel of the UPS. This shall be compatible with UPS firmware v1.65 or greater. A user supplied remote push button and external +12VDC source shall be connected to the DB-9 connector on the UPS-RLCARD to activate the remote shutdown feature.
 3. Expansion Battery - Rackmount expansion battery pack shall be Middle Atlantic Products model# (see above description). Rackmount expansion battery pack shall be warrantied for a period of 2 years.
 4. Replacement Battery - Replacement Battery Pack for the UPS shall be Middle Atlantic Products model # UPS-RBP. Replacement battery pack shall be suitable for use with both UPS-1000R__ and UPS-2200R__. Replacement battery shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 2 years.
- F. Technical Specifications:

ELECTRICAL SPECIFICATIONS

NEXSYS Line Interactive UPS				
Model		UPX-1000R-2 UPX-RLNK-1000R-2 UPX-RLNK-1000R-8	UPX-1500R-2 UPX-RLNK-1500R-2 UPX-RLNK-1500R-8	UPX-2000R-2 UPX-RLNK-2000R-2 UPX-RLNK-2000R-8
	UPS Topology	Line Interactive		
	VA	1000VA	1500VA	1350VA
	Watts	900W	1350W	1800W
	Power Factor	0.9		
Input	Nominal Voltage	120Vac		
	Voltage Range	80-158 Vac		
	Frequency	50/60Hz Autosensing		
	Sensitivity	Adjustable for generator application		
	Input Power Cord Type	SignalSAFE IEC to 5-15P 6' (1.83M)	SignalSAFE IEC to 5-20P 6' (1.83M)	
Output	Waveform on Battery	Pure Sine Wave		
	Voltage Regulation	90Vac min-146Vac max		
	Double Boost	105Vac and 90Vac		
	Double Buck	130Vac and 146Vac		
	Nominal Voltage (Battery Mode)	120Vac ±5%		
	Selectable Battery Voltage	110/120/127 Vac ±5% (Note: 110Vac selection derates UPS to 90%)		
	On Battery Frequency	50Hz or 60Hz ±0.5Hz		
	Number of Outlets	8		
	Outlet Type	NEMA 5-15R	NEMA 5-20R	
	Surge Protection	1000 joules		
	Overload Protection	Circuit Breaker		
	Transfer Time	Typical: 4ms Max: 0-10ms		
	Fan / Audible Noise	45db @ 1m variable speed fan		
	Crest Ratio	3:1		
	Harmonic Distortion	5% max @ 100% linear load, 12% max @ 100% non-linear load		
	BTUs (Line Mode)	70	105	140
	BTUs (Battery Mode)	495	750	990
	Full Load Run Time	4 minutes	3 minutes	3 minutes
	Half Load Run Time	13 minutes	10 minutes	10 minutes

NEXSYS Line Interactive UPS				
Model		UPX-1000R-2 UPX-RLNK-1000R-2 UPX-RLNK-1000R-8	UPX-1500R-2 UPX-RLNK-1500R-2 UPX-RLNK-1500R-8	UPX-2000R-2 UPX-RLNK-2000R-2 UPX-RLNK-2000R-8
Battery	Recharge Time	6-8hrs		
	Battery Maintenance	Hot Swappable Front Access		
	Battery Pack Voltage	36VDC	36VDC	48VDC
	Battery Pack Details	(3) 12V 7Ah Sealed Maintenance Free Lead Acid Batteries	(3) 12V 9Ah Sealed Maintenance Free Lead Acid Batteries	(4) 12V 9Ah Sealed Maintenance Free Lead Acid Batteries
	Replacement Battery Part Number	UPX-RPLBA TT-A	UPX-RPLBATT-B	UPX-RPLBATT-C
Environment	Operating Temperature & Relative Humidity	32 DEG F (0 c) - 104 DEG F (40 c) 0% - 95% non-condensing		
Communication	Storage Temperature	5 DEG F (-15 c) - 113 DEG F (45 c)		
	NEXSYS Management Software	Supports Windows® 7/8/10/11 and Windows Server 2008, 2012, 2016, 2019 Windows 2008/2012 Server Core, Hyper-V 2008/2012		
	Ports	USB, RS232, EPO, Dry Contacts, EXB Auto Detect and RackLink Network Card Option		
Control	Load Shed	Programmable Bank 1 and 2 (standard), Programmable Individual Outlet (optional)		
	Active On / Off	Manually turn power receptacles on or off using the front panel LCD or the UPS Manager Software		
	Scheduling	Fully programmable scheduling available for bank or outlet switching (based on the model purchased)		
RackLink Network Card Option	Features	SNMP V3, HTTP, HTTPS, TLS 1.2, SSH, Imbedded Web GUI w/Dashboard, RADIUS, TCP/IP, Telnet, FTP		
Front LCD Interface	Notification	LED = Normal Mode, AVR Mode, Battery Mode, Internal Fault, Battery Fault		
	Audible Alarms	On Battery, Low Battery, Battery Disconnected, Fault or Overload		
Dimensions	Width x Height x Depth	17.3" (440mm) x 3.4" (86.5mm) x 17.3" (440mm) 17.3" (440mm) x 3.4" (86.5mm) x 23.6" (600mm)		
Weight	Product Weight	44.1 lbs. (20kg)		63.05 lbs. (28.6kg)
	Shipping Weight	54.1 lbs. (24.5kg)		71 lbs. (32.2kg)
Certifications	Safety Standards	cTUVus - Tested to UL 1778 & CAN CSA-C22.2 standards		
	EMI Standards	FCC Class A		
	Environmental	RoHS 3 / REACH Compliant		
	Energy Efficiency	Energy Star 2.0		
Features	Load Shedding	Yes		
	Site Fault Detection	Yes		
	Cold Start	Yes		
	Standard Warranty	3 Years Limited (2 Years Battery). For warranty information, refer to legrandav.com/policies/warranty_information		

NEXSYS Line Interactive UPS				
Model		UPX-1000R-2	UPX-1500R-2	UPX-2000R-2
		UPX-RLNK-1000R-2	UPX-RLNK-1500R-2	UPX-RLNK-2000R-2
		UPX-RLNK-1000R-8	UPX-RLNK-1500R-8	UPX-RLNK-2000R-8
Weight	Product Weight	44.1 lbs. (20kg)		63.05 lbs. (28.6kg)
	Shipping Weight	54.1 lbs. (24.5kg)		71 lbs. (32.2kg)
Certifications	Safety Standards	cTUVus - Tested to UL 1778 & CAN CSA-C22.2 standards		
	EMI Standards	FCC Class A		
	Environmental	RoHS 3 / REACH Compliant		
	Energy Efficiency	Energy Star 2.0		
Features	Load Shedding	Yes		
	Site Fault Detection	Yes		
	Cold Start	Yes		
	Standard Warranty	3 Years Limited (2 Years Battery). For warranty information, refer to legrandav.com/policies/warranty_information		

2.27 PURE SINE WAVE UNINTERRUPTIBLE POWER SUPPLY WITH SURGE SUPPRESSION AND POWER FILTRATION: REFERENCED PRODUCT APC SMART UPS SMT FLOOR MOUNT UNINTERRUPTABLE POWER SUPPLY

A. GENERAL

1. Provide the specific model of backup UPS as listed on the contract documents *and* as is needed based upon the plugged equipment power requirements (provide per intended load, regardless of what is shown on contract documents).
2. APC Smart-UPS traditional Tower form factor.
3. PowerChute management software for servers and workstations and advanced UPS management (All major operating systems supported). Connectivity is through serial or USB port (USB not standard on all models). Additional manageability is available through the SmartSlot, an internal accessory slot that allows you to install optional accessories to enhance the performance of your UPS. Network connection with Web browser management and/or environmental monitoring, serial port expansion, and out-of-band management options are available.
4. With pure sine-wave output ensuring compatibility with all connected devices, Intelligent Battery Management ensuring a highly available UPS and an advanced 16 segment bar graph display.

B. TECHNICAL SPECIFICATIONS:

Cable Details	
Form Factor :	External
Dimensions & Weight (Shipping)	
Shipping Depth :	23 in
Shipping Height :	15 in
Shipping Weight :	58.2 lbs
Shipping Width :	13 in
Run Time Details	
Load Type :	Full load
Run Time (Up To) :	7
UPS	
Battery Technology :	Lead acid
Battery	
Enclosure Type :	Internal
Load Type :	At full load
Recharge Time :	3 hours
Run Time (Up To) :	7 min
Cable	
Connectivity Details Length :	6 ft
Connectivity Details Type :	Power cable
Connectivity Details Type :	USB cable
Environmental Parameters	
Humidity Range Operating :	0 – 95%
Max Operating Temperature :	104 °F
Min Operating Temperature :	32 °F
Sound Emission :	45 dBA
Header	
Brand :	APC
Compatibility :	PC
Manufacturer :	APC
Model :	1500VA USB
Packaged Quantity :	1
Product Line :	APC Smart-UPS

Interface Provided			
Connector Type :	25 pin D-Sub (DB-25)		
Qty :	1		
Type :	Management (RS-232)		
Type :	Management (USB)		
Miscellaneous		Power Output Connectors Details	
Color :	Black	Connector Qty :	8
Color Category :	Black	Connector Type :	Power NEMA 5-15
Networking		Power Supply	
Remote Management Interface :	RS-232, USB	Device Energy Rating :	459 Joules
Power Device		Service	
Form Factor :	External	Support Details Full Contract Period :	2 years
Frequency Provided :	50/60 Hz	Support Details Type :	Limited warranty
Frequency Required :	50/60 Hz	Service & Support	
Input Connector Qty :	1	Type :	2-year warranty
Input Connector Type :	Power NEMA 5-15	Slot Provided	
Input Voltage Range :	AC 82 - 144 V	Free Qty :	1
Input Voltage Range (Adjustable) :	AC 75 - 154 V	Total Qty :	1
Output Connector Qty :	8	Type :	SmartSlot
Power Capacity (VA) :	1440 VA	Dimensions & Weight	
Power Provided :	1kW	Depth :	17.3 in
Surge Suppression :	Yes	Height :	8.5 in
UPS Output Waveform :	Sinewave	Weight :	53.13 lbs
UPS Technology :	Line interactive	Width :	6.7 in
Voltage Provided :	AC 120 V	General	
Voltage Provided Margin :	± 5%	Product Type :	UPS
Voltage Required :	AC 120 V	Subcategory :	UPS

C. GENERAL

1. Provide with the APC 3-year warranty.

2.28 4-COLOR MIXING OR WHITE LIGHT EMITTING DIODE ELLIPSOIDAL FIXTURE: REFERENCED PRODUCT ETC COLORSOURCE SPOT V LED

- A. Basis of Design:** ColorSource Spot V as manufactured by ETC Inc. Brings together a five-color light engine with the build-quality and support of an ETC product. Uses a mix of red, green, blue, indigo and lime LED emitters. ETC optics, adapters, and accessories.
1. Standards Compliance:
 - a. Listed: cETLus, UL 1598, UL 924, CSA C22.2 No. 250.0.
 - b. Compliance: CE.
 2. Model ColorSource Spot V with shutter barrel, black.
 3. Model ColorSource Spot V, body only, black.
 4. Source:
 - a. LED Details: 60 Lumileds LUXEON Rebel and LUXEON C LEDs.
 - b. Max Lumens: 9300.

- c. Lumens per Watt: 47.2.
 - d. L70 Rating: Greater than 54000 hours.
 - 5. Colors:
 - a. Colors Used Spot: Red, green, blue, indigo, lime.
 - b. Color temperature Range: Color mixing.
 - c. Calibrated Array: Yes.
 - d. Red Shift: No.
 - 6. Optical:
 - a. Beam Angle Range: 5 to 90 degrees. Swappable lens tubes.
 - b. Gate Size: 80 mm.
 - c. Aperture Size: 6.25 to 14 inches depending on lens tube.
 - d. Pattern Projection: Yes.
 - e. Pattern Size: A or B.
 - f. Camera Flicker Control/Hz Range: 5 kHz and 25 kHz.
 - 7. Control:
 - a. Input Method:
 - 1) DMX-512 via 5-pin XLR connector. Protocols: DMX512, RDM.
 - 2) City Theatrical Multiverse. Protocols: DMX512, RDM
 - b. NFC Configuration: Yes, via Set Light app.
 - c. RDM Configuration: Yes.
 - d. User Interface Type:
 - 1) ColorSource Spot V: 7-segment 3 button interface.
 - e. Local Control: Yes. (ColorSource Spot V only)
 - f. Onboard Presets: Yes, 12. Onboard Sequences: Yes, 5. Onboard Effects: No.
 - g. Fixture-to-Fixture Control: Yes.
 - h. 15-bit virtual dimming engine.
 - 8. Electrical:
 - a. Voltage: 100 to 240 VAC, 50 to 60 Hz.
 - b. Input Method: powerCON True1 TOP in and thru.
 - c. Inrush First Half Cycle: 55 A at 120 V. 59 A at 240 V.
 - d. Fixtures per Circuit:
 - 1) Eight. (R20 module or similar).
 - 9. Thermal: Operating Temperature: 32 to 104 degrees F.
 - a. Fan: Yes. Controllable.
 - b. Droop Compensation: Yes.
 - c. BTUs/hour: 671.77.
 - 10. Physical: IP Rating: ColorSource Spot V: IP-20.
 - a. Materials: Die-cast aluminum. Colors: Black, white, silver, or custom.
 - b. Mounting Options: Yoke.
 - c. Included Accessories: Hanging yoke, 39 inch power cable, soft-focus diffuser in an A-size gobo holder.
- 2.29 FIVE COLOR MIXING LIGHT EMITTING DIODE MANUAL ZOOM WASH FIXTURE: REFERENCED PRODUCT ETC COLORSOURCE PAR V ZOOM LED
 - A. General
 - 1. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a ColorSource Par V Zoom as manufactured by Electronic Theatre Controls, Inc. or approved equal.
 - 2. All LED fixtures shall be provided by a single manufacturer to ensure compatibility.
 - 3. The fixture shall comply with the USITT DMX-512 A standard.
 - 4. The fixture shall come standard with wireless DMX (Multiverse DMX/RDM) and NFC (near field communication) configuration capabilities.
 - B. Physical

1. The fixture shall be contained in a rugged all-metal die-cast tour-ready housing, free of burrs and pits.
2. The housing shall have a rugged black powdercoat finish
 - a. White or silver/gray powdercoat finishes shall be available as color options
 - b. Other powdercoat color options shall be available on request
3. Power supply, cooling and electronics shall be integral to each unit.
4. Fixture housing shall provide two easy-access slots for secondary lenses and other accessories
 - a. Slots shall be equipped with locking retaining clip
5. The unit shall ship with:
 - a. Theatrical-style hanging yoke as standard
 - b. 5' power lead with Edison connector as standard
6. Fixture shall feature a manual zoom lens
 - a. Zoom range spot to wash (17-41 degree zoom)
7. Available options shall include but not be limited to:
 - a. Weighted base.
 - b. Bare-end, Stage-Pin or Twist-lock type-equipped power leads
 - c. TRUE1 to TRUE1 cables for fixture power linking
8. Light output shall be via a round aperture
 - a. Aperture and accessory slots shall accommodate standard 7.5" accessories such as used in other similar-sized fixtures
 - b. Accessories available as options shall include but not be limited to:
 - i) Gel/diffusion frames
 - ii) Top hats (half, 3" or 6")
 - iii) Egg crate louvers
 - iv) Standard and studio barn doors

C. ENVIRONMENTAL AND AGENCY COMPLIANCE

1. The fixture shall be cETLus and shall be so labeled when delivered to the job site.
2. The fixture shall comply with UL 1573, CSA C22.2 No. 166.0, CE and UKCA.
3. The fixture shall be rated for IP-20 dry location use.

D. THERMAL

1. The fixture shall be cooled with a variable speed fan.
2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use
 - a. Thermal management shall include multiple temperature sensors within the housing to include:
 - i) The LED array
 - ii) The control board
3. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.

E. ELECTRICAL

1. The fixture shall be equipped with 100V to 240V 50/60 Hz internal power supply
2. The fixture shall support power in and thru operation
 - a. Power in shall be via Neutrik® PowerCon TRUE1™ input connector
 - b. Power thru shall be via Neutrik ® PowerCon TRUE1™ output connector
 - c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 20A breaker
3. The fixture requires power from non-dim source
4. Power supply outputs shall have self-resetting current limiting protection
5. Power supply shall have power factor correction

F. LED Emitters

THEATRICAL LIGHTING & CONTROL SYSTEMS

1. The fixture shall contain 5 different LED colors to provide color characteristics as described in Section H below.
2. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - a. Fixture shall utilize Luxeon® C™ LED emitters
3. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
4. LED emitters should be rated for nominal 20,000 hour LED life to 70% intensity
5. All LED fixtures (100% of each lot) shall undergo a minimum three-hour burn-in test during manufacturing.
6. LED system shall comply with all relevant patents

G. CALIBRATION

1. Fixture shall be calibrated at factory for achieve consistent color between fixtures built at different times and/or from different LED lots or bins
 - a. Calibration data shall be stored in the fixture as a permanent part of on-board operating system
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency
 - c. Fixtures not offering LED calibration shall not be acceptable
 - d. Fixtures do not offer Red shift calibration.

H. SOURCE & COLOR

1. The fixture shall output 5,007 max lumens.
2. LPW: 33.4.
3. L70: 54,000 hours.
4. The fixture shall utilize a minimum of 34 Lumileds LUXEON C LED emitters
 - a. These emitters shall be made up of Red, Green, Blue, Indigo and Lime

I. DIMMING

1. The LED system shall use 15-bit virtual nonlinear scaling techniques for high-resolution dimming.
2. The dimming curve shall be optimized for smooth dimming over longer timed fades.
3. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
4. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment
 - b. PWM rates shall be adjustable by the user via RDM to avoid any visible interference to video cameras and related equipment

J. CONTROL AND USER INTERFACE

1. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors
2. The fixture shall be City Theatrical Multiverse (ShoW Baby)-compatible via wireless DMX (900 MHz/2.4 GHz). Wireless shall be banded on the 2.400 – 2.480 GHz band with a range of 100 m indoors, 500 m line of sight (subject to site conditions). Maximum receivers shall be: DMX (no limit); RDM (varies by transmitter used); Multiverse ShoW Baby (585); Multiverse Transmitter (5,000). Broadcast power shall be 100 mW.
3. The fixture shall be NFC (near field communication)-compatible via ETC's Set Light app (and shall be configurable without power). This enables wireless addressing & configuration of fixtures (either to set new or to pull existing configurations).
4. The fixture shall be compatible with the ANSI RDM E1.20 standard
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console

- b. Temperature sensors within the luminaire shall be viewable in real time via RDM
- c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
- 5. The fixture shall be equipped with a 7-segment display for easy-to-read status and control
- 6. The fixture shall be equipped with a three-button user-interface
- 7. The fixture shall offer RGB control
- 8. The fixture shall operate in Regulated mode for droop compensation
- 9. The fixture shall offer stand-alone functionality eliminating the need for a console
 - a. Fixture shall ship with 12 preset colors accessible as a stand-alone feature
 - b. Fixture shall ship with 5 Sequences accessible as a stand-alone feature
 - c. Each color and sequence can be modified by the end user
 - d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture
 - i) Up to 6 fixtures may be linked
 - e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming
 - f. Fixtures without stand-alone operation features described in a, b, c, d, and e shall not be acceptable.

K. WARRANTY

- 1. Fixture: 5 years
- 2. LED array: 10 years

2.30 5-COLOR MIXING LIGHT EMITTING DIODE FRESNEL WASH FIXTURE: REFERENCED PRODUCT ETC COLORSOURCE FRESNEL V MAX LED

- A. Basis of Design: ColorSource Fresnel V MAX as manufactured by ETC Inc. An affordable high quality Fresnel wash fixture with motorized zoom. Uses RGBIL color system.
- 1. Standards Compliance:
 - a. Listed: cETLus, UL 1598 & 924, CSA C22.2 No. 250.
 - b. Compliance: CE and UKCA.
 - 2. Model ColorSource Fresnel V MAX: Black, White, Silver Gray (custom colors upon request)
 - 3. Arrays:
 - a. RGBIL (Red/Green/Blue/Indigo/Lime).
 - 4. Source:
 - a. LED Details: 60 Lumileds LUXEON C ES LEDs
 - b. Max Lumens: 10,023
 - c. Lumens per Watt: 48.
 - d. L70 rating: Greater than 54,000 hours.
 - 5. Color:
 - a. Color temperature Range: Color mixing.
 - b. Calibrated Array: Yes.
 - c. Red Shift: No.
 - 6. Optical:
 - a. Beam Angle Range: 13-44 degrees
 - i) Motorized zoom
 - b. Gate Size: N/A.
 - c. Aperture Size: 7.48" (190 mm)
 - d. Pattern Projection: No.
 - e. Pattern Size: N/A.
 - f. Camera Flicker Control/Hz Range: Default: 5kHz. RDM: 25,000 Hz (via RDM).
 - 7. Control:

- a. Input Method: DMX-512 via 5-pin XLR connector. Protocols: DMX512, RDM, City Theatrical Multiverse, NFC.
 - b. RDM Configuration: Yes.
 - c. NFC Configuration: Yes
 - d. User Interface Type: 7-segment 3 button, single encoder interface.
 - i) Encoder controls local motorized zoom
 - e. Modes (footprint): 6 modes (standard, RGB, 1 channel, direct, 6 channel & CCT – studio)
 - f. Local Control: Yes.
 - g. Onboard Presets: Yes, 12.
 - h. Onboard Sequences: Yes, 5.
 - i. Onboard Effects: No.
 - j. Fixture-to-Fixture Control: Yes.
 - k. 15-bit virtual dimming engine.
 - l. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors
 - m. The fixture shall be City Theatrical Multiverse (SHoW Baby)-compatible via wireless DMX (900 MHz/2.4 GHz). Wireless shall be banded on the 2.400 – 2.480 GHz band with a range of 100 m indoors, 500 m line of sight (subject to site conditions). Maximum receivers shall be: DMX (no limit); RDM (varies by transmitter used); Multiverse SHoW Baby (585); Multiverse Transmitter (5,000). Broadcast power shall be 100 mW.
 - n. The fixture shall be NFC (near field communication)-compatible via ETC's Set Light app (and shall be configurable without power). This enables wireless addressing & configuration of fixtures (either to set new or to pull existing configurations).
8. Electrical:
- a. Voltage: 100 to 240 VAC, 50 to 60 Hz. Input Method: PowerCON True1 in and thru.
 - b. Inrush First Half-Cycle: 120 V, 36A; 240 V, 57A.
 - c. Fixtures per Circuit (on standard R20 breaker):
 - i) 3 (link up to 4 via Power Thru connector)
 - ii) Note TRUE1 connector rated for 20A (120V/60Hz) and 16A (230V/50Hz).
 - iii) Wattage: 208 W at 120 V. 205 W at 230 V.
 - iv) Current Draw: 1.75 A at 120 V. 0.95 A at 230 V.
9. Thermal: Operating Temperature: 32 to 104 degrees F.
- a. Fan: Yes. Controllable: Yes.
 - b. Droop Compensation: Yes.
 - c. BTUs/hour (120V): 709.
10. Physical:
- a. Materials: Die-cast & extruded aluminum.
 - b. Color Options: Black, white, silver, or custom
 - c. Mounting Options: Yoke.
 - d. IP Rating: IP-20.
 - e. Included Accessories: Power cable and hanging yoke.
 - f. Weight: 6.24 kg (13.75 lb).
11. Accessories:
- a. Aperture and accessory slots shall accommodate standard 7.5" accessories such as used in other similar-sized fixtures
 - b. Accessories available as options shall include but not be limited to:
 - i) Gel/diffusion frames
 - ii) Top hats (half, cross baffle, 3" or 6")
 - iii) Egg crate louvers
 - iv) Standard and studio barn doors

- v) Weighted base
- 12. WARRANTY
 - a. Fixture: 5 years
 - b. LED array: 10 years

2.31 FIVE COLOR MIXING LIGHT EMITTING DIODE ASSYMMETRIC CYC FIXTURE: REFERENCED PRODUCT ETC COLORSOURCE CYC LED

A. General

1. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a ColorSource® CYC as manufactured by Electronic Theatre Controls, Inc. or approved equal.
2. All LED fixtures shall be provided by a single manufacturer to ensure compatibility
3. The fixture shall be UL 1573 listed for stage and studio use
4. The fixture shall comply with the USITT DMX512-A standard

B. Physical

1. The fixture shall be contained in a rugged all-metal die-cast housing, free of burrs and pits.
2. The housing shall have a rugged black powder coat finish
 - a. White or silver/gray powder coat finishes shall be available as color options
 - b. Other powder coat color options shall be available on request
3. Power supply and electronics shall be integral to each unit.
4. Fixture housing shall provide built in spill control
5. Fixture shall operate directly on the ground or by hanging via yoke
6. The unit shall ship with:
 - a. Theatrical-style hanging yoke as standard
 - b. 5' power lead with Neutrik® PowerCON™ to Edison connector as standard
7. Available options shall include but not be limited to:
 - a. DMX input via RJ45 connector
8. Light output shall be produce an asymmetrical beam
 - a. Lensing shall be designed to provide smooth coverage both horizontally and vertically for seamless blending from fixture to fixture
 - b. With a minimum setback from the cyclorama of 2', the fixtures shall be able to achieve a 2-to-1 spacing ration and maintain smooth coverage

C. ENVIRONMENTAL AND AGENCY COMPLIANCE

1. The fixture shall be UL and cUL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.
2. The fixture shall be UL LISTED to the UL1573 standard for stage and studio use
3. The fixture shall be rated for IP-20 dry location use.

D. THERMAL

1. The fixture shall be natural convection cooled and shall not use a fan
2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 50,000 hours of use
 - a. Thermal management shall include multiple temperature sensors within the housing to include:
 - 1) The LED array
 - 2) The control board
3. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.

E. ELECTRICAL

1. The fixture shall be equipped with 100V to 240V 50/60 Hz internal power supply
2. The fixture shall support power in and thru operation
 - a. Power in shall be via Neutrik® PowerCON™ input connector
 - b. Power thru shall be via Neutrik ® PowerCON™ output connector

- c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker
- 3. The fixture requires power from non-dim source
- 4. Power supply shall have power factor correction
- F. LED Emitters
 - 1. The fixture shall contain 5 different LED colors to provide color characteristics as described in Section H below.
 - 2. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - a. Fixture shall utilize Luxeon® C™ LED emitters
 - 3. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
 - 4. LED emitters should be rated for nominal 50,000 hour LED life to 70% intensity
 - 5. LED system shall comply with all relevant patents
 - 6. Fixtures shall have a flicker free mode that will set the LED refresh rate to 25,000 Hz for flicker free operation on camera
- G. CALIBRATION
 - 1. Fixture shall be calibrated at factory for achieve consistent color between fixtures built at different times and/or from different LED lots or bins
 - a. Calibration data shall be stored in the fixture as a permanent part of on-board operating system
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to ensure consistency
 - c. Fixtures not offering LED calibration shall not be acceptable
 - 2. Fixture shall have droop compensation to overcome thermal droop in the LEDs to maintain output levels and color point.
- H. COLOR
 - 1. The fixture shall utilize a minimum of 42 LED emitters
 - a. These emitters shall be made up of Red, Green, Blue, Indigo and Lime
- I. DIMMING
 - 1. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
 - 2. The dimming curve shall be optimized for smooth dimming over longer timed fades.
 - 3. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
 - 4. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment
 - b. PWM rates shall be adjustable by the user via RDM to avoid any visible interference to video cameras and related equipment
- J. CONTROL AND USER INTERFACE
 - 1. The fixture shall be USITT DMX512-A compatible via **In** and **Thru** 5-pin XLR connectors **or** RJ45 connectors
 - 2. The fixture shall be compatible with the ANSI RDM E1.20 standard
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
 - 3. The fixture shall be equipped with a 7-segment display for easy-to-read status and control
 - 4. The fixture shall be equipped with a three-button user-interface
 - 5. The fixture shall offer multiple control modes including but not limited to:
 - a. RGB
 - b. 5 channel (IRGBS)
 - c. Direct

- d. Single channel
- 6. The fixture shall operate in Regulated mode for droop compensation
- 7. The fixture shall offer stand-alone functionality eliminating the need for a console
 - a. Fixture shall ship with 12 preset colors accessible as a stand-alone feature
 - b. Fixture shall ship with 5 Sequences accessible as a stand-alone feature
 - c. Each preset can be modified by the end user
 - d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture
 - 1) Up to 32 fixtures may be linked
 - e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming
 - f. Fixtures without stand-alone operation features described in a, b, c, d, and e shall not be acceptable.

2.32 RGBA LED CYCLORAMA WASH FIXTURE: REFERENCED PRODUCT CHROMA-Q COLOR FORCE
3

A. FEATURES:

- 1. Fixtures are designed for applications where powerful and precise lighting is essential, including cyc, flood and wall washing.
- 2. ColorSure 3 provides deep color calibration and smoother control ensuring superior fixture to fixture consistency.
- 3. Multi-point CCT control from 2000K to 7100K with precise green/magenta control for film and broadcast applications.
- 4. 7000K sparkle LED's above and below each cell with pin-point beams & pixel mappable.
- 5. Quick-change lens system, eliminating the need to re-focus fixtures when changing lenses. Enhanced on and off axis lens visibility.
- 6. IP65 Neutrik XLR 5pin and EtherCon connectors with Art-Net / sACN / RDM connectivity.
- 7. Dual NFC points for fast and reliable iOS or Android fixture configuration.
- 8. Touchscreen interface and e-Link display with fixture and networks settings instantly visible.
- 9. Trunnions with tilt degree markings and sliding omega brackets for precision positioning.
- 10. Optional Lumen Radio TimoTwo for robust, reliable wireless DMX connectivity.
- 11. Accessories: Provide each fixture with the following accessories along with any others as noted on the contract drawings or elsewhere within these specifications.

B. OPTICS:

Hot lumen output (combined)	CF3 12: 7,000 lm CF3 48: 28,000 lm CF3 72: 42,000 lm
Optics	Fully homogenised lenses
Beam angle	22° (approx.)
Beam angle with optional cyc optic	80 x 35° (approx.)
Beam angle with optional border optic	43° (approx.)
Colour engine	Advanced RGBA ColorSure 3 calibrated engine using latest CQ3 colour science control
CCT	Adjustable 2000K - 7100K Extended 1000K - 10000K
Tint control	+2/-2 Green
CRI	>90
TM-30 Rf, Rg	RF>90, RG >100
SparQle hot lumen output (combined)	CF3 12: 1,000 lm CF3 48: 4,000 lm CF3 72: 6,000 lm
SparQle beam angle	15° (approx.)
LED lifetime (hours)	L70 at 50,000 hours* *Measured under manufacturer's test conditions

C. CONNECTIONS:

Power connectors in/out	Neutrik powerCON TRUE1 in and out
Data connectors in/out	XLR 5-pin in and out Ethernet in and out
Wireless connections	Optional LumenRadio module
NFC reader	CF3 12: one on the display side CF3 48 and CF3 72: one on the display side and one on the back under the serial label

D. ELECTRICAL:

Power supply	Built-in, multi-voltage
Power input rating	100-240V AC 50-60Hz CF3 12: 180VA CF3 48: 800VA CF3 72: 1100VA
Power factor	0.97 @ 120V AC 0.92 @ 230V AC
Power consumption	CF3 12: 180W @ 120V AC, 180W @ 230V AC CF3 48: 800W @ 120V AC, 800W @ 230V AC CF3 72: 1100W @ 120V AC, 1100W @ 230V AC
Idle power consumption	CF3 12: 27W @ 120V AC, 30W @ 230V AC CF3 48: 27W @ 120V AC, 30W @ 230V AC CF3 72: 27W @ 120V AC, 30W @ 230V AC
Earth leakage	0.18mA
Inrush current	Up to 80A @120 VAC
Max fixtures in series	CF3 12: 5 @ 120V, 10 @ 230V CF3 48: 2 @ 120V, 4 @ 230V CF3 72: 1 @ 120V, 2 @ 230V
Typical power & current	Measurements done with all LEDs at maximum intensity. Measurements made at nominal voltage. Allow for a deviations of +/- 10%

E. CONTROL:

Control protocol	ANSI E1.11 USITT DMX 512-A, Artnet / sACN / RDM
Control modes	Main Cells: RGB, RGBA, RGB Compact, RGBA Compact, RGB Extended, RGBA Extended, all modes available in 8 bit or 16 bit
Number of controllable mixed source(s)	CF3 12: 4 RGBA, 8 SparQle CF3 48: 16 RGBA, 32 SparQle CF3 72: 24 RGBA, 48 SparQle
Dimming curve	Linear, Soft Rise, Fast Rise, S-Curve
Display	4" graphic touch display and 1" e-ink
PWM frequency	Native ultra high speed PWM selectable from 24,000Hz at full 16bit to 96,000khz at 14 bits

F. APPROVALS:

CISPR 32:2015 / EN 55032:2015,
CISPR 24:2010/EN 55024:2010, IEC
60598-2-17:1984 +
A1:1987+A2:1990 used in conjunction
with
IEC 60598-1: 2008 (Seventh Edition)
FCC Part 15 Subpart B:2015 &
ICES-003:2016
CSA C22.2 No. 166:2015-06
UL 1573:2003/R:2014-01

G. PHYSICAL:

Cooling system	Combined convection & forced air
Maximum surface temperature	Ta=26°C: (68°C, 154°F)
Operating temperature:	0°C to 40°C (32°F to 104°F)
Total heat dissipation (calculated, +/- 10%)	CF3 12: 615 BTU/hr CF3 48: 2730 BTU/hr CF3 72: 3755 BTU/hr
Construction	Powder coated aluminium extrusion
Built-in hardware	Tilt-Lock, 2 accessory slots, safety bracket(s), 2 alignment pins, quarter turn receptacle
IP rating	IP65
Mounting points	2 Omega brackets included with the fixture
Idle sound level	Background noise + 2db
Max sound level	32db at quiet mode
Color Force 3 12	
Dimensions (l x h x w)	335mm x 179mm x 210mm 13.2" x 7.1" x 8.3"
Weight	6.8kg / 15lb
Shipping dimensions	432mm x 343mm x 279mm 17" x 13.5" x 11"
Shipping weight	9kg / 20lb
Distance centre-to-centre	335mm / 13.2"
Color Force 3 48	
Dimensions (l x h x w)	1,198mm x 179mm x 213mm 47.2" x 7.1" x 8.4"
Weight	23.5kg / 52lb
Shipping dimensions	1,295mm x 305mm x 320mm 51" x 12" x 12.5"
Shipping weight	26.5kg / 58.5lb
Distance centre-to-centre	1,198mm / 47.2"
Color Force 3 72	
Dimensions (l x h x w)	1,782mm x 179mm x 213mm 70.2" x 7.1" x 8.4"
Weight	31kg / 68lb
Shipping dimensions	1,855mm x 305mm x 320mm 73" x 12" x 12.5"
Shipping weight	34kg / 75lb
Distance centre-to-centre	1,782mm / 70.2"

H. ACCESSORIES:

Color Force 3 12	
CHCFBD12	Barndoor, black
CHCFBD12W	Barndoor, white
CHCFECL12	Egg crate louvre, black
CHCFTH12	Top hat, black
CHCFH12	Half top hat, black
CHCFZH12	Zip hood
CHCFDBX	Diffuser box, black
CHCFDBXW	Diffuser box, white
All Models	
CQ1530-9030	CF3 12 border lens
CQ1530-9040	CF3 48 border lens
CQ1530-9050	CF3 72 border lens
CQ1530-9031	CF3 12 cyc lens
CQ1530-9041	CF3 48 cyc lens
CQ1530-9051	CF3 72 cyc lens
CQ1530-9032	CF3 12 clear lens
CQ1530-9042	CF3 48 clear lens
CQ1530-9052	CF3 72 clear lens
CQ1530-9033	CF3 12 stealth lens
CQ1530-9043	CF3 48 stealth lens
CQ1530-9053	CF3 72 stealth lens
CQ1530-9034	CF3 12 lightshield
CQ1530-9044	CF3 48 lightshield
CQ1530-9054	CF3 72 lightshield
CQ1530-9020	RF LumenRadio kit option

Power cable with PowerCon and 2 x ¼ turn brackets included.

I. OPTICS:

J. PROVIDE:

- a. Cyc Lens
- b. Border Lens
- c. PowerCon to Edison power cable (5' – 0" long); PowerCon to PowerCon daisy chain power cable (5' – 0" long); XLR to XLR DMX data cable (2 - 5' – 0" long) (provide whatever version of connector is the current standard for these fixtures).

2.33 FAN COOLED, AUTOMATED, WHITE-LIGHT, LIGHT EMITTING DIODE FRAMING MOVING HEAD FIXTURE: REFERENCED PRODUCT HIGH END SYSTEMS LONESTAR

A. General

1. The fixture shall be a high-intensity white-light fixture with Cyan, Magenta, and Yellow subtractive color mixing and framing shutters. The fixture shall be a Lonestar by ETC or approved equivalent.
2. All LED moving light fixtures shall be provided by a single manufacturer to ensure compatibility.
3. The fixture shall be UL 1573 listed for stage and studio use and comply with EN60598-2-17 standard per CE certification
4. The fixture shall comply with the USITT DMX-512A standard

B. Physical or Mechanical

1. The fixtures structural framing shall be constructed of rugged, 1/8" aluminum, free of burrs and pits and finished with a matte black powder coating.
2. Outer covers of head and yoke shall be constructed of ABS plastic with fine textured black surface and fastened to the head frame with quarter turn fasteners.
3. The fixture dimensions shall be

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- a. 600 mm (23.6") from base of the enclosure, to the tip of the lens baffling. Fixtures that are longer than this dimension shall not be deemed acceptable.
- b. 367 mm (14.5") across the exterior dimensions of the yolk
- c. The Electronics enclosure shall be 220 mm (8.7") Wide
- d. Head length 409 mm (16.1 ")
- e. Fixtures shall weigh 22.7 kg (50 lbs)
4. The fixture shall be able to be either truss mounted or set upright on a stable surface. Fixture shall be suitably designed for operation over or under mounted on a truss perpendicular to the ground as well as outrigger parallel to the ground.
5. The following shall be provided:
 - a. Shutter assembly shall be a four plane system capable of rotating +/- 30 on and fully crossing the beam on each individual shutter blade. Additionally the entire Shutter assembly must rotate +/- 60 .
 - b. The fixture must include nine (9) interchangeable rotating gobos with 17.5 mm outside diameter and 13 mm image area. Fixtures that have less than nine rotating gobo patterns shall not be deemed acceptable.
 - i) Rotating gobo systems must be able to index to any point on the 360 positioning of the gobo.
 - ii) Rotating gobos must be interchangeable with glass and metal gobo patterns without permanent or semi-permanent modification to the wheels or cartridges.
 - c. CMY (Cyan Magenta Yellow) subtractive color mixing system
 - d. Ten (10) interchangeable colors including red, blue, green, yellow, orange, purple, TM-30 filter, lavender, half CTO, full CTO, and dark blue. Capable of split colors and linear indexed positioning. Fixtures without color wheels shall not be deemed acceptable.
 - e. Electronic Linear CTO from Native Color temperature minus 4800 K
 - f. Fixture shall have 540 degrees of pan and 270 degrees of tilt. Pan and tilt must be controlled with 16bit control and utilize encoder sensors to guarantee correct step position.
 - i) Fixture shall have a pan speed of 2.30s for 360 degree movement
 - ii) Fixture shall have a tilt speed of 1.26s for 180 degree of movement.
 - iii) Pan and tilt locks that stop at 0, 45, and 90 degrees for service and handling. Pan and tilt locks are not intended to be engaged during transport in pre-rigged truss.
 - g. A 14 leaf iris which reduces the projection area by 96%.
 - h. Frost system with two different diffusion media that soften the edges of the projection on a surface and allows for variation in insertion speed. Fixtures that do not have two or more diffusion media shall not be deemed acceptable.
 - i. Automated 3.8-55 zooming lens system. Fixtures that can not achieve a hard focus on the gate at less than 4 degrees shall not be deemed acceptable.
 - j. Animation wheel that allows for continuous and uninterrupted motion in two directions and can be moved in/out of the beam.
 - k. Two prisms including five facet prism and four facet linear.
 - i) Prism are index able, and continuously rotatable in both clockwise and counterclockwise directions.
 - ii) Both prisms must be able to be inserted in the beam simultaneously. Fixtures that can not insert two prisms into the beam simultaneously shall not be deemed acceptable.
6. The yolk arms must have collapsible, spring loaded, handles for fixture handling and manipulation.
7. Power supply, cooling and electronics shall be integral to each unit.
8. The unit shall ship with:
 - i) 5' Neutrik True1 PowerCon™ to wire ferrule as standard

- ii) Two (2) brackets that facilitate attaching standard brackets to the fixture base via ¼ turn thumb screws.

C. Optical

1. The light emitting diode engine shall produce 7000K white light within +/-400K out of the front lens of the luminaire
2. The light engine shall be create color rendering at greater than 70 CRI
3. The fixture shall produce a maximum of 12,000 or greater field lumens while thermally stable and at full intensity. Luminaires that reach 12,000 lumens only by integrating sphere or total lumen testing shall not be deemed acceptable.
4. The unit shall provide, but not be limited to:
 - a. Low gate and beam temperature
 - b. Sharp imaging through a four-plane shutter design
 - c. Sharp Imaging on all gobo Planes and Iris planes
5. The unit shall provide, but not be limited to:
 - a. 3.8 through 55 degree field angles
 - b. High-quality pattern imaging throughout zoom range
 - c. Sharp shutter cuts without halation. Shutter systems that suffer from warping and burnout in normal use shall be deemed unacceptable.
 - i) No more than 5% distortion curvature on framing blades when measured in the widest possible zoom with sharp edge framing shutters. Systems that have more than 5% curvature shall be deemed unacceptable.
6. Fixture shall have two diffusions, one light and one medium, and have an option for a third diffusion, heavy, to be added without removing either of the other two diffusion options.

D. Environmental and Agency Compliance

1. The fixture shall be ETL and cETL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.
2. The fixture shall be ETL LISTED to the UL1573 standard for stage and studio use
3. The fixture shall be rated for IP-20 dry location use.
4. Fixture shall have linear fan control that allows a user to select fan speed level. When this feature is active the luminaire may budget output as is necessary to maintain safe operating temperatures but may not change fan speed. Fixtures that do not have linear fan control in this manner shall be deemed unacceptable.

E. Thermal

1. Fixture shall be equipped with a heat pipe radiant cooling system.
2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use
 - a. Fan speed will adjust automatically based on thermal management needs.
 - i) Fixture will provide three fan speed modes that are selectable via DMX.
 - ii) Fixture will also provide a linear fan speed control channel.
 - b. Thermal management shall include temperature sensors within the housing to include:
 - i) LED array circuit board temperatures
 - c. Fixture shall permit monitoring of temperature sensors via a legible LCD multi-line backlit display
 - d. Fixtures that do not provide active thermal monitoring, fan speed controls, and current management of LED circuits shall not be acceptable.
3. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 45° C (113°F) maximum ambient temperature. During times of storage, the fixture shall be stored in temperatures range of -20C (0°F) to 60C (140°F)
4. The fixture shall maintain .5 m (1.64 feet) distance from any flammable object

5. The fixture shall maintain a minimum of 2.0 m (6.56 feet) to any lighted object.
- F. Electrical
 1. The fixture shall be equipped with a 100V to 240V 50/60Hz auto-sensing internal power supply
 - a. Fixture shall draw a maximum of 6.2 amps at 100V and 2.5 amps at 240 V.
 2. The fixture shall support power in and thru operation
 - a. Power in shall be via Neutrik® PowerCon™ True1 input connector
 - b. Power thru shall be via Neutrik® PowerCon™ True1 output connector
 3. The fixture requires power from a non-dimmer source
 4. Power supply outputs shall have self-resetting current-limiting protection
 5. Power supply shall have power factor correction greater than 0.95 from 100 VAC to 240 VAC.
- G. LED Emitters
 1. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - a. YLX is the sole manufacturer of approved emitter engines.
 2. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
 3. All LED fixtures (100% of each lot) shall undergo a minimum 12-hour burn-in and stress test during manufacturing.
 4. LED system shall comply with all relevant patents
 5. Fixtures shall have PWM frequency up to 16,000hz to avoid flicker on camera
- H. Calibration
 1. Fixture shall be calibrated at factory to achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins
 - a. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency.
- I. Color
 1. The fixture shall be available in specialized LED arrays as outlined below:
 - a. Ultra-Bright 8000k white light engine
 - i) White LED Engine calibrated and binned to achieve 8000k (+/- 400k).
 - a) Measured brightness of Ultra-Bright 8000k engine installed in luminaire shall be greater than 15,400 Lumens when tested in an integrating sphere.
 2. Fixture must have a subtractive color mixing system utilizing six (6) dichroic color flags, controlled in pairs, to linearly subtract the following colors out of fixtures light output.
 - a. Cyan
 - b. Magenta
 - c. Yellow
 3. Fixture must have semi trapezoidal dichroic glass color segments on a single wheel that transmit the following colors. Dichroics are permanent and mounted in place via adhesive.
 - a. Red
 - b. Green
 - c. Blue
 - d. Yellow
 - e. Purple
 - f. TM-30
 - g. Light Pink
 - h. Half CTO
 - i. Full CTO

- j. Dark Blue
- 4. Fixture shall have an electronic CTO that utilizes the CMY mixing system of the fixture to reduce CCT color temperature from fixtures native color temperature down to 2200 K
- J. Dimming
 - 1. The LED system shall use 16-bit DMX control techniques for high-resolution dimming.
 - 2. Dimming curves shall be optimized for smooth dimming over longer timed fades.
 - 3. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
 - 4. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment
- K. Control and User interface
 - 1. Ethernet compatible with support for ANSI11.31 Streaming ACN and ArtNet protocols
 - 2. Fixture must provide an internal ethernet switch that supports both active and passive data pass-through.
 - 3. Fixtures shall be support protocol conversion from Ethernet to DMX output and also conversion from DMX input to Ethernet output.
 - 4. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors
 - 5. The fixture shall be compatible with the ANSI RDM E1.20 standard
 - a. All fixture functions shall be accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM.
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
 - 6. The fixture shall be equipped with multi-line color LCD display for easy-to-read status reports and configuration changes.
 - a. Display must have a feature to battery power the menu structure when the fixture is unplugged to allow fixture settings to be adjusted, including DMX.
 - 7. The fixture shall be equipped with a six-button user-interface
 - 8. The fixture may offer two DMX control profiles.
 - a. Standard DMX Control Profile will have 48 channel control.
 - b. Trifusion DMX Control Profile will have 48 channel control.
- 2.34 FOLLOW SPOT LIGHTING UNIT: REFERENCED PRODUCT LYCIAN SUPERSTAR LED FOLLOW SPOT MODEL 1280
 - A. The luminaire is a 600-watt LED followspot designed with a self-contained LED light source. The spot diameter of the beam shall be continuously variable from flood to spot and shall be controlled by a top-mount lever which opens and closes a nichrome steel iris. The unit shall include a top operated 3 plate sliding fader and a 6 color, self-cancelling color boomerang.
 - B. The unit shall include externally controlled, horizontal stainless-steel trim shutters. Individually operated shutters shall not be acceptable.
 - C. The unit shall contain only optical grade lenses.
 - D. The luminaire shall be cooled by two quiet, low-volume fans such that the unit will operate at the proper temperature. An approved power supply and igniter shall be internally mounted. Extended (box) ballast shall not be acceptable. A circuit breaker illuminated rocker "off/on" switch and line cord terminated in a NEMA-5-15P connector with 12' long Neutrik Power Con cable shall be provided.
 - E. Housing shall be of extruded aluminum and cold rolled sheet steel powder coated in grey and black. Housing dimensions are TBD. Net weight for the floor stand shall not exceed TBD lbs.

The floor stand assembly shall be of the telescoping four-legged folding type and shall include both casters and leveling jacks. Allowable downward tilt is 70 degrees below horizontal and 40 degrees above horizontal.

- F. The power supply shall be electronic switching style and shall be integrated into the followspot head. Current draw at 120V A/C shall not exceed 4.58 amperes. The luminaire shall be UL listed and labeled for use with the LED light source.
- G. Beam angle shall be 7° - 15°
- H. Photometric data shall conform to the table below:

Superstar 600 LED Photometrics					
Distance Feet	60'	80'	100'	150'	200'
Distance Meters	18 Meters	25 Meters	30 Meters	45 Meters	60 Meters
Spot Dia. Feet	5'	8'	12'	15'	20'
Spot Dia. Meters	1.5	2.4	3.7	4.9	6.1
Flood Dia. Feet	15'-7"	20'-8"	26'-1"	39'-1"	
Flood Dia. Meters					
FC Spot	556	313	200	89	50
Lux Spot	5,985	3,369	2153	958	538
FC Flood	133	75	48	21	
Lux Flood	1432	807	517	226	

2.35 ONE PORT NETWORK DATA DISTRIBUTION DEVICE: REFERENCED PRODUCT ETC NET3 ONE PORT GATEWAY

A. General

1. The lighting control gateway shall be a microprocessor-based unit specifically designed to provide DMX-512 control of stage, studio, and entertainment lighting systems. The
2. The gateway shall permit DMX-512 data to be encoded, routed over Ethernet and decoded back to DMX-512. The unit shall be a Net3 DMX One Port Gateway as provided by ETC, Inc.
3. Gateways shall communicate over Ethernet directly with at least ETC, Inc.'s entertainment and architectural lighting control products and other Ethernet interfaces.
4. Connections shall be made between gateways, consoles, architectural systems, and PCs over standard Ethernet distribution systems using 10/100BaseT.
5. The unit shall support ESTA ACN and Streaming ACN.
6. The unit shall support the ETCNet2 protocol suite.
7. The unit shall be tested to UL standards and labeled ETL Listed.
8. The unit shall be RoHS Compliant (lead-free).
9. The unit shall be CE compliant.

B. DMX Ports

1. DMX Ports shall comply with the requirements of the USITT DMX512 and ANSI E1.11 DMX512-A standards.

2. The DMX port shall be software-configurable for either input or output
3. Hardware configuration override setting shall be provided on the gateway.
4. DMX input shall be fully opto-isolated from the gateway electronics.
5. DMX output shall be earth-ground referenced.
6. DMX Port shall be capable of withstanding fault voltages of up to 250VAC without damage.
7. Each port shall incorporate one 5-pin XLR type connector. A DMX output port shall utilize female connectors and a DMX input port shall utilize male connectors.

C. Processor

1. Each gateway shall have sufficient processing power to manage up to 64,279 DMX universes (32,910,848 DMX addresses).
2. Maximum delay time from input to output shall not be greater than one packet time (approximately 22 mSec.).
3. A minimum DMX update rate of 40Hz shall be sustained under all conditions unless specifically configured for a slower rate for the sake of compatibility of older 3rd party DMX devices.

D. Mechanical

1. The gateway faceplate shall be constructed of durable cast aluminum. It shall mount in a standard 1 gang masonry deep back box. Faceplates manufactured of plastic shall not be acceptable.
2. Gateways shall be of pleasing appearance, suitable for high visibility architectural locations.
3. Gateways shall be provided in matte black finish.

E. Power

1. Power for the gateway shall be provided either over the Cat5 cable, complying with IEEE 802.3af, or via a power supply capable of an operating range of 10-28vDC. Power consumption shall not be greater than 3 watts.
2. The gateway electronics shall be electrically isolated from the power supplied over the Cat5 cable.
3. Power may be provided from IEEE 802.3af compliant power-over Ethernet distribution equipment, or by using conventional switches together with isolated in-line power supplies as provided by gateway manufacturer.

F. Configuration

1. Each gateway on the network shall be individually configurable using ETCNet 2 Network Configuration Editor (NCE) or Gateway Configuration Editor, running on a PC connected to the network. The PC shall only be required for configuration, labeling and signal routing, and shall not be required for normal operation of the system. The One port gateway shall also have hardware dipswitches for a basic address scheme.

2. Each DMX gateway shall control up to 512 DMX addresses, within the confines of 64,279 DMX "universes". The specific DMX data input or output by the gateway shall be freely configurable by the user. Duplicate outputs of DMX lines (DMX splitter) and discrete outputs shall be fully supported.
3. Any number of DMX universes may be configured with any length up to 512 addresses as long as the total does not exceed 32,767. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.
4. All relevant routing information shall be stored in non-volatile memory at each gateway. The system shall recover from a power outage without requiring the PC to be online.

G. Network

1. Communications physical layer shall comply with, at a minimum, IEEE 802.3.1 10BASE-T Ethernet specification.
2. All network cabling shall be Cat5 or higher, conforming to TIA-568A/B, and shall be installed by a qualified network installer.
3. Data transport shall utilize the TCP/IP suite of protocols to transfer the DMX data.
4. ESTA ACN and streaming ACN shall be supported.
5. Switches shall comply with power-over-Ethernet IEEE802.3af, unless a separate in-line power supply is provided.
6. Multiple DMX signal routing patches and multiple facilities shall be specifically supported and limited only by the file storage capacity of the computer with ETC Network Configuration Editor software installed.
7. Each DMX gateway shall control up to 512 DMX addresses, per port within the confines of up to 64 DMX (32,767 EDMX address) "universes" when using EDMX and 64,279 "universes" (32,910,848 DMX addresses) when using Streaming ACN. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.
8. Units shall have built in DMX merger on a universe or channel-by-channel basis.
9. Units shall have built in prioritizer on a universe or channel-by-channel basis.

H. Environmental

1. The ambient operating temperature shall be 0° to 40°C (32° to 104°F).
2. The storage temperature shall be -40° to 70°C (-40° to 158°F).
3. The operating humidity shall be 5% - 95% non-condensing.

I. Accessories (Provide only as noted on drawings)

1. U-Bolt kit
2. Touring Options – with Cat5 XLR, patch cable.

3. Plug in station covers: 1, 2, and 4 gang.
4. Optional punch down kit
5. ETC Network Configuration Editor (NCE) software

J. System Requirements

1. Provide the quantity and type of gateways required, as scheduled. Gateways and software shall be as manufactured by Electronic Theater Controls Inc. of Middleton, WI.
2. Provide Ethernet hubs and power supplies as scheduled and as shown on drawings.
3. Provide a current generation PC with Windows operating system and a 10/100 Ethernet card.
4. Systems that do not provide the above capabilities shall not be acceptable.

2.36 NETWORK DATA DISTRIBUTION DEVICE: REFERENCED PRODUCT ETC NET 3 TWO-PORT GATEWAY

A. General

1. The lighting control gateway shall be a microprocessor-based unit specifically designed to provide DMX-512 control of stage, studio and entertainment lighting systems. The gateway shall permit DMX-512 data to be encoded, routed over Ethernet and decoded back to DMX-512. The unit shall be a Net3 DMX 2-port Gateway as provided by ETC, Inc.
2. Gateways shall communicate over Ethernet directly with at least ETC, Inc.'s entertainment and architectural lighting control products and other Ethernet interfaces.
3. Connections shall be made between gateways, consoles, architectural systems, and PCs over standard Ethernet distribution systems using 10/100BaseT.
4. The unit shall support ESTA ACN and Streaming ACN
5. The unit shall support the ETCNet2 protocol suite.
6. The unit shall be tested to UL standards and labeled ETL Listed.
7. The unit shall be RoHS Compliant (lead-free).
8. The unit shall be CE compliant.
9. The gateway shall have a backlit graphic LCD display for identification (soft-labeling) and status reporting. Labeling shall be user configurable using Gateway Configuration Editor (GCE). Each gateway shall also have power and network activity LED's on both the front and rear of the unit. The LCD display shall show DMX port configuration indication as well as indicate the presence of valid DMX/EDMX signal. Units that do not indicate port configuration (input/output) and valid DMX/EDMX data shall not be allowed.

B. DMX Ports

1. DMX Ports shall comply with the requirements of the USITT DMX512 and ANSI E1.11 DMX512-A standards.
2. The DMX port shall be software-configurable for either input or output.
3. Hardware configuration override setting shall be provided on the gateway.
4. DMX input shall be fully opto-isolated from the gateway electronics.
5. DMX output shall be earth-ground referenced.
6. DMX Port shall be capable of withstanding fault voltages of up to 250VAC without damage.
7. Each port shall incorporate one 5-pin XLR type connector. A DMX Output port shall utilize female connectors and a DMX input port shall utilize male connectors.

C. Processor

1. Each gateway shall have sufficient processing power to manage up to 64,279 DMX universes (32,910,848 DMX addresses).

2. Maximum delay time from input to output shall not be greater than one packet time (approximately 22 msec.).
 3. A minimum DMX update rate of 40Hz shall be sustained under all conditions unless specifically configured for a slower rate for the sake of compatibility of older 3rd party DMX devices.
- D. Mechanical
1. Wall Mount/Portable gateway
 - a. The Wall mount Gateway will be fabricated of .16-gauge steel, finished in fine-texture, scratch-resistant, black powder coat. Suitable enclosures for the gateway shall include 2-gang standard or deep backbox.
 - b. The weight of the gateway shall be 2.5 lbs (1.1 kg).
- E. Power
1. Power for the gateway shall be provided either over the Category 5 (or better) cable, from 48V IEEE 802.3af compliant Power over Ethernet distribution equipment, or via conventional switches together with isolated in-line power supplies capable of an operating range of 8-28vDC provided by the gateway manufacturer. Power consumption shall not be greater than 5 watts.
 2. The gateway electronics shall be electrically isolated from the power supplied over the Cat5 cable.
 3. Power may be provided from IEEE 802.3af compliant power-over Ethernet distribution equipment, or by using conventional switches together with isolated in-line power supplies as provided by gateway manufacturer.
- F. Configuration
1. Each gateway on the network shall be individually configurable using ETCNet 3 Gateway Configuration Editor, running on a PC connected to the network. The PC shall only be required for configuration, labeling and signal routing, and shall not be required for normal operation of the system.
 2. Each DMX gateway shall control up to 512 DMX addresses, within the confines of 64,279 DMX "universes". The specific DMX data input or output by the gateway shall be freely configurable by the user. Duplicate outputs of DMX lines (DMX splitter) and discrete outputs shall be fully supported.
 3. Any number of DMX universes may be configured with any length up to 512 addresses as long as the total does not exceed 32,767. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.
 4. All relevant routing information shall be stored in non-volatile memory at each gateway. The system shall recover from a power outage without requiring the PC to be online.
- G. Network
1. Communications physical layer shall comply with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet specifications.
 2. All network cabling shall be Category 5 or better (for 5e and Category 6), conforming to TIA-568A/B, and shall be installed by a qualified network installer.
 3. Data transport shall utilize the TCP/IP suite of protocols to transfer the DMX data.
 4. ESTA ACN and streaming ACN shall be supported.
 5. Switches shall comply with power-over-Ethernet IEEE802.3af, unless a separate in-line power supply is provided.
 6. Multiple DMX signal routing patches and multiple facilities shall be specifically supported and limited only by the file storage capacity of the computer with ETC Network Configuration Editor Software installed.
 7. Each DMX gateway shall control up to 512 DMX addresses, per port within the confines of up to 64 DMX (32,767 EDMX addresses) "universes" when using EDMX and 64279 "universes" (32, 910,848 DMX addresses) when using Streaming ACN. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.

8. Units shall have built in DMX merger on a universe or channel-by-channel basis.
 9. Units shall have built in prioritizer on a universe or channel-by-channel basis.
 - H. Environmental
 1. The ambient operating temperature shall be 0° to 40°C (32° to 104°F).
 2. The storage temperature shall be -40° to 70°C (-40° to 158°F).
 3. The operating humidity shall be 5% - 95% non-condensing.
 - I. Accessories - Provide the following:
 1. Net3 Gateway Configuration Editor (GCE) software
 - J. System Requirements
 1. Provide the quantity and type of gateways required, as scheduled. Gateways and software shall be as manufactured by Electronic Theatre Controls Inc. of Middleton, WI.
 2. Provide Ethernet switches and power supplies as scheduled and as shown on drawings.
 3. Provide a current generation PC with Windows operating system and a 10/100 Ethernet card.
- 2.37 FOUR PORT NETWORK DATA DISTRIBUTION DEVICE: REFERENCED PRODUCT ETC NET3 FOUR PORT GATEWAY**
- A. General
 1. The lighting control gateway shall be a microprocessor-based unit specifically designed to provide DMX-512 control of stage, studio, and entertainment lighting systems. The gateway shall permit DMX-512 data to be encoded, routed over Ethernet and decoded back to DMX-512. The unit shall be a Net3 DMX 4-port Gateway as provided by ETC, Inc.
 2. Gateways shall communicate over Ethernet directly with at least ETC, Inc.'s entertainment and architectural lighting control products and other Ethernet interfaces.
 3. Connections shall be made between gateways, consoles, architectural systems, and PCs over standard Ethernet distribution systems using 10/100BaseT.
 4. The unit shall support ESTA ACN and Streaming ACN
 5. The unit shall support the ETCNet2 protocol suite.
 6. The unit shall be tested to UL standards and labeled ETL Listed.
 7. The unit shall be RoHS Compliant (lead-free).
 8. The unit shall be CE compliant.
 9. The gateway shall have a backlit graphic LCD display for identification (soft-labeling) and status reporting. Labeling shall be user configurable using Network Configuration Editor (NCE). Each gateway shall also have power and network activity LED's on both the front and rear of the unit. The LCD display shall show DMX port configuration indication as well as indicate the presence of valid DMX/EDMX signal. Units that do not indicate port configuration (input/output) and valid DMX/EDMX data shall not be allowed.
 - B. DMX Ports
 1. DMX Ports shall comply with the requirements of the USITT DMX512 and ANSI E1.11 DMX512-A standards.
 2. The DMX port shall be software-configurable for either input or output.

3. Hardware configuration override setting shall be provided on the gateway.
4. DMX input shall be fully opto-isolated from the gateway electronics.
5. DMX output shall be earth-ground referenced.
6. DMX Port shall be capable of withstanding fault voltages of up to 250VAC without damage.
7. Each port shall incorporate one 5-pin XLR type connector. A DMX Output port shall utilize female connectors and a DMX input port shall utilize male connectors.

C. Processor

1. Each gateway shall have sufficient processing power to manage up to 64,279 DMX universes (32,910,848 DMX addresses).
2. Maximum delay time from input to output shall not be greater than one packet time (approximately 22 m Sec.).
3. A minimum DMX update rate of 40Hz shall be sustained under all conditions unless specifically configured for a slower rate for the sake of compatibility of older 3rd party DMX devices.

D. Mechanical

1. Rack Mount/Portable gateway
 - a. The rack mount/portable gateway will be fabricated of .16-gauge steel, finished in fine-texture, scratch-resistant, black powder coat. Dimensions shall be 8.5" (22 cm) wide x 8.0" (20 cm) deep x 1.75" (5 cm) high not including tabs.
 - b. The weight of the gateway shall be 3.5 lbs (1.6 kg) with four connector modules. An individual module shall weight no more than .25 lbs (.1 kg).

E. Power

1. Power for the gateway shall be provided either over the Category 5 (or better) cable, from 48V IEEE 802.3af compliant Power over Ethernet distribution equipment, or via conventional switches together with isolated in-line power supplies capable of an operating range of 8-28vDC provided by the gateway manufacturer. Power consumption shall not be greater than 5 watts.
2. The gateway electronics shall be electrically isolated from the power supplied over the Cat5 cable.
3. Power may be provided from IEEE 802.3af compliant power-over Ethernet distribution equipment, or by using conventional switches together with isolated in-line power supplies as provided by gateway manufacturer.

F. Configuration

1. Each gateway on the network shall be individually configurable using ETCNet 2 Network Configuration Editor (NCE) or Gateway Configuration Editor, running on a PC connected to the network. The PC shall only be required for configuration, labeling and signal routing, and shall not be required for normal operation of the system.

2. Each DMX gateway shall control up to 512 DMX addresses, within the confines of 64,279 DMX "universes". The specific DMX data input or output by the gateway shall be freely configurable by the user. Duplicate outputs of DMX lines (DMX splitter) and discrete outputs shall be fully supported.
3. Any number of DMX universes may be configured with any length up to 512 addresses as long as the total does not exceed 32,767. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.
4. All relevant routing information shall be stored in non-volatile memory at each gateway. The system shall recover from a power outage without requiring the PC to be online.

G. Network

1. Communications physical layer shall comply with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet specifications.
2. All network cabling shall be Category 5 or better (for 5e and Category 6), conforming to TIA-568A/B, and shall be installed by a qualified network installer.
3. Data transport shall utilize the TCP/IP suite of protocols to transfer the DMX data.
4. ESTA ACN and streaming ACN shall be supported.
5. Switches shall comply with power-over-Ethernet IEEE802.3af, unless a separate in-line power supply is provided.
6. Multiple DMX signal routing patches and multiple facilities shall be specifically supported and limited only by the file storage capacity of the computer with ETC Network Configuration Editor Software installed.
7. Each DMX gateway shall control up to 512 DMX addresses, per port within the confines of up to 64 DMX (32,767 EDMX addresses) "universes" when using EDMX and 64279 "universes" (32, 910,848 DMX addresses) when using Streaming ACN. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.
8. Units shall have built in DMX merger on a universe or channel-by-channel basis.
9. Units shall have built in prioritizer on a universe or channel-by-channel basis.

H. DMX Connector modules

1. Each gateway shall incorporate four connector module locations. Each module shall contain a single connector and its associated electronics for ease of service. Connector module options shall include a male DMX input connector, a female DMX output connector or a terminal strip connector.
2. Each connector module shall be fully opto-isolated from the gateway electronics and from each other.
3. DMX connector modules shall be capable of withstanding fault voltages of up to 250VAC without damage.

I. Environmental

1. The ambient operating temperature shall be 0° to 40°C (32° to 104°F).
2. The storage temperature shall be -40° to 70°C (-40° to 158°F).
3. The operating humidity shall be 5% - 95% non-condensing.

J. Accessories

1. Flexible Hanging Bracket kit - bracket shall allow unit to be mounted in 3 orientations, U-Bolt option also available
2. Rack mount kit – a 1U rack-mount bracket that shall support either two complete units or one unit and a Front Access Panel kit. This kit shall allow up to eight ports of DMX in a 1U rack space.
3. Front Access Panel kit – a kit that allows the connectors on the rear of the unit to be accessed from the front of the unit in an equipment rack
4. Universal Power Supply with international plug-set included. Multiple power supplies shall be able to fit in a vertically stacked power strip.
5. ETC Network Configuration Editor (NCE) software

K. System Requirements

1. Provide the quantity and type of gateways required, as scheduled. Gateways and software shall be as manufactured by Electronic Theater Controls Inc. of Middleton, WI.
2. Provide Ethernet switches and power supplies as scheduled and as shown on drawings.
3. Provide a current generation PC with Windows operating system and a 10/100 Ethernet card.

2.38 EIGHT PORT NETWORK DATA DISTRIBUTION DEVICE: REFERENCED PRODUCT ETC NET3 EIGHT PORT GATEWAY

A. General

1. The lighting control gateway shall be a microprocessor-based unit specifically designed to provide DMX-512 control of stage, studio, and entertainment lighting systems. The gateway shall permit DMX-512 data to be encoded, routed over Ethernet and decoded back to DMX-512. The unit shall be a Net3 DMX 8-port Gateway as provided by ETC, Inc.
2. Gateways shall communicate over Ethernet directly with at least ETC, Inc.'s entertainment and architectural lighting control products and other Ethernet interfaces.
3. Connections shall be made between gateways, consoles, architectural systems, and PCs over standard Ethernet distribution systems using 10/100BaseT.
4. The unit shall support ESTA ACN and Streaming ACN
5. The unit shall support the ETCNet2 protocol suite.
6. The unit shall be tested to UL standards and labeled ETL Listed.
7. The unit shall be RoHS Compliant (lead-free).

8. The unit shall be CE compliant.
9. The gateway shall have a backlit graphic LCD display for identification (soft-labeling) and status reporting. Labeling shall be user configurable using Network Configuration Editor (NCE). Each gateway shall also have power and network activity LED's on both the front and rear of the unit. The LCD display shall show DMX port configuration indication as well as indicate the presence of valid DMX/EDMX signal. Units that do not indicate port configuration (input/output) and valid DMX/EDMX data shall not be allowed.

B. DMX Ports

1. DMX Ports shall comply with the requirements of the USITT DMX512 and ANSI E1.11 DMX512-A standards.
2. The DMX port shall be software-configurable for either input or output.
3. Hardware configuration override setting shall be provided on the gateway.
4. DMX input shall be fully opto-isolated from the gateway electronics.
5. DMX output shall be earth-ground referenced.
6. DMX Port shall be capable of withstanding fault voltages of up to 250VAC without damage.
7. Each port shall incorporate one 5-pin XLR type connector (or Phoenix style connectors). A DMX Output port shall utilize female connectors and a DMX input port shall utilize male connectors.

C. Processor

1. Each gateway shall have sufficient processing power to manage up to 64,279 DMX universes (32,910,848 DMX addresses).
2. Maximum delay time from input to output shall not be greater than one packet time (approximately 22 m Sec.).
3. A minimum DMX update rate of 40Hz shall be sustained under all conditions unless specifically configured for a slower rate for the sake of compatibility of older 3rd party DMX devices.

D. Mechanical

1. Rack Mount/Portable gateway
 - a. The rack mount/portable gateway will be fabricated of .16-gauge steel, finished in fine-texture, scratch-resistant, black powder coat. Dimensions shall be 8.5" (22 cm) wide x 8.0" (20 cm) deep x 1.75" (5 cm) high not including tabs.
 - b. The weight of the gateway shall be 3.5 lbs (1.6 kg) with four connector modules. An individual module shall weight no more than .25 lbs (.1 kg).

E. Power

1. Power for the gateway shall be provided either over the Category 5 (or better) cable, from 48V IEEE 802.3af compliant Power over Ethernet distribution equipment, or via conventional switches together with isolated in-line power supplies capable of an operating range of 8-28vDC provided by the gateway manufacturer. Power consumption shall not be greater than 5 watts.

2. The gateway electronics shall be electrically isolated from the power supplied over the Cat5 cable.
3. Power may be provided from IEEE 802.3af compliant power-over Ethernet distribution equipment, or by using conventional switches together with isolated in-line power supplies as provided by gateway manufacturer.

F. Configuration

1. Each gateway on the network shall be individually configurable using ETCNet 2 Network Configuration Editor (NCE) or Gateway Configuration Editor, running on a PC connected to the network. The PC shall only be required for configuration, labeling and signal routing, and shall not be required for normal operation of the system.
2. Each DMX gateway shall control up to 512 DMX addresses, within the confines of 64,279 DMX "universes". The specific DMX data input or output by the gateway shall be freely configurable by the user. Duplicate outputs of DMX lines (DMX splitter) and discrete outputs shall be fully supported.
3. Any number of DMX universes may be configured with any length up to 512 addresses as long as the total does not exceed 32,767. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.
4. All relevant routing information shall be stored in non-volatile memory at each gateway. The system shall recover from a power outage without requiring the PC to be online.

G. Network

1. Communications physical layer shall comply with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet specifications.
2. All network cabling shall be Category 5 or better (for 5e and Category 6), conforming to TIA-568A/B, and shall be installed by a qualified network installer.
3. Data transport shall utilize the TCP/IP suite of protocols to transfer the DMX data.
4. ESTA ACN and streaming ACN shall be supported.
5. Switches shall comply with power-over-Ethernet IEEE802.3af, unless a separate in-line power supply is provided.
6. Multiple DMX signal routing patches and multiple facilities shall be specifically supported and limited only by the file storage capacity of the computer with ETC Network Configuration Editor Software installed.
7. Each DMX gateway shall control up to 512 DMX addresses, per port within the confines of up to 64 DMX (32,767 EDMX addresses) "universes" when using EDMX and 64279 "universes" (32, 910,848 DMX addresses) when using Streaming ACN. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX line may have its own start address and offset for ease of use.
8. Units shall have built in DMX merger on a universe or channel-by-channel basis.
9. Units shall have built in prioritizer on a universe or channel-by-channel basis.

H. DMX Connector modules

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1. Each gateway shall incorporate four connector module locations. Each module shall contain a single connector and its associated electronics for ease of service. Connector module options shall include a male DMX input connector, a female DMX output connector or a terminal strip connector.
2. Each connector module shall be fully opto-isolated from the gateway electronics and from each other.
3. DMX connector modules shall be capable of withstanding fault voltages of up to 250VAC without damage.

I. Environmental

1. The ambient operating temperature shall be 0° to 40°C (32° to 104°F).
2. The storage temperature shall be -40° to 70°C (-40° to 158°F).
3. The operating humidity shall be 5% - 95% non-condensing.

J. Accessories

1. Flexible Hanging Bracket kit - bracket shall allow unit to be mounted in 3 orientations, U-Bolt option also available
2. Rack mount kit – a 1U rack-mount bracket that shall support either two complete units or one unit and a Front Access Panel kit. This kit shall allow up to eight ports of DMX in a 1U rack space.
3. Front Access Panel kit – a kit that allows the connectors on the rear of the unit to be accessed from the front of the unit in an equipment rack
4. Universal Power Supply with international plug-set included. Multiple power supplies shall be able to fit in a vertically stacked power strip.
5. ETC Network Configuration Editor (NCE) software

K. System Requirements

1. Provide the quantity and type of gateways required, as scheduled. Gateways and software shall be as manufactured by Electronic Theater Controls Inc. of Middleton, WI.
2. Provide Ethernet switches and power supplies as scheduled and as shown on drawings.
3. Provide a current generation PC with Windows operating system and a 10/100 Ethernet card.

2.39 DATA DISTRIBUTION DEVICE: REFERENCED PRODUCT ETC RESPONSE 0-10V GATEWAY

A. Specialty Gateway Series:

1. Product: Response 0 to 10V Gateway by ETC, Inc. Lighting control gateway; microprocessor-based providing 0 to 10 V control for lighting systems. Permit DMX-512 and Ethernet Data to be received and converted to 0 to 10V control outputs.
 - a. Model RSN-LV: Response 0 to 10 V Gateway.
 - b. Standards Compliance: cETLus Listed. CE compliant. EAC certified. RoHS compliant. WEEE. UL 924 LISTED for emergency lighting applications

- c. Functional:
 - i) Supports sACN control input (ANSI E1.31).
 - ii) Supports USITT DMX512-A control input (ANSI E1.11).
 - iii) Supports 0-10 V sink control (IEC60929 Annex E).
 - iv) Supports per-address- or per-universe-level priority.
 - v) Configurable dimming curve per channel.
- b) Linear.
- c) Mod-Square.
- d) Custom.
- d. Mechanical:
 - i) Intuitive four-button interface.
 - ii) Onboard display for identification, status, and configuration.
 - iii) Extruded aluminum enclosure.
 - iv) Network and power activity indicators.
- b) Blue power indicator.
- c) Green and orange network activity indicator.
 - i) Female RJ45 for connection to lighting network.
 - ii) Pluggable terminals provided for all wiring connections.
 - iii) Selection switch for emergency input configuration.
- d) Normally Open, Normally Closed or Off.
 - i) 10 unit DIN enclosure.
 - ii) Mounting complies with DIN43880 (35/7.5 rail).
- e. Electrical:
 - i) Compliant with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX.
 - ii) 18 to 24 VDC power input using two-pin pluggable connection.
 - iii) Maximum 18 W current draw at 18 to 24 V.
 - iv) 24 0 to 10 V outputs, each supporting voltage sink connections, 400 mA maximum current per output.
- f. DMX Input Port:
 - i) Optically-isolated input from the Gateway electronics.
 - ii) Withstands fault voltages of up to 250 VAC.

- iii) Integrated DMX/RDM termination.
- g. Configuration:
 - i) Onboard configuration using intuitive four-button interface.
 - ii) Configuration provided using Concert software.
 - iii) Configurable starting address.
 - iv) Up to four sources may be combined to the network with each source or address allowed an independent priority.
- h. Ambient Operating Temperature: 32 to 104 degrees F (0 to 40 degrees C).
- i. Operating Humidity: 5 to 95 percent non-condensing.
- j. Storage Temperature: Minus 40 to 158 degrees F (Minus 40 to 70 degrees C).

2.40 POWER DISTRIBUTION EQUIPMENT:

A. General

1. Connectors available are 20A, 50A and 100A grounded stage pin, 20A twist lock and 20A "U" ground (dual rated "T-slot"); other connectors available as specified. Pigtailed shall be three-wire type "SOW" rubber jacketed cable sized for the circuit ampacity. Internal wiring shall be sized to circuit ampacity and shall be rated at 125°C.
 - a. 20 amp cable mount stage pin connectors shall be 12 gauge 4 way indent crimp (with inspection window) type where the wire is inserted and crimped directly in the socket.
2. Terminations shall be at one end using feed through terminals individually labeled with corresponding circuit numbers. 20 amp circuits shall use screwless tension clamp or standard screw-type/barrier strip U-style terminals listed for 20 – 8 gauge wire. 50 amp circuits shall use compression terminals listed for 10 – 1 gauge wire and 100 amp circuits shall use compression terminals listed for 8 – 2/0 gauge wire. Terminals that place a screw directly on the wire are not acceptable.
3. Equipment, except for wall-mounted boxes, shall be supplied with appropriate brackets and hardware for mounting as shown on the drawings. Connector strips shall have brackets on 5' centers. Brackets shall be 1½" x .188" ASTM A 36 steel and hardware shall be ASTM A307 grade 5.
4. A low voltage distribution system for DMX or Network (or other protocols as specified) shall be available, incorporated in the connector strip, locations and methods to be per print. Connector strips shall have a voltage barrier installed to accommodate these systems. Distributed DMX or Network systems shall use pass through assemblies consisting of a 6" panel with the following: one DMX or Network Output Connector, one DMX or Network Input (Pass Through) connector, one DMX or Network Pass Through (Bypass) Switch, and a label detailing the use of the pass through assembly. The bypass switch shall be used when no DMX or Network devices are present at that location. When activated, the pass through switch shall pass DMX or Network directly through to the next DMX or Network panel on the strip. The pass through switch shall have a mechanical indicator to show the operator that it has or has not been engaged. Low Voltage signals shall enter the connector strip via a strain relief or connector mounted in a separate DMX or Network terminal box at the specified end of the connector strip.
5. Power distribution equipment shall be Underwriter Laboratories (UL) Listed.

B. Connector Strips

1. Connector Strips shall be fabricated from 18 gauge galvanized steel 6.25"H x 3.3"D with length specified in increments of 6" and shipped fully wired in a minimum of 6'0" sections with all

splicing hardware included. They shall be finished with fine-textured, scratch-resistant, black powder coat. Circuits shall be labeled on one side of the connector strip with 2" white lettering on black background labels. Pigtails and outlets shall be spaced on 18" centers, or as otherwise specified. Outlets shall be mounted on individual 3" panels and there shall be no external terminal boxes for units with 28 or fewer circuits unless otherwise specified.

a. Connector strip circuit number labeling:

- 1) Circuits shall be labeled on one side of the connector strip with 2" white lettering on black background labels.

C. Junction Boxes

1. Gridiron Junction Boxes shall be fabricated from 16-gauge cold rolled steel with 14 gauge end panels. They shall be finished with fine-textured, scratch-resistant, black powder coat. For 30 circuits and less they shall be 14"H x 14"W x 4"D and for 31 to 60 circuits they shall be 14"H x 28"W x 4"D. Cover(s) shall be attached with machine screws and Tinnerman retainer nuts. Cover(s) shall be 16-gauge cold rolled steel. Cover(s) shall be hinged and mounting should allow installer to orient the hinged door to open in any direction.

D. Outlet and Pigtail Boxes

1. Outlet and Pigtail Boxes shall be fabricated from 18-gauge cold rolled steel with 16 gauge covers. They shall be finished with fine-textured, scratch-resistant, black powder coat. Circuit numbers shall be 2" or 3/4" labels with white letters on black background (sized to match product). Pigtails and outlets shall be spaced on 3" centers, or as otherwise specified.

E. NEMA Wall Plates

1. An alternative to surface and recessed outlet boxes, ETC's NEMA style wall plates shall be available for 20A Stage Pin, Edison and Twist-Lock connectors. For use with industry-standard back boxes, the wall plates shall be fabricated of .125 AL and shall be finished with fine-textured, scratch-resistant, black powder coat. Circuit numbers shall be 2" or 3/4" labels with white letters on black background (sized to match product).

F. Floor Pockets

1. The floor pocket shall be a wiring device designed for flush mount installation in the stage floor. The floor pocket cover plate shall be constructed of 3/8" cast iron with a non-skid tread pattern and four (4) recessed mounting holes. The cover shall be constructed with integral hinges and four (4) cable notches. Secured to the cover plate shall be an angled sheet-steel mounting panel for receptacles. The floor pocket back box shall have provisions for an integral voltage barrier for low voltage circuits. Circuit designations shall be white on black background labels. The floor pocket cover plate, back box and connector-mounting panel shall be finished in a low gloss black finish. The back box shall be constructed of 16-gauge cold rolled steel and UL listed for use in the United States and Canada.

2.41 WIRING DEVICES (DISTRIBUTION EQUIPMENT): SEE DRAWINGS FOR DETAILS

- A. Wiring devices shall be fabricated from 16-gauge cold rolled steel, in 6' 0" sections as required. Devices shall be properly cleaned, primed and painted with fine-textured, scratch resistant, black powder coat. Circuit numbers shall be 3/4" Lexan tags with white letters on black background.
- B. Individual pigtails and outlets shall be evenly spaced, on 12" centers in connector strips, or as otherwise specified. Where a circuit would fall on a joint it shall be moved 3" towards the junction box end of the strip.
- C. All connectors shall be flush mount 20 Amp 2P&G unless otherwise noted.
- D. Devices except for wall-mounted boxes shall be supplied with appropriate hardware for mounting as shown on the drawings. Connector strips shall have brackets on 5' centers. Connector strips shall have a terminal block on one end as shown on the drawings.
- E. Wiring devices shall be UL Laboratories Listed.

2.42 DIN RAIL SYSTEM: REFERENCED PRODUCT PATHWAY CONNECTIVITY DIN RAIL SYSTEM

A. eDIN #1103 Rack Mount Panel Kit:

1. Features:

- a. Blank steel rack panel with solid bottom pan (on which to mount DIN rail) with a black powder coat finish. Made in single piece construction.
- b. Integral cable management system.
- c. Face dimensions: Standard EIA 19" (482mm) x 3.5" (2RU height that will accommodate all eDIN modules).
- d. Tray dimensions (solid bottom pan) – 17" W x 10" D (430mm x 254mm).
- e. DIN Rail Supplied: Two sections 16.5" (420mm) long each, 5.1 lbs (2.3 kg).
- f. DIN rail made from cold rolled carbon steel sheet with a electrolytic zinc plating or chromated bright surface finish.
- g. DIN rail: Standard 35 mm x 7.5 mm.
- h. DIN rail is a mounting system only and does not carry voltage.
- i. Complies with DIN 50045, 50022 and 50035 Standards.

B. Power Supply:

1. Provide a power supply with the following features:

- a. 1001-30: Power supply suitable for use with Rack Mount Panel Kit.
- b. Mount power supply neatly, so that it does not interfere with the DIN rail system or any DIN rail mounted devices and per all applicable codes.
- c. Provide additional power supplies as required in order to power all necessary DIN rail mounted devices.
- d. Provide separate UL listed enclosures, etc. as necessary for power supplies.
- e. Do not power the DIN rail themselves. Power only the DIN rail devices.
- f. Protect all power cabling from becoming inadvertently shorted or routed to improper areas, terminals, etc.

C. Calculate required DIN rail mounted devices necessary for this project and provide as many DIN rail rack mount panel kits, power supplies and accessories as is required in order to mount and power all DIN rail equipment.

D. Do not drill face/tray of DIN rail rack mount kit in order to route wiring. All wiring shall remain concealed behind face and routed as required to other devices.

2.43 CONVECTION COOLED WHITE LIGHT LED RETROFIT REPLACEMENT ENGINE: REFERENCED PRODUCT CANTO USA RETRO-FUSION 150/.300/500/700/1000

A. General

1. The LED Retrofit lamp replacement engine is a high intensity LED illuminator with forward phase, reverse phase or sinewave dimming. The lamp replacement LED engine shall be manufactured by CANTO USA or Equal.
2. All LED Lamp replacement engines shall be provided by a single manufacturer to ensure dimming curve compatibility.
3. The fixture shall be UL/CSA recognized for LED lamps and Retrofit applications.
4. The fixture shall be compatible with forward, reverse phase or sinewave, 2 wire dimmers, allowing the unit to be dimmed smoothly from 0-100%.
5. Unit shall be able to hold any light level in the dimming curve without flicker or decay of intensity.
6. Provide all upgrades and existing fixture modifications/additions and accessories/stem extensions, junction boxes, sockets, etc. as required to incorporate these new RLED replacement fixtures into the existing and to remain fixture housings.

B. Physical

1. The unit shall be constructed of sheet and extruded aluminum, free of burs and pits.
2. The following shall be provided:

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- a. Reflector shall be secured by plastic retaining ring that also holds in place the COB LED Chip.
 - b. Unit shall use a heatsink and fan arrangement to allow active cooling of the LED array.
 - c. Heatsink and fan assembly shall be attached by a series of aluminum brackets that will attach to the bottom of the LED Driver Aluminum casing.
 - d. LED Driver shall be housed in a vented aluminum casing, allowing the fan from the LED heatsink below to pull air over the case to optimize the life of the electronics.
 - e. LED Driver case shall allow for mounting holes for an Edison Medium Screwbase or E11 Mini Candelabra
 - f. Reflectors shall be easily interchangeable via a tool-less design.
 - g. LED will be a single COB chip, mounted on an aluminum board which is thermally bound to the heatsink via thermal paste. Multiple point source LED Fixtures will not be accepted.
 - h. Unit shall have multiple points of attachment for customized retrofit options, but are not limited to PAR 46, PAR 56, PAR 64, E26 Medium Screwbase, bare ends, E11 Mini Candelabra, etc.
 3. The LED Engine shall comprise have integrated optics, electronics and heatsink in a single source package, allowing the end user to be able to service the LED components easily and efficiently.
 4. The LED driver shall be able to be dimmed on most forward, reverse phase or sinewave dimmers.
 5. The Unit shall ship with:
 - a. LED COB mounted to Heatsink
 - b. Heatsink mounted to LED Driver casing
 - c. Either Bare end of medium screwbase male connector to tie into the existing lamp housing.
 6. Available options shall include:
 - a. Mini Candelabra lamp base (E11) 1-4" tall adaptable stem
 - b. Bare End Wires w/ PAR 56, PAR 64 or Custom Method of attachment
 - c. Medium Screwbase (E26)
 - d. Mogul Screwbase (E39)
 - e. Par 56 adapter Ring
 - f. Par 64 adapter Ring
 - g. BA15D Double Bayonet Socket
- C. Optical
1. The light output shall be a emulating a single point source.
 2. The unit shall be provided with a native 120 Degree Beam Angle with the option of the following optical attachments:
 - a. Tall 11 Degree
 - b. Tall 20 Degree
 - c. Tall 47 Degree
 - d. Short 15 Degree (Low Profile)
 - e. Short 28 Degree (Low Profile)
 - f. Short 56 Degree (Low Profile)
 - g. Short 74 Degree (Low Profile)
- D. Environmental and Agency Compliance
1. The LED retrofit shall be UL/CSA OR UL RECOGNIZED LISTED and shall be so labeled when delivered to the job site.
 2. The LED Retrofit shall be CSA/ UL Listed to UL1598C and UL8750 standard for LED retrofit use.
 3. The fixture shall be rated for IP-20 dry location use.

4. LED Retrofit shall be either DLC or Energy Star Listed.
- E. Thermal
1. LED Retrofit shall be equipped with a cooling fan.
 - a. Fan output on driver board shall be able to output 12vdc at max of 300ma.
 - b. Standard cooling fan shall be installed and shall not exceed 21 decibels at 1 meter distance.
 - c. Optional higher cfm fan shall be available with an ambient noise of 37 decibels at a 1-meter distance.
 2. LED Retrofit fan shall dim linearly with the output of the light as the dimmer increases in voltage to the LED Dimmable retrofit.
 3. The LED retrofit shall have the ability to be installed into a plenum rated fixture, with only the front of the fixture exposed for max light output as well as air ventilation and shall have a maximum of 2% light loss over 24 hours due to droop.
 4. Case temperature of the LED Driver shall not reach beyond 30 Degrees Celsius in a plenum rated can at an ambient room temperature of 25 Degrees Celsius.
 5. LED Driver case shall be constructed with a thermistor to provide an over temp protection in the case of a fan failure of sudden increase of ambient room temperature. In cases like this, the LED Electronics shall reduce forward current to LED or in extreme cases, shut off driver all together.
 6. LED Retrofits that do not have a thermistor or fan cooling, shall not be acceptable.
- F. Electrical
1. The fixture shall be equipped with a transformer that can accept 110V to 120V AC.
 2. LED retrofit shall have optional 277VAC or 220/240VAC inputs as well.
 3. The LED Retrofit can receive its power from a forward/reverse phase circuit or from a constant hot circuit.
 4. LED Driver shall have a THD higher than 90%.
- G. LED Array
1. LED array shall be able to produce more than 7000 Lumens in a 22.5mm diameter package, while not exceeding 55 Watts of power consumption.
 2. LED array shall be provided from Citizen Electronics
 3. LED array shall be offered in the following color temperatures:
 - a. 2700K
 - b. 3000K
 - c. 3500K
 - d. 4000K
 - e. 5000K
 4. LED array shall be offered in the following CRI:
 - a. 80 CRI
 - b. 90 CRI
 - c. 97 CRI
 5. LED COB (Chip on Board) array shall be sorted using the 3 Step Macadam System.
- H. Calibration
1. LED Retrofit shall be tested on a continuous dimming cycle of 20 Seconds fade up, hold for 5 Seconds, and 20 Seconds fade out, hold for 5 Seconds. This is to ensure consistent dimming across multiple fixtures plugged into the same circuit as well as testing for any immediate product failure.
 2. LED Retrofit shall be inspected to ensure that all LED emitters in COB array are lit and that no damage has been done in manufacturing process.
- I. Color

1. The LED Retrofit shall have 1 COB LED Array to simulate a single point source light source.
 - J. Maintenance and Service
 1. LED retrofit shall have all serviceable parts.
 2. LED Driver shall not be contained inside "Potting material" or no serviceable case. LED Retrofits that have no serviceable/non socketed driver will not be accepted.
 - K. Dimming Performance
 1. LED Retrofit shall dim smoothly on a standard forward/ reverse phase dimmer.
 2. LED Driver shall use CCR (Constant Current Reduction) as the method of dimming the LED. Any LED Driver using PWM as the method of output to dim the LED array will not be accepted.
 3. LED Retrofit shall have the ability of dimming smoothly all the way to 0% without a bottom end cut off or POP off.
 4. Any LED driver not being able to meet the above criteria shall not be acceptable.
 5. Any substituted manufacturers must provide 5 existing installations, demonstrating all units in the auditorium perform from 0-100% while dimming.
 - L. Warranty
 1. Full Fixture – 5-year standard warranty.
 2. Full Fixture – Additional extended warranties can be purchased at a per year, up to 8 years maximum.
 3. COB Array – 10-year standard warranty.
 - M. Accessories
 1. Provide all required accessories, goof rings, trim rings, mounting screws, power adapter whips to interface with existing housing, etc.
- 2.44 HIGH OUTPUT LINEAR HIGH BAY WHITE ONLY LED WORKLIGHT FIXTURE: REFERENCED PRODUCT ILP ENDEAVOUR 2.0
- A. FEATURES
1. Sleek Curved Polycarbonate Injection Molded End Caps
 2. White and black finish options
 3. Aluminum Body with steel channel for added rigidity
 4. Toolless Hinged Driver Access
 5. Wide & Narrow Distributions
 6. Impact Resistant and IP5X Rated Lens Options:
 - a. Frosted Acrylic (FRL)
 - b. Frosted Polycarbonate (PFL) IK10 Impact Rated
 7. V-Clips for dual point chain or cable hanging (standard)
 8. 131°F Standard Ambient Temperature Range
 9. 149°F Max High Ambient Temperature Option
 10. 3000K–5000K CCT
 11. Uplight Options to optimize full room illumination
 12. 17 Size/Lumen packages:
 - a. 2': 8,000 lumens – 36,000 lumens
 - b. 4': 12,000 lumens – 100,000 lumens
 13. >80 Color Rendering Index (CRI)
 14. Calculated L70 >100,000 hrs
 15. 0-10V Dimmable Driver (100%–10%)
 16. 5 Year Warranty (standard); 10 Year Warranty (optional)
 17. ETL Listed for Damp Location
 18. DesignLights Consortium® Premium Qualified Luminaire
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B. RATINGS

1. IK10
2. California Title 24
3. IP5X
4. Recovery.gov
5. ETL US/Intertek
6. DLC/DLC Premium

C. OPTIONS/ACCESSORIES

1. Provide with every option/accessory as listed on the contract drawings.
2. FIOS: On/Off Occupancy Sensor
3. ESMC/HB: EasySense High Bay Sensor
4. CLOS: Cold Storage On/Off Occupancy Sensor
5. FSP-311/Lx: Legrand FSP-311 Sensor LX = Mounting Height - L3 = 20'MH - L7 = 40'MH
6. FIOSPC: On/Off Occupancy Sensor w/ Photocell
7. ZLD1Z: Leviton ZLD1Z 120-277V Bluetooth Groupable Sensor (16 Devices) w/ 8-20' & 20-40' lens included
8. FIOSPC/DLH: 11 On/Off Occupancy Sensor w/ Daylight Harvesting
9. 5S/CU/CL: Enlighted Connected Lighting (CL) Sensor
10. DHPC: Daylight Harvesting
11. 5S/CU/IOT: Enlighted IOT Lighting (IOT) Sensor
12. USBD: User Selectable Bi-Level Dim Sensor w/ Occupancy
13. SYN: Synapse Control System
14. BDxx: Preset Bi-Level Dim Sensor (xx = eg. 20%,30%)
15. SYNS/Lx: Synapse Control System w/ Sensor (x=Mounting height, 3=20', 7=40')
16. BDxxPC: Preset Bi-Level Dim Sensor w/ Photocell
17. AWRN: Lutron Athena Option
18. GTD: Generator Transfer Device
19. SMZB KIT EDV: Surface Mount Bracket (2), leaves 2" gap b/w fixture and surface
20. EM5: 5W LED Battery Backup
21. HOOK: Cast Hook
22. EM5/HE: 5W LED Battery Backup - CEC Title 20 Compliant
23. HUB ¾: ¾ Conduit Hub
24. EM7: 7W LED Battery Backup
25. ACxY Adjustable Y-Toggle aircraft cable set (x = 5' or 10')
26. EM7/HE: 7W LED Battery Backup - CEC Title 20 Compliant
27. ESMC/WWS/DR: EasySense Dual Rocker Wireless Wall Switch
28. EM10: 10W LED Battery Backup
29. WC: 11ga Wire Cage
30. EM10/HE: 10W LED Battery Backup - CEC Title 20 Compliant
31. EM10/HE/SD: 10W Self Diagnostic Battery Backup - CEC Title 20 Compliant
32. EM12: 12W LED Battery Backup
33. EM20: 20W LED Battery Backup - CEC Title 20 Compliant
34. EM25: 25W LED Battery Backup
35. EM25/HE: 25W LED Battery Backup - CEC Title 20 Compliant
36. EM25/HE/SD: 25W LED Battery Backup - CEC Title 20 Compliant - Self Diagnostic
37. EMCT14: 14W LED Cold Temp Battery Backup; -4°F (-20°C)
38. SD347: 347V Step Down Transformer
39. SD480: 480V Step Down Transformer
40. Cx/3W 3-wire cord standard fixtures (xFT = Length; x=6,10,15,20)
41. Cx/3W/L715P Cord (xFT = Length; x=6,10,15,20) with 277V 15amp Plug
42. Cx/4W 4-wire cord for EM fixtures (xFT = Length; x=6,10,15,20)
43. Cx/5W 5-wire cord for non EM fixtures with external dim control
44. (xFT = Length; x=6,10,15,20)
45. Cx/6W 6-wire cord for EM fixtures with external dim control
46. (xFT = Length; x=6,10,15,20)

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47. QDx/3W 3-wire Quick Connect standard fixtures (xFT = Length; x=6,10,15,20)
 48. QDx/4W 4-wire Quick Connect for EM fixtures (xFT = Length; x=6,10,15,20)
 49. QDx/5W 5-wire Quick Connect for non EM fixtures with external dim control
 50. (xFT = Length; x=6,10,15,20)
 51. QDx/6W 6-wire Quick Connect for EM fixtures with external dim control
 52. (xFT = Length; x=6,10,15,20)
 53. FMB:Fixture Mounting Box - Use when single point mounting
- D. AMBIENT TEMPERATURE RANGE (IN DEGREES FARENHEIGHT)
1. Standard: 122/131 (depending on exact model)
 2. High Temp: 131/149 (depending on exact model)
- E. SPECIFICATIONS
1. CONSTRUCTION
 - a. Aluminum body with steel driver channel for maximum rigidity and thermal properties. Sleek curved polycarbonate injection molded end caps provide a modern finish while adding rigidity and durability. Toolless hinged driver door access for ease of maintenance and installation. Power access plate mounted on back of center driver channel for easy access to wiring. Product proudly assembled in the United States of America.
 2. ELECTRICAL
 - a. Class 2 LED light engine for high efficacy and long life. Calculated L70 > 100,000 hrs. LED Lumen Maintenance Estimates based on TM-21 projections for the light source at 25°C ambient. Power Factor > 0.90. THD < 20%. Standard 120-277 Vac 0-10V dimmable (10%-100%) with optional 347-480 Vac step down transformer. Optional emergency battery backups and generator transfer device available to meet critical life safety lighting requirements.
 3. MOUNTING
 - a. Options include suspension chain, aircraft cables, hook, single pendant (HUB), surface mount (SMZB KIT EDV). Reduced maximum ambient range for surface mount.
 4. WARRANTY
 - a. 5 Year Warranty Standard; 10 Year Warranty Optional (Terms and Conditions apply).
 5. OPTICS
 - a. Standard without lens. Optional frosted acrylic (FRL) and frosted polycarbonate (PFL) lenses available for added LED protection and glare reduction. Both optics are IP5X rated; protected against dust intrusion. Frosted Polycarbonate lens (PFL) is IK10 impact rated; highest impact rating available. Wide (std.) & Narrow (ND) Distribution options available for all lumen packages.
 6. THERMAL
 - a. Standard ambient temperature range -40°F up to 131°F (-40°C to 55°C), Optional high ambient temperature range -40°F up to 149°F (-40°C to 65°C). Fixture to be mounted at a minimum plenum height of 18" to maintain maximum ambient temperature. Reduced maximum ambient for surface mounting ,emergency battery backup, and step down transformers; see ambient temperature table on page 5 for more details
 7. CONTROLS
 - a. Factory installed Advanced and Basic integral occupancy sensor options available. All Basic sensors are end mounted. Advanced EasySense sensor is end mounted. All other Advanced sensors are center driver cover mounted. Inquire with manufacturer for additional controls options, including customer supplied items.
 8. CERTIFICATIONS
 - a. ETL listed to US and Canadian safety standards. Suitable for damp locations. American Recovery and Reinvestment Act Funding Compliant. Please refer to the DLC (DesignLights Consortium) Qualified Products List at www.designlights.org/QPL to confirm specific product qualifications.
 9. UPLIGHT OPTION
 - a. Offers an additional layer of lighting to optimize full room illumination by reducing the contrast between the luminaire and the ceiling, eliminating the "cave" effect. With a

dedicated individual switchable 0-10V (10%) dimmable driver and 2 linear strips of LED boards, the modules are encapsulated with a frosted polycarbonate lens. Optional upright wired to sensor if ordered together.

F. CONTROLS OPTIONS (PROVIDE ONLY AS SPECIFIED ON CONTRACT DRAWINGS)

1. BASIC

- a. FIOS: Standard on/off motion sensor. Comes with 360 degree high bay lens, 360 degree low bay lens & aisle lens. 360 degree high bay lens factory installed, unless notified otherwise. Sensor mounted off end cap of fixture. Inquire for mounting on center of driver cover.
- b. FIOSPC: Motion sensor with the addition of photocell control. When installed, fixture will not activate unless 1. motion is detected and 2. light levels are below the preset level. When activated, fixture will turn on to 100% light output & will only shut off when one of the two levels mentioned above are met. If no motion is detected & light levels fall below preset level the fixture remains off. Sensor mounted off end cap of fixture.
- c. FIOSPC/DLH: Factory installed motion sensor with the addition of photocell control that will allow for daylight harvesting. When installed, fixture will not activate unless 1. motion is detected & 2. light levels are below the preset level. When activated, fixture will turn on only enough to meet the preset light levels and will adjust as the amount of light in the space adjusts between 100%-10%. If light levels are adequate the fixture will remain off. Sensor mounted off end cap of fixture.
- d. DHPC: Daylight Harvesting off photocell. Fixtures will continually dim up/down throughout the day based on light level readings taken from the photocell control. Sensor mounted off end cap of fixture.
- e. USBD: User Selectable Bi-Level Dimming. Allows the end user to manually select the unoccupied dimming level. Once motion is detected, the fixture will return to 100% light output. Sensor mounted off end cap of fixture.
- f. BDxx: Factory set Bi-Level Dimming. Sensor is set to dim level, as indicated in the "xx" portion of the part number, when the area is unoccupied. Example: BD20 sets the fixture to dim down to 20% lumen output when the area is unoccupied. Once motion is detected, the fixture will return to 100% light output. Sensor mounted off end cap of fixture.
- g. BDxxPC: Factory set Bi-Level Dimming with motion and photocell. Sensor is set to dim level, as indicated in the "xx" portion of the part number, when the area is unoccupied and will not return to 100% light output unless 1. motion is detected and 2. the light level is below the preset level. Example: BD20PC sets the fixture to dim down to 20% lumen output when the area is unoccupied and will not return to 100% light output unless the above conditions are met for both motion and light level readings. Sensor mounted off end cap of fixture.

2. ADVANCED

- a. Philips ESMC/HB: EasySense sensor combines occupancy sensing, daylight harvesting and institutional tuning in one compact solution. This is an ideal control for any high bay application. Each device allows you to turn on/off occupancy and/or daylight harvesting functions as well as set the full light output, background light level, occupancy prolong time, occupancy grace fading time & occupancy time out/hold time. Easily Controlled via Mobile Phone with Philips MasterConnect Bluetooth App. (Sold separately). Sensor mounted off end cap of fixture.
- b. Enlighted 5S/CU/CL: Bundled System with Enlighted Sensor. Fixtures are controlled based on occupancy & ambient light. Includes individual lighting control plus connection to Enlighted Energy Manager. The Energy Manager provides data analysis for all data collected by the Enlighted Smart Sensors for energy, occupancy & environment. Provided factory installed components only. Enlighted system provided by others. Contact factory for more information. Sensor mounted on center driver channel.
- c. Enlighted 5S/CU/IOT: Bundled System with Enlighted Sensor. Fixtures are controlled based on occupancy and ambient light. Includes individual lighting control plus connection to Enlighted Energy Manager. The Energy Manager provides data analysis for all data collected by Enlighted Smart Sensors for energy, occupancy & environment. Additionally,

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the IOT functionality takes the data access and function beyond just lighting to a wide range of applications beyond the standard connected lighting controls. Provided factory installed components only. Enlighted system provided by others. Contact factory for more information. Sensor mounted on center driver channel.

3. Legrand FSP-311: FSP-311 offers fully adjustable high and low dimmed light levels with optional photocell. Hold off setpoint with automatic calibration option. Adjustable time delay and cut off delay. Sensor adjustable programming via iOS® or Android® 'Sensor Configuration' App. Sensor mounted on center driver channel.
 - a. Leviton ZLD1Z: Optional Bluetooth Groupable PIR sensor that allows for Programmable Options such as, Continuous Dimming, Motion and/ or daylight harvesting, fully adjustable high/low dimmed light levels, and Adjustable time delay/ cutoff delay. The sensor is programmed via a free iOS® or Android® Sensor Configuration App (compatible device provided by others). Sensor Mesh Grouping allows for 16 devices per group, with both Occupancy and Daylight Control. Recommended spacing < 100'. Comes standard with both 8'-20' or 20'-40' mounting lenses.
 - 1) Default Settings:
 - a) • High Mode: 100% Output
 - b) • Auto-ON/Auto-OFF with 20-minute timeout
 - c) • Sensitivity: High
 - d) • Daylight Harvesting: Enabled
 - b. Lutron Awnr: Athena wireless node is a radio frequency (RF) device that enables simple, digital control of individual light fixtures in an Athena control system. Enables individual wireless control of each fixture in an Athena control system. Accommodates zone and control changes without rewiring. All drivers on the link are controlled as a single zone. Provided with factory installed components only. Lutron Athena system provided by others.

2.45 DIMMABLE LED TROFFER FIXTURES: REFERENCED PRODUCT LITHONIA VT SERIES

A. FEATURES & SPECIFICATIONS

1. CONSTRUCTION — Rugged, one-piece cold-rolled steel coated polyester, painted after fabrication with embossed facets. Impact-modified, single clear acrylic diffuser provides excellent shielding and wide distribution. End plates include integral T-bar clips. Fixture may be mounted and wired in continuous rows. Total fixture height is only 4-3/8".
2. OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions, vertical and horizontal work surfaces — rendering the interior space, objects and occupants in a more balanced, complementary luminous environment. Linear faceted reflector cavity softens and distributes light into the space while minimizing luminous contrast between the fixture and ceiling. Sloped end plates provide a smooth, luminous transition between fixture and ceiling while enhancing the perception of fixture depth. High-performance diffuser provides LED concealment, even illumination across the diffuser and improved lumen-per-watt performance. Available with two different aesthetics including the standard Acrylic Linear Prismatic Diffuser (ADP) and the Acrylic Linear Prismatic Diffuser with Diffuser Trim Rings (ADPT).
3. ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. 90% LED lumen maintenance at 60,000 hours (L90/60,000). eldoLED driver options deliver choice of dimming range, and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI. Optional integrated nLight® controls make each luminaire addressable, allowing them to digitally communicate with other nLight enabled controls such as dimmers, switches, nLight AIR RIO, RES7 occupancy sensors, and photocontrols. Simply connect all the nLight enabled control devices and the VTLED luminaires using standard Cat-5 cabling, or the nLight AIR wireless network. Unique plug-and-play convenience allows devices and luminaires to automatically discover each other and self-commission. Lumen Management: Unique lumen management system (option N80) provides on board intelligence that actively manages the LED light source so that constant lumen output is maintained over the system life, preventing the energy waste

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created by the traditional practice of over-lighting. Step-level dimming option allows system to be switched to 50% power for compliance with common energy codes while maintaining fixture appearance. Driver disconnect provided where required to comply with US and Canadian codes.

4. **SENSOR**— Integrated sensor (individual control): Sensor Switch MSD7ADCX (Passive infrared (PIR)) or MSDPDT7ADCX (PIR/Microphonics Dual Tech (PDT)) integrated occupancy sensor/automatic dimming photocell allows the luminaire to power off when the space is unoccupied or enough ambient light is entering the space. See page 2 for more details on the integrated sensor. Integrated Sensor (nLight Wired Networking): This sensor is nLight-enabled, meaning it has the ability to communicate over an nLight network. When wired, using CAT-5 cabling, with other nLight-enabled sensors, power packs, or WallPods, an nLight control zone is created. Once linked to a Gateway, directly or via a Bridge, the zone becomes capable of remote status monitoring and control via SensorView software. See page 2 for the nLight sensor options. Integrated Smart Sensor (nLight Air Wireless Platform): The RES7 sensor is nLight AIR enabled, meaning it has the ability to communicate over the wireless nLight control platform. It is available with an automatic dimming photocell, and either a digital PIR microphonics dual technology (PDT) occupancy sensor. It pairs to other luminaires and wall switches through our mobile app, CLAIRITY, which allows for simple sensor adjustment. See page 4 for more details on the Integrated Smart Sensor.
5. **INSTALLATION** — Unique grid interfacing arrangement provides mounting into standard 1" and 9/16" tee bar or screw slot grids. 9/16" allows fixture trim to hang level with architectural ceiling tiles. Drywall ceiling adaptors available. Suitable for damp location.
6. **LISTINGS** — CSA Certified to meet U.S. and Canadian standards. IC rated. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.
7. **WARRANTY** — 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx
8. **NOTE:** Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C.

Performance Data			
Lumen Package	Lumens	Input Watts ²	LPW
20L ADP LP830	2128	17.4	122
20L ADP LP835	2286	17.4	131
20L ADP LP840	2333	17.5	133
20L ADP LP850	2500	17.5	143
33L ADP LP830	3495	29.3	119
33L ADP LP835	3711	29.4	126
33L ADP LP840	3821	29.5	129
33L ADP LP850	4072	29.3	139
40L ADP LP830	4080	35.2	116
40L ADP LP835	4351	35.3	123
40L ADP LP840	4447	35.5	125
40L ADP LP850	4730	35.7	133

Note: Based on ADP diffuser

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2.46 WIRE STANDARDS: ALL WIRE IN OR OUT OF CONDUIT WILL BE TYPE CL2-CL3 UNLESS OTHERWISE REQUIRED BY NEC AND JOB SITE CONDITIONS. PORTABLE CABLE EXCLUDED.

A. WIRE – PORTABLE CONTROL CABLES (those cables for use with DMX512-A and USITT DMX512/1990 Systems):

1. The data transmission rate (250 kbits/s) used by DMX512 requires the selection of a portable DMX512 cable that does not significantly distort the signal or give rise to spurious signal reflections. Cables intended for use with audio systems (such as microphone cables), while having the convenience of flexibility, availability and relative low cost, may not be suitable for use with DMX512 because of their high capacitance and incorrect characteristic impedance; at DMX512 data rates this will give rise to bit time distortion and signal reflections/overshoot.
2. Maximum and minimum cable lengths
 - a. Maximum and minimum run lengths are specifically omitted due to a number of factors, including signal quality, device operating characteristics including capacitive values, and installation environment. Maximum distance runs without repeaters, therefore, shall be determined by standard industry practices of approx. 330 feet. Regardless of the overall run lengths, the system shall run properly, reliably and without errors, glitches, etc. due to improper use of installed/portable cabling or connectors, terminations, etc.
3. Construction
 - a. Portable DMX512 cables shall use twisted pair conductors. Conductors shall be of stranded construction. The raw cable used for a DMX512 cable assembly shall be declared by its manufacturer as suitable for use with EIA-422/EIA-485/EIA-485-A systems. Shielding shall be on individual pairs or overall shielding of pairs or both. The portable cable itself shall be flexible and rugged enough for the repeated coiling and uncoiling to which it will be subjected.
 - 1) Cables implementing only the Primary Data Link shall consist of at least one twisted pair and be marked according to ANSI E1.27-1, Clause 7.1.
 - 2) Cables implementing both Data Links shall consist of at least two twisted pairs and be marked according to ANSI E1.27-1, Clause 7.1.
 - 3) Cables implementing only the Secondary Data Link shall not be allowed.
4. Impedance
 - a. Portable DMX512 cables shall have a characteristic impedance in the range 100 to 120 ohms. Due to the characteristic impedance of 120 ohms in EIA-485 systems, 120 ohms is preferred.
5. Capacitance
 - a. Capacitance between conductors within a shield shall not exceed 19.8 pF/ft (65 pF/m). Capacitance between any conductor and the shield shall not exceed 35 pF/ft (115 pF/m).
6. Dielectric Withstanding Protection
 - a. Dielectric rating for portable DMX512 cables shall conform to prevailing electrical codes.
7. Connection Methods - Required Connector
 - a. Portable cables shall use 5-pin XLR connectors. The physical pin designations of the 5-pin XLR shall be in accordance with Table 1 (see below).
 - b. Any use of alternate connectors shall comply with ANSI E1.11.
8. Electrical Specifications and Physical Layer
 - a. General
 - 1) The physical layer of a DMX512 data link is constrained by earth grounding practices, termination methods, signal levels, EMI, and accidental damage by connection to other devices. Where a conflict exists, DMX512-A shall govern.
 - b. DMX512 Portable Cables
 - 1) General
 - a) A DMX512 Portable Cable is a digital data transmission cable designed for the provisional interconnection of two DMX512 devices. Portable cables shall each have two prescribed connectors, a male 5-pin XLR at the end nearest the transmitting device and a female 5-pin XLR at the end nearest the receiving device. Pins shall be designated 1 through 5. There shall be no connection to the shell.

9. Data link common and grounding topologies
 - a. In all cases Pin 1 of DMX512 portable cable connectors shall act as Data Link Common. The wire connected to Pin 1 shall be no smaller than the wire used for the twisted pairs in the cable.
10. Each data link shall consist of a separate twisted pair.
11. Terminations
 - a. All DMX cabling shall be terminated per applicable standards and so that all devices in any given data run work properly. Use DMX terminators where and as needed and recommended by equipment manufacturers.
 - b. 5-Pin XLR Cabling:

Table 1 – Signal Designations Summary		
Use	5-Pin XLR Pin	DMX512 Function
Common Reference	1	Data Link Common
Primary Data Link	2	Data 1-
	3	Data 1+
Secondary Data Link	4	Data 2-
	5	Data 2+

- c. CAT5 Pinout DMX Cabling: *

Wire Color & #	Function	Equivalent XLR Pin #
1 (White/Orange)	Data + (pair 1 true)	3
2 (Orange)	Data – (pair 1 complement)	2
3 (White/Green)	Optional Data + (pair 2)	5
6 (Green)	Optional Data – (pair 2)	4
4 (Blue)	Unassigned	--
5 (White/Blue)	Unassigned	--
7 (White/Brown)	Common for pair 1	1
8 (Brown)	Common for pair 2	1

* The above table is shows the ANSI E1.27-2 standard DMX pinout when using Category 5 (or higher) wire and an RJ45 connector.

The above table is intended for DMX512 cabling only - NOT DMX-over-Ethernet cabling. Great care must be taken to prevent the accidental connection of DMX equipment to non-DMX equipment. The connection of DMX equipment to non-DMX equipment such as Ethernet switches or telephone equipment may result in serious equipment damage and/or personal injury, as pins 4 and 5 may carry voltages of up to 48VDC or greater. Category wire is not recommended for loose or temporary cabling. The use of RJ45 connectors for DMX equipment should be restricted to patch bays in access controlled rooms and should not be used for the direct connection of portable equipment.

Please be aware that some non-standard pin-outs are also in use (i.e. Color Kinetics, etc.) and that custom cabling, connectorizations, etc. may be required in order to interface non-standard pin-outs with the specified system.

2.47 RACKS AND HARDWARE

A. SWING OUT WALL RACK: DWR

1. EIA compliant 19" wall mount rack shall be Middle Atlantic Products model # DWR-__-__ (refer to chart). Overall dimensions shall be 23.4" W x __" H x __" D (refer to chart). Weight capacity shall be __ lbs. Tool-Free Quick-Mount™ system enables one-person installation. Useable depth shall be __" (refer to chart) and shall extend into the back pan 3.5". Center section and back pan shall be 16-gauge steel, phosphate pre-treated and finished in a black textured powder coat. Rackrail shall be constructed of 11-gauge steel with tapped 10-32 mounting holes in universal EIA spacing with black e-coat finish and marked rack spaces. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either

left or right opening. Rack shall have a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts installed in base, and a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts, four Decora® cutouts, and BNC knockouts for UHF/VHF antennas installed in top. Large laser knockout on back pan shall have a 12-1/2" x 12-1/2" cutout for electrical pull-box. Fan knockouts on top and bottom shall allow for installation of up to four 4-1/2" fans. Rack shall have 2" knockouts, 4" knockouts for Wiremold 4000® Series raceways, and knockouts for UCP Series universal connector panels on the side. Top, bottom and sides shall feature vertical vent pattern. DWR Series enclosures shall satisfy the 2007 & 2010 CBC; 2006, 2009 & 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) "D" with lateral force requirements for protecting 140 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5 when used with DWRSR-ZL Latch. Rack shall be UL Listed in the US and Canada to the UL-2416 (NWIN) Category when used with optional bonding kit, model # PET-K-___. DWR Series shall meet all enclosure requirements towards PCI DSS (Payment Card Industry Data Security Standard) Compliance. Rack shall be GREENGUARD Gold Certified. Rack shall comply with the requirements RoHS EU Directive 2002 / 95 / EC. Rack shall be manufactured by an ISO 9001 and ISO 14001 registered company. Rack shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for the lifetime of the rack.

2. Options

- a. Front doors shall be reinforced 16-gauge steel, model # FD-XX (solid), VFD-XX (vented, 25% open area), LVFD-XX (vented, 64% open area), PFD-XX (plexi), (XX= # of rackspaces of DWR rack)
- b. Keyless Latch replaces keylock, fits front & rear doors, shall be models # LATCH
- c. Rear rail kit 11-gauge, 10-32 threaded, sold in pairs, hardware included, shall be model # DWR-RRXX
- d. Fan kits with two 4-1/2" exhaust fans, fan guards and vent blockers, shall be model # DWR-FK17 (fits DWR-xx-17), DWR-FK22 (fits DWR-xx-22), DWR-FK26 (fits DWR-xx-26), DWR-FK32 (fits DWR-xx-32)
- e. Vent Blockers used to promote active thermal management, shall be model # VBK-D17 (fits DWR-XX-17), VBK-SD22 (fits DWR-XX-22), VBK-E20 (fits DWR-XX-26)
- f. Optional cover plate / shelf kit shall be model # DWR-CVR • Minimum-clearance latch shall allow side-by-side or corner mounting, shall be model # DWRSR-ZL
- g. Optional bonding kit for UL-2416 (NWIN) compliance shall be Middle Atlantic Products PET-K-D/EWR (for backpan to center section), PET-K-D/EWRD (for backpan to center section to front door), PET-K-FD (for front door to center section)

B. RACK DRAWERS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO D SERIES.

1. Provide ONE rack drawer for each CR rack. Locate system as-built drawings and manuals inside this drawer.
2. EIA compliant 19" rackmount drawer shall be Middle Atlantic Products model # DX or TDX (X = # of rackspaces required, refer to chart). Drawer shall have an overall height of ___" (refer to chart), and useable depth of 14-1/2". Drawer base shall be 20-gauge steel, top and sides shall be 16-gauge steel. Drawer faceplate shall be .090" thick aluminum with a ___ (black brushed & anodized or black textured powder coat) finish (refer to chart). Drawer shall use full extension, ball bearing slides. Grommet shall be provided for safely passing cables through the cable entry point at the rear of the drawer on 2, 3 and 4 space models. 2, 3 and 4 space drawers shall include a no-slip drawer mat. Drawer shall have a 50 lb. weight capacity.
3. Drawer shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for a period of three years. Drawer shall be UL Listed in the US and Canada.
4. Drawer shall be GREENGUARD Indoor Air Quality Certified for Children and Schools. Drawer shall be RoHS EU Directive 2002/95/EC compliant. Drawer shall be manufactured by an ISO 9001 and ISO 14001 registered company.

C. POWERCOOL

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1. EIA compliant 19" PowerCool™ Rackmount power distribution and cooling unit shall be Middle Atlantic Products model # PD-COOL-__ (refer to chart), with a __ (15, 20 refer to chart) amp capacity, 2 stage, normal mode (Line to Neutral) spike and surge suppression with dry contact and LED status indicators and EMI filtering. PowerCool shall activate at 87°F (30.5°C), reach full speed at 95°F (35°C) and switch off at 85°F (29.4°C). PowerCool shall displace 50 CFM with a maximum decibel level of 29 dB (measurements made 1 meter from source, centered horizontally and vertically). PowerCool shall operate at a static pressure of .031 in. H2O. PowerCool shall have a removable 10" temperature probe. PowerCool shall have a normally open contact closure for remote surge suppression status notification to customer supplied monitoring device shall operate on 120 volt AC/60Hz nominal power. PowerCool shall have a removable 6' __A (14-3) IEC SignalSAFE™ power cord with IEC C-(14 or 20) receptacle (refer to chart). PowerCool shall have __ (0,1) front and 10 NEMA 5-__R outlets, and (circuit breaker switch with switch guard, keyswitch, always on, refer to chart) located on the front of the unit. "Clean ground" surge suppressor design shall not pass noise contamination to the ground. PowerCool shall occupy one rackspace with a (flat black, black brushed and anodized finish, refer to chart). PowerCool shall comply with the requirements of RoHS EU Directive 2002/95/EC. PowerCool shall be manufactured by an ISO 9001 registered company. PowerCool shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years. PowerCool shall be ETL listed to UL standard 1419 in the US and CAN/CSA C22.2 #60065 in Canada.
- D. MODULAR POWER RACEWAYS: REFERENCED PRODUCT MIDDLE ATLANTIC MPR RACEWAYS. SEE DRAWINGS FOR CIRCUIT QUANTITIES AND CONFIGURATION.
 1. MPR modular raceways shall be Middle Atlantic Products model # MPR-6. Power modules shall be M-20. Isolated ground outlets shall be available, suffix part with IG (ex. RLM-20IG). Stand-alone power modules shall be RLM-xx-1C and shall include a 9' power cord with NEMA 5-15P plug or 5-20P plug. MPR components shall be warrantied to be free from defects in material and workmanship under normal use and conditions for a period of 3 years. MPR components shall be UL Listed separately and as a system in the US and Canada.
 - a. Modules on the same circuit shall interconnect using J series jumpers, which feature #12 (20 amp) wire with genderless 30 amp connectors at both ends and require no hard wiring.
 - b. All modules on separate circuits shall connect using T series tails, which feature #12 (20 amp) wire with genderless appliance-grade 30 amp connector on one end and wire tails for J-box connection on the other.
 - c. Two separate circuits can feed two duplexes on M-2X modules. Remove the factory-installed jumpers (line & neutral) and feed each duplex using two T series tails.
 - d. Isolated ground outlets shall not be mixed with non-isolated ground modules on the same circuit.
 - e. Module chassis shall be constructed of 18-gauge steel finish in a durable black powdercoat.
 - f. The modules shall be attached to MPR raceways using two conveniently located screws.
- E. BLANK PANELS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO BL SERIES.
 1. EIA compliant 19" blank panels shall have a black powdercoat finish. Blank panels shall be constructed of 16-gauge aluminum.
- F. VENT PANELS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO VT SERIES.
 1. EIA compliant 19" vent panels. Vent panel shall be constructed of 16-gauge aluminum and shall have a black powder coat finish.
 - a. VT perforation pattern shall be: 5/32" dia. hole, with 3/16" staggered centers. Open Area 63%
- G. RACK DRAWERS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO D SERIES.
 1. EIA compliant 19" rackmount drawer shall have an overall height of X", and useable depth of 14-1/2". Drawer base shall be 20-gauge steel, top and sides shall be 16-gauge steel. Drawer faceplate shall be .090" thick aluminum with a black brushed & anodized finish. Drawer shall use full extension, ball bearing slides. Laser knockout shall be provided for passing cables

through the rear of the drawer. Drawer shall be UL Listed in the US and Canada. Provide all drawers with keylock option.

2.48 LED RACK WORK LIGHT: REFERENCED PRODUCT MIDDLE ATLANTIC LT SERIES

A. Features:

1. LT series shall have an adjustable width of 17.73" to 21", a height of 1.75" and a depth of 1.72".
2. LT series shall have a light temperature of 2,700-6,500K, and provide __lm (refer to chart).

	Light Qty	Interconnect Cable / Length	Light Temperature	Lumens
LT-CABUTL-SINGLE	1	no	2700-6500K	480-540lm
LT-CABUTL-DUAL	2	yes / 118 [3000]	2700-6500K	960-1080lm

3. LT series light bar shall have an adjustment range of 100°. LT series shall have a cord length of 59", and the interconnect cable (LT-CABUTL-DUAL only) shall be 118".
4. LT Series shall include power adaptors for US, BS, SAA and EU. LT Series shall have a UL Listed power supply that meets US DOE Level VI requirements with an output of 12VDC, 2 Amps.
5. LT Series shall have an input voltage range of 90VAC to 260VAC, an input frequency range of 50/60Hz, and a max AC current draw of 800mA AC.
6. LT Series shall meet the EU RoHS Directive 2011/65/EU. LT Series shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years.
7. LT Series shall be CE Marked (single light only) and FCC Part 15, Class B.

B. Technical Specifications:

TECHNICAL SPECIFICATIONS	LT-CABUTL-SINGLE	LT-CABUTL-DUAL
INPUT (AC/DC ADAPTER)		
Input Voltage Range	90VAC - 260VAC	
Input Frequency Range	50/60Hz	
Max AC Current Draw @ Full Load	800mA AC	
OUTPUT (AC/DC adapter)		
Nominal DC Output Voltage	12VDC	
DC Output Voltage Range	11.4VDC - 12.6VDC	
Typical DC Current Draw	Single Light 0.6ADC, Dual Light 1.2ADC	
Max DC Load Current	2.0ADC	
Short Circuit Protection	Yes	
DC Output Connector	3.5mm x 1.35mm x 12mm, Center Positive	
PHYSICAL (AC/DC adapter)		
Dimensions	1.8 x 3.5 x 1.5 in (45.5mm x 88mm x 38mm)	
AC Receptacles	Four (4) Interchangeable: US, BS, SAA, EU	
Weight Lb. (G)	0.39lb (175g)	
REGULATORY(AC/DC adapter)		
Safety	UL, cUL, CE	UL, cUL
EMI (Adapter and Lights)	FCC Class B, CE	FCC Class B
Efficiency	Meets US DOE Level VI requirements	
ENVIRONMENTAL (lights and AC/DC adapter)		
Operating Temperature	32F TO 104F (0C TO 40C)	
OPERATING RELATIVE		
Humidity	0 TO 90% NON-CONDENSING	

2.49 BILL OF MATERIALS

- A. Dimming system equipment, console and all accessories and controls - see drawings for equipment, quantities and required coordination with the EC and other related trades.
- B. Relay system equipment, console and all accessories and controls - see drawings for equipment, quantities and required coordination with the EC and other related trades.
- C. Lighting fixtures: See drawings for quantities, types, lamps, locations, installation requirements, etc.
- D. Provide all theatrical fixtures with C-clamp, safety cable, lamp, gel frame and connector as called for on the contract drawings and/or to match existing devices (provide adapters as necessary for all fixtures that require them in order to interface with any existing and reused system equipment). Swap out connectors as required when reusing existing system equipment.
- E. Every portable cable shown or referenced on the TL series drawings shall have one 24" piece of black tie-line (Samson black braided tie cord/sash cord or equal - breaking strength 100 lbs./WLL 15 lbs., rip-tie hook & loop black Velcro or equal) choked onto one end (near connector). Provide two full 500'/600' rolls for this project and leave the remainder on site for the owner's future use upon project completion (or at least 1/2 roll, whichever is more). This does not include two-fer cables under 5' long in overall length. Provide 16" tie line for portable cables under 8' in overall length.
- F. Provide gels (cut to size, installed and ready to use) as well as all necessary hardware for all followspot fixtures' boomerang or other color changing apparatus. Provide manufacturer's standard colors. If the manufacturer doesn't furnish colored gels for the boomerangs, then provide Rosco gel colors as determined by the owner or the owner's representative.
- G. Provide and install the gobo holder with the soft diffusion gel (comes standard with all ETC LED ellipsoidal fixtures) in each related fixture.
- H. Furnish extra (spare) lamps for all fixtures provided. Quantity to be equal to 10% for each different type of incandescent lamp provided. Store all spare lamps as per the owner's instructions in their original manufacturer provided packaging.
- I. Theatrical Fixtures: Contractor shall be prepared to swap out, at no additional cost to the owner, any different or additional lenses or fixture barrels for the specified fixtures that may be needed due to field conditions, focus plot intents, etc. and that were not specified in the contract documents (except specialty beam patterns, such as 5, 10, 14, 19, 50, 70 – those lens barrels would be provided at additional cost to the owner). If there are no specific lenses called out on the drawings for the LED fixtures, then the contractor shall still be responsible to provide lenses dictated by the field conditions, focus plot and the consultant – typically this will be a maximum of two lenses per fixture. If the specific fixture barrels called out on the drawings do not provide the intended patterns, etc. that are needed and desired by the focus plot intents or consultant, then the contractor shall provide barrel swaps for all affected fixtures so that the focus plot functions as intended – typically this will be only one barrel per fixture.
- J. The providing contractor shall furnish extra (spare) LED house/work/hi-bay lighting as indicated. All spare fixtures shall be set up and addressed ready for use (seamless replacement fixtures) and along with any specialty items required (swivel mounts, stems, drivers, etc.). Quantity to be equal to 10% for each different type, style, pattern and intensity of fixtures he has provided (round up to the next nearest whole fixture quantity). Store all spare fixtures as per the owner's instructions in their original manufacturer provided packaging, well marked with all appropriate nomenclature as to installation locations, mountings, etc.
- K. Furnish all portable cables shown on the bid drawings plus any and all additional portable cabling, adaptors, turn-arounds, termination devices or misc. interface devices needed in order to present the owner with a complete, fully-functioning system (even if those devices or cabling do not specifically appear on the drawings but are required for the system to function).

- L. Provide all DMX terminators as necessary for all DMX controlled equipment.
- M. Due to the difficulties involved with a large-scale burn-in of the houselighting fixtures, the providing contractor shall be responsible to replace any failed LED houselighting fixture at no additional cost to the owner for a period of 12 months from the date the facility is turned over to the owner, complete. This includes any and all fixtures, additional third-party DMX/RDM programming, lighting control system interfacing and manufacturer assistance, misc. parts, lifts/scaffolding, installation labor, portable cabling, fixture addressing, control wiring, power, rack assignments/resets, programming, etc. as required to make all new fixtures seamlessly integrated into the existing system as originally intended.

PART 3 - EXECUTION

3.1 GENERAL:

- A. All liability for rigging, fastening, wiring and other installation methods shall be borne by the contractor alone. If the contractor has a reason to believe that safety will be compromised in the installation of any specified equipment in the locations specified, they must note this at the time of bid and offer alternatives in writing.
- B. Assess life safety implications of all installation methods and verify there is no compromise of life safety issues.
- C. Any dangerous work areas must be marked or roped off in a manner that will inform all persons as to potential danger, regardless of that person's sensory handicaps.
- D. Maintain M.S.D.S. for all materials used where applicable and submit same if requested upon completion.
- E. Maintain the integrity of all fire-walls and doors during construction and upon completion.
- F. Take all precautions necessary to guard against electromagnetic interference, electrostatic hum and RF interference, especially into the audio and video systems.
- G. The contractor shall supply adequate ventilation and will install all equipment for the maximum safety of the operator.
- H. The contractor shall verify all on site dimensions prior to the ordering or installation of critically dimensioned equipment and wiring. In a case of discrepancy between these documents and attached drawings, construction documents and actual on-site dimensions, the contractor will notify the owner and consultant in writing before making any changes in intended work. The owner and consultant will determine the correct modification to the work that needs to be done
- I. All methods must be cosmetically acceptable to the owner. All equipment shall be installed neatly, with respect to level & plumb, sight lines and finish. All wiring must be neatly run and concealed in an orderly fashion and attached to appropriate support structures.
- J. Identify any equipment requiring licensing and initiate licensing procedures for all such equipment.
- K. Coordinate all work with other on-site trades in order to achieve a coordinated progress at all times.
- L. All RDM fixtures (remote device management) shall incorporate the latest RDM standard in fixture addressing, remote management, reporting, etc. (must be ANSI E1.37.2 or later compliant).

3.2 WIRING AND RACKS:

- A. All CR (communications rack) wiring shall be neatly tie wrap bundled (or as indicated otherwise on contract drawings) with wires parallel and perpendicular to rack sides and backs All wiring shall be properly strain relieved as it exits the rear connection points on the related equipment, shall be routed out to lacing bars, shall be routed out along lacing bars to rack side areas and shall be tie

wrapped to the lacing bars. All rack wiring shall be performed as noted. Loose, haphazard or otherwise poorly managed wiring without proper strain relief shall not be allowed.

- B. Provide all internal network/DMX style wiring, etc. Needed inside the relay panel & all required interconnections & feeds to external equipment.
- C. Control hookup is provided by the factory technician.
- D. Within the dimmer/relay rack all wiring splices must utilize butt style line insulated splices crimped with a controlled cycle termination tool. Referenced style Panduit BSV10X-D or equal. Size splices per gauges of wiring to be spliced. See written specifications for more info.
- E. All wiring that is not in conduit shall be plenum rated wiring (Belden 1585A or equal).
- F. All control booth wiring shall be neatly tie wrap bundled and dressed neatly.
- G. All lighting or power cables & wiring must be dressed neatly with tie wraps & eyes or ring runs & tucked up against underside of lighting countertop
- H. No undue stress shall be placed on any connection by a lack of support of the wiring within the rack.
- I. Any wiring splices necessary must utilize butt style inline insulated splices crimped with a properly adjusted controlled cycle termination tool. Referenced style Panduit BSV10X-D or equal. Size splices per gauges of wiring to be spliced & provide as required. No incorrectly sized splices shall be allowed.
- J. Any equipment having accessible controls that are not normally used during system operation will have its controls capped or otherwise locked such that they are not adjustable. If no other means is feasible the use of security covers is mandated. Rack doors are not acceptable as means of tamper resistance for controls.
- K. Provide all (rack panels, bottom/top pans, spreader bars, access panels, etc.) blank and/or vent panels as needed to complete each rack with no unfilled spaces, as per rack elevations or as required by alternates to equipment specified. No racks with unfilled panel spaces shall be allowed. Seal all air gaps around conduit entry holes as needed in order to keep air gaps to a minimum.
- L. Wiring Standards - Plenum Rated Cable: Unless specifically noted on the drawings, all low voltage wiring is to be CL2/CL3 wiring.
- M. No rack rails will be allowed for equipment mounting in the rear of the rack unless otherwise noted in this specification.
- N. All conduits indicated on the drawings shall terminate directly into racks as shown – top, bottom or at any of the provided knockout locations (unless otherwise and specifically indicated on the drawings as otherwise) and so as not to obstruct access to the racks or adjacent walkways or approaches.
- O. Route conduits into racks with as few bends as possible – use sweep elbows where necessary. All wiring shall be protected in conduit until it has reached the internal space of the indicated rack(s).
- P. All dimming/lighting system related racks shall be mounted vertically and as intended by the manufacturers. No racks shall be allowed to be mounted horizontally.
- Q. The contractor shall program the main dimmer rack(s) control module(s) to “hold last look” upon loss of DMX signal. Duration of this hold shall be for 15 minutes (unless the system has been shut down or turned off by the architectural control system). This shall prevent the room from going dark in the case of lighting console failure or inadvertent disconnection of DMX/NET input from lighting control console to the system.
- R. ELECTRICAL & GROUNDING:
 - 1. Grounding of shields and chassis will adhere to industry standard practice and as required by the dimming & control systems manufacturer.

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2. Verify that all hot, neutral and ground conductors are tightened at least 5 days after initial installation and landing of line & load conductors.
3. Any AC service shall be installed to standard Edison U-Ground style outlets at the locations noted on the electrical drawings. Where racks are located the service is to be run to the interior of the rack. Two U-ground outlets will be available for each 20-amp, single-phase circuit unless otherwise indicated or terminated into MPR style devices.
4. Internal rack AC distribution is the responsibility of the contractor. Acceptable methods: Rack mount power strips, rack mounted power distribution devices, Wiremold style outlet strip.
5. Install all internal AC rack power with all switches and controls carrying hazardous voltage housed in steel enclosures within the rack. Provide positive electrical grounding for all steel enclosures. All AC service will incorporate separate hot, neutral and ground for each device. All grounds and neutrals will be appropriately bonded and connected to earth as required by codes and normal practice.

S. CONDUITS:

1. Use separate conduits for data and other control cabling. Control power and ground may be run with data for the same devices.
2. All conduits shall be concealed unless the owner has been notified in writing and accepts by written approval the location of all exposed conduits.
3. A pull string shall be left in place by the installing contractor after pulling all wiring through each conduit. This pull string shall be tied off at both ends and left for future use.
4. All lines, cabling or wiring in any conduit run must be free from any splices or junction points.
5. All lines, cabling or wiring must be free from damage. Any that exhibits stress, damage, intermittent signal problems, data errors or other anomalies due to excessive pull torque shall be replaced.

T. JUNCTION/GANG BOXES:

1. Unless otherwise specified all controls, receptacles, user interface stations, plugs and outlets shall be located in an appropriately sized gang box. No multi-gang backboxes with raised, tile ring, extension ring or mud ring style reducers to obtain the specified faceplate gang size shall be acceptable in lieu of the indicated device backbox.
2. Any junction (i.e. terminal blocks, punch down blocks etc.) shall be housed in metal enclosures with an attached ground. No such connections may be made in ceiling spaces or other areas without the use of a steel enclosure.
3. Any field added junction boxes shall be sized and located for ease of troubleshooting access and all connections within shall be connected on terminal strips, which are clearly identified, in a logical, consistent & permanent manner.

3.3 ASSEMBLY AND PRE-TEST:

A. LIGHTING FIXTURES:

1. Install connectors as required on fixtures prior to bench test and focus.
2. Attach all safety cables to fixtures by removing one yoke bolt and sliding the fixed end loop of the safety cable over the yoke. Reinstall the yoke bolt.
3. All incandescent lamps shall be burned in for at least 8 hours to check for defective lamps. Replace any lamps that fail and burn those lamps in for at least 8 hours.
4. Adjust incandescent lamp center for highest output flat field (bench focus). This is required for any new and/or existing to remain and be reused fixtures.
5. All LED fixtures shall be DMX addressed, set up in the proper color mode, have fan speeds set to quietest mode of operation, etc. and tested with addressing in place.
6. Each LED fixture shall be turned on and "burned in" at full for (2) weeks in the contractor's shop in order to check for defective power supplies, drive electronics packages or other fixture anomalies.
7. See TL series drawings for a more complete description of the procedures recommended for bench focusing of fixtures.

B. LIGHTING EQUIPMENT (OTHER THAN FIXTURES):

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1. All new equipment shall be turned on/burned in and tested prior to delivery to the site. No equipment may be delivered to the site without being fully tested off-site. The equipment does not need to be under load during this period. This includes, but is not limited to, the lighting control console, fader wing panels, video displays/monitors, remote focusing units, Blues System power supplies, portable network gateways/nodes, architectural control processors, followspot fixtures and related power supplies, network switches, portable dimmer devices and any other lighting related portable equipment. Burn in requirements do not apply to installed dimmer racks, grid iron junction boxes, individual dimmer modules or DMX distribution racks.

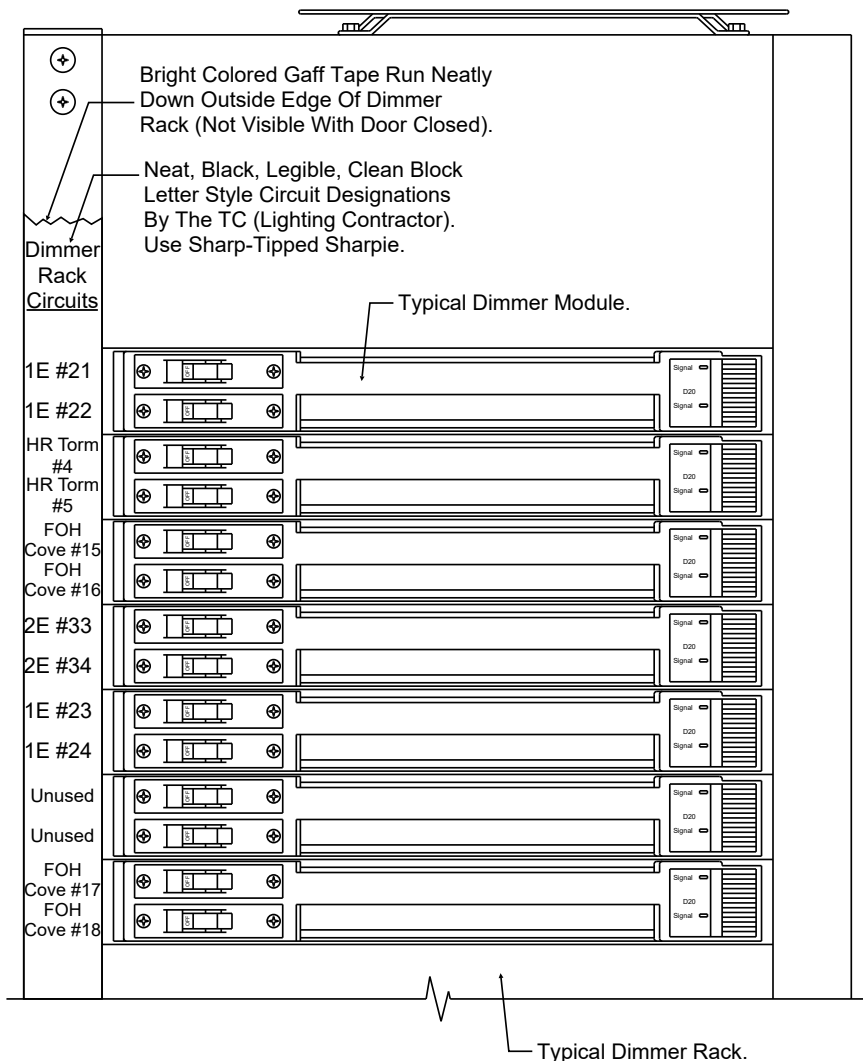
3.4 FINISHES & CLEANING:

- A. All finishes shall be returned to their original finish and condition after any temporary machining or other work.
- B. Cover any walls, furniture, finished floors and carpeted areas to catch all metal particles, grit, etc. that may occur during installation.
- C. Cover and protect all equipment left or installed on site during construction.
- D. Provide thorough cleaning of all work areas including vacuuming, spray cleansers and dust removal as required. Clean all equipment fan filters before final acceptance tests.
- E. Provide a thorough cleaning of all lighting system and related devices, including but not limited to, fixtures, housings, racks, cables/cordsets, data lines, reflectors, lenses, modules, mounting pipes, controls, consoles, etc. regardless of status (new or existing to remain/reuse). Cleaning shall be after all dust/dirt creating work has been completed and just prior to walk-through/punch list and turnover to the owner.
- F. Maintain clean work areas, removing all debris daily.

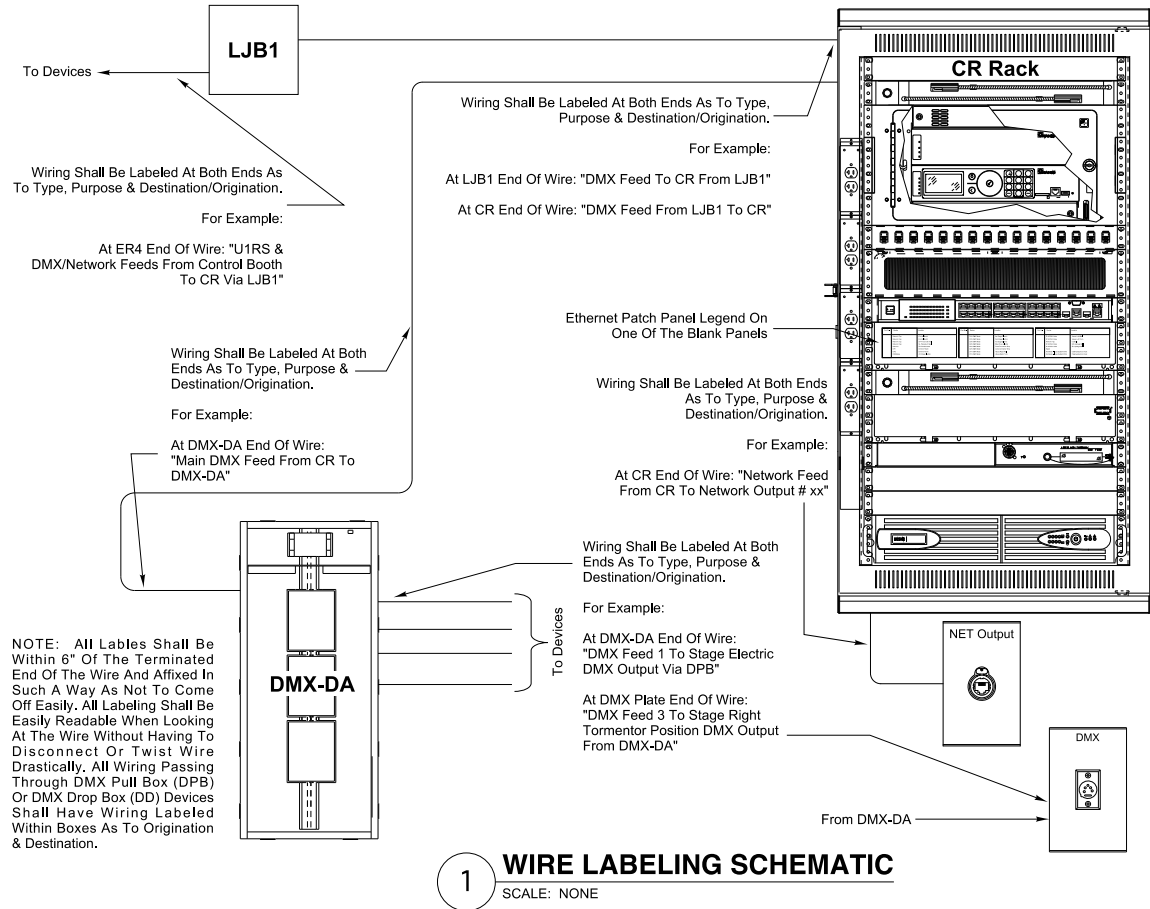
3.5 LABELING:

- A. All switches, cables, wire, controls and outlets will be permanently and logically marked during installation. Submit to the consultant for approval a listing of intended nomenclature. Where possible engrave directly upon plates and assemblies. Where disassembly would be required the use of adhesive or screw on engraved labels will suffice. Engravings will be paint filled for best contrast with black or white paint.
- B. Do not use Dymo style labels or hand lettering. No cables shall be labeled with masking tape, gaffer tape or other material subject to degradation. Such labeling may be done on a temporary basis during installation so long as all such labels are removed and their adhesive cleaned off when final labeling is applied. Self-laminating labels are preferable for the final labeling system.
- C. Permanently mark cables with an identifying label at each end in a consistent, logical manner.
- D. Color-coding of the entire system shall be logical and adhere to accepted industry standards.
- E. The contractor shall provide the owner with a laminated hard copy chart (Microsoft Excel style) of the dimmer channel assignments and locations along with any soft patched devices, DMX assignments, Network assignments, house, accent and worklighting channel assignments, submaster assignments, etc. to be left at the control console location.
- F. The contractor shall label each circuit in each dimmer rack as to its destination (permanent black marker on bright colored gaff tape is acceptable – printed legibly). Contractor may also use any style of durable, stick-on, printed style labeling that will remain adhered, is approved by the manufacturer, does not violate NEC and is large enough to easily read. Example for circuit #32 would be – “1E #32” (First Electric, Circuit #32) OR example for circuit #2 would be – “Cove, Circuit #2” OR example for circuit #102 would be – “Houselights R1” (row 1 of houselights). Contractor shall also provide multiple copies of a typed “spreadsheet-style” sheet showing all circuit assignments along with their destinations, designations, descriptions and locations to the owner for

future reference. Place one laminated copy of this sheet on the wall beside the dimmer rack. See diagram below for more info. This includes any existing and to be reused dimmer racks - layout may deviate from what is shown due to physical differences and constraints of existing racks vs diagram that follows. In that case, provide labeling for each such rack that is as similar to what is shown as is possible, while placing labels as needed and in locations that make sense, do not impede airflow, module removal or rack functionality or violate existing rack manufacturer's specifications.



- G. The following schematic diagrams have been provided as examples of acceptable and intended wiring & patch panel legend labels to be included for all racks, wiring destinations & originations: (these schematic drawings are diagrammatic only and do not reflect all of the actual parts and/or components, etc. designed into this project.) Contractors (Both EC and lighting contractors) shall use these schematic diagrams as guides and references and label or wire all related and additional devices in a similar manner to those shown here. These diagrams are typical of all lighting related devices, communications racks, etc. designed into this project. The intent is for all portions of this project to be labeled in a concise, intelligent and consistent manner.



3.6 RIGGING:

- A. The following minimum standards apply in addition to the standards referenced elsewhere in this specification. These guidelines do not negate the standards referenced elsewhere in this specification.
- B. All equipment not described as portable in this specification will be rigidly held in place as per the manufacturer's recommendations or as indicated.
- C. All equipment (except luminaires) will be supported at a minimum of three points plus a backup. Each point shall be able to carry the entire rated load with a safety margin of at least five (5) times the rated load. All methods shall incorporate an independent safety backup with a safety margin of at least five (5) times the rated maximum load as installed in case of failure of any rigging component. All safety cables shall be installed so that they have little to no slack in order to reduce shock loading in the event of a catastrophic failure of the primary attachments.
- D. Theatrical lighting fixtures will be supported by their primary attachment point, either C clamp or factory supplied or other specified clamp (such as a Megaclaw style clamp for motorized lighting fixtures). A safety cable rated for at least 10 times the rated static weight of the fixture will be utilized as a safety backup in case of a failure of the primary attachment point.
- E. All rigging and related fastening methods must be treated as permanent. All threads shall be treated with vibration compounds such as Vibratite or Loctite as per manufacturer's recommendations and shall be visible upon inspection.
- F. All rigging hardware shall be load rated with the load rating or approval stamped on each piece of hardware.

- G. No chain of any type will be acceptable for the hanging or backup support of any equipment except in the case of trim chains.
- H. All trim chain shall be Peerless black theatrical chain type or equal.
- I. No fabric or plastic devices of any type will be considered as acceptable methods of hanging of any equipment.
- J. No stainless steel or galvanized wire rope shall be secured with Crosby clamps or other threaded type fittings alone. Compression type closures such as Nicopress with thimbles and copper sleeves ONLY must be utilized for all wire rope terminations. Each closure must have a backup closure. All wire rope is to have strain relief thimbles installed where it attaches to other rigging components. The contractor shall never violate the minimum bend radius when using or installing wire rope.
- K. All loose ends of the wire rope will be neatly taped down after Nicopress is installed and crimped. No frayed rope ends will be allowed under this specification. This includes safety cables.
- L. All Nicopress or equal compression connections and wire rope swaging products utilized on this project shall be required to pass field gauge tests as to their proper terminations and compression (typically referred to as go-no-go gauge tests). Due to the sheer quantity of manufacturer's and the varying types/styles of compression tools in use, this will require the contractor to provide the proper go-no-go gauge during acceptance testing (punch list) for each different compression tool utilized on the project (typically a specific gauge is provided with each tool purchased). This gauge will be turned over to the consultant for use in verifying that the correct compression has been performed on the oval sleeves. It is understood that the consultant cannot test every single oval sleeve but will, instead, check a random percentage of sleeves that will be assumed to be typical of all similar compression fittings on this project. It is the contractor's responsibility to verify, during installation, that every oval sleeve has been compressed properly and that it passes the go-no-go gauge test.
- M. All Nicopress of equal compression connection thimbles shall be loaded (mounted) only on a round shaft. Thimbles through a punched hole or other where the thimble encounters an edge shall not be allowed.
- N. Nothing shall be allowed into the interior of any Nicopress or equal compression connection oval sleeves except the wire rope itself. Any taping of wire rope ends shall be performed only after all compression connections are properly swaged.

3.7 ROUGH-IN:

- A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. DO NOT SCALE PLANS. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the owners representative for approval before proceeding.
- B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.
- C. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.
- D. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved roughing drawings giving exact location for each piece of equipment.

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Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment.

- E. For equipment and connections provided in this contract, prepare roughing drawings as follows:
- F. Where more than one trade is involved in an area, space or chase, the contractor shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements.
- G. Provide code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation.
- H. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location. Submit as part of submittal package prior to installation. Do not install prior to written approvals.
- I. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings. Submit as part of submittal package prior to installation. Do not install prior to written approvals.

3.8 CUTTING AND PATCHING:

- A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction" for additional requirements. Patch all cut or abandoned holes left by removals of equipment or devices. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering or other finished surfaces. Patch openings and damaged areas equal to existing surface finish (i.e. "patch to match existing"). If no instructions exist in the contract documents addressing these issues, then the contractor shall contact the architect and construction manager in writing prior to proceeding with any work in order to obtain written instructions regarding this type of work.

3.9 CONCEALMENT:

- A. Conceal all contract work above ceilings and in walls, below slabs and elsewhere throughout building (this does not include lighting fixtures, control consoles, user interface stations, etc.). If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review and written authorization and instructions on how to proceed.

3.10 PERFORMANCE:

- A. The systems will be utilized for lighting various types of performances from solo artists to large groups. The intent is for the preset lighting controls to accommodate most of the general lighting needs. The owner will compile a list of presets to be loaded into the control system. These presets will consist of a prefocused aiming of all lighting instruments.
- B. All LED fixtures shall exhibit quiet operation (the preference is for all fixtures to be convection cooled). Audible requirements for ALL LED fixtures is as follows:
 - 1. No LED fixture shall be allowed that exceeds an NC10 noise curve as measured 4' – 0" from any point of the fixture.
 - 2. NC measurements shall be dBA and measured in 1/3rd octave resolution.
 - 3. For fan cooled devices, the fans are normally to be set up and operated in auto mode.
 - 4. Any fixtures and fixture fans that exhibit that develop a tonality within the first 12 months of use shall be replaced by the contractor at no additional cost to the owner and within a reasonable amount of time (typically less than 2 weeks).

** Tonality shall be defined as any frequency or frequency bands that are narrower than 1/3rd of an octave that exceed the average adjacent background level by more than 3

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dB as measured on an FFT style trace. This is typical of both fundamental frequencies as well as any related harmonics.

- C. For relay circuits powering LED fixtures, set dimmer profile to be on in all cues, etc. So that LED fixtures are always powered on during performances. Relays shall be set to be turned off when system is not in use in order to preserve drive electronics' estimated max life cycle. Perform this function in the architectural control system programming software.
- D. Program all theater lighting presets to maintain the minimum required egress levels of lighting at all times and in all cues based upon life safety code nfpa101 & local building codes. The minimum egress lighting level is .2 fc.
- E. Provide custom signage for the dimmer/relay rack location as indicated. Provide all nomenclature indicated plus additional as applicable. Mount signage on an adjacent wall near the dimmer/relay rack as space allows.
- F. Provide the consultant, owner and architect with the following files as it regards the lighting system, control console, paradigm system, misc. Devices and controllers. All project related final lighting system files shall be provided in both compiled and uncompiled (editable) formats and in the current software/firmware format. All files must be named so that identification as to project, file type/intent, etc. Is readily identifiable from the name alone. Provide all files saved to a thumb drive:
 - 1. ETC Paradigm Lightdesigner config file
 - 2. ETC concert config file
 - 3. ETC console config file
 - 4. All console template files
 - 5. Network system config files
- G. LED fixtures: all fan-cooled LED fixtures must have the ability to be run at full light output (typically full white) for a 4 hour minimum without light output reduction and without the fan speed ramping up to a level noticeable to a listener from a distance of 6' - 0" away. Fan speeds must be assigned to a DMX channel, configured by the setup technician and locked so that they are at the lowest fan speed setting possible while still maintaining full light output out of the fixtures. The cumulative fan acoustic output must be inaudible in the seating area, no matter how many LED fixtures are on. This configuration must be field verified on site for an 8 hour minimum - (2) 4 hour cycles. The total light output shall, at no point in time, be allowed to automatically dip below 90% overall output (unless specifically being dimmed for a theatrical reason) in order to enter a "self-protection" mode or other automated cycle designed to prevent the fixture from overheating. See written specifications for more information and noise curve requirements for all LED fixtures.
- H. Provide the owner with a copy of the pathway Pathport manager gateway configuration editor (5.3 or later), via manager software (if applicable) DMX/RDM device configuration softwares and 12 hours of additional training on those platforms (in addition to training noted elsewhere on the drawings or in the written specifications) so that the owner or owner's designated operators will have a full working knowledge of how to address, readdress, maintain, troubleshoot and reconfigure the network gateways located within this system.
- I. Post a complete copy set of the lighting system one-line diagram, system as-built drawings, laminated excel spreadsheets of all circuit & DMX/network assignments, etc. as listed on TL flow diagrams) in the CR rack drawer. Provide an additional laminated circuit assignments sheet for the lighting console position.
- J. Training & Instruction:
 - 1. Provide all on-site owner training, software training, architectural system preset programming (including pushbutton & LCD stations), edited DVD training video, bench & field focus of fixtures, etc. As detailed on the bid drawings and in written specifications. (training, DVD, focus and programming time is extensive and detailed). See specs for total quantity of hours of training, focus and software programming requirements that the owner is entitled to as part of this bid package. All items shall be provided as a part of his bid at no additional cost to the

owner after bid. Owner is not obligated to receive all training time; however, all training time, etc. As listed above, in written specifications and on the bid drawings is the sole responsibility and obligation of the contractor to provide. All training shall be at times and in duration as directed by the owner and shall be held on-site at the owner's facilities.

2. Give the owner detailed and specific instructions on powering/depowering and the insertion/removal of PowerCon power connectors for any LED fixtures included in this project. Since the PowerCon connector is a connector without breaking capacity, these connectors should not be inserted or removed under load or when live. Per the manufacturer's instructions, the user is to disconnect the end of the power cable that is plugged into the wall outlet/distribution first and prior to insertion/removal of any PowerCon connectors. Failure to do so may damage, pit or char the contacts inside of the PowerCon connector, rendering them unable to make proper contact and unusable without replacement of the PowerCon connectors. Any such damage to the PowerCon connectors due to failure to disconnect the fixtures from power first will result in factory repairs that will not be covered under warranty.
3. Give the owner detailed and specific instructions on (as well as turning over a copy of the manufacturer's safety notice data sheet) on the hazards that may be associated with the improper use of Neutrik PowerCon True1connectors.

K. LIGHTING SYSTEM NETWORK:

1. Design and provide all LCD touchscreen layouts as indicated in the written specifications.
2. Provide all ethernet style switches to be power over ethernet switches with all ports/outputs powered. Provide quantity of switches and outputs in order to output signal to all lighting system network devices.
3. After final system setup and configuration, provide the owner with a usb flash memory drive (memory stick or thumb drive) device with a complete copy of the "as built" system configuration stored on it - including electronic as built drawing set (4 GB drive - in addition to other drives noted).
4. Instruct the owner on how to make basic system and preset setup changes with a standard web browser (via Lightdesigner access).
5. The lighting system network shall not be hardwired to or capable of being interconnected with the building-wide network or direct access to a gateway providing internet (world wide web) access. The lighting system network is comprised of simple network devices that do not have the capability or protection to remain immune to viruses, etc. The lighting system network must remain a stand-alone network. Failure to segregate the lighting system network from the building-wide network and internet access could result in a catastrophic failure of the entire lighting network and loss of vital data (including show files, system patch, fixture profiles, default system setup, etc.) If infected with a computer virus, and which would result in the need for a total system reboot back to factory defaults (all "as built" system configuration files would then need to be recreated from scratch).

- L. Verify the load requirements for all PoE switch outputs and the related devices being powered via the network switch. Provide a switch that is capable of powering all network devices & outputs indicated per the manufacturer's recommendations.
- M. Perform all DMX and network programming, dimmer assignments, device addressing and related software/firmware setup, LED setup, modes and addressing, etc. All LED fixtures, network gateways, houselighting fixtures and RDM setups and any other DMX/network/RDM addressable devices shall be addressed in an intelligent, consecutively numbered, individually addressed manner prior to completion of the project and final acceptance tests.
- N. Work closely with related trades in setting up, testing, verifying and tweaking the houselighting system, lamps, etc. In order to get consistent and acceptable results. This includes DMX/RDM setup of houselighting fixtures, populating those fixtures into the architectural control system, dimming rack control module and lighting control console, dimmer module curve settings, providing/swapping out indicated modules for modules that will control the associated fixtures better (i.e. ELV's for D20e's, etc. As needed), assisting in visual confirmation of performance acceptability, recording lighting performance visuals for record and any other items as noted in ec houselighting notes or

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other required coordination. Obtain a written sign-off acceptance by the owner of visual performance of the houselighting system prior to finalizations & programming.

- O. All connector strip, outlet box, gateway, etc. Devices must have the proper grommets and strain relief devices in place from the point where the loose or multicable wiring enters the device and at all connection/transition points into the related device. Devices without grommets and strain relief shall not be allowed.
- P. Verify the actual electrical loading demands of all devices plugged into indicated UPS devices and provide appropriately sized backup UPS devices as needed, even if that means providing upsized devices beyond what is indicated in order to meet the actual electrical demands of the serviced devices. No UPS device shall be allowed to be loaded past 90% of its rated capacity.

3.11 INITIAL POST COMPLETION TESTS & SET UP:

A. FIXTURE FOCUS & SET UP:

- 1. The lighting plot shown on drawings is not necessarily the plot the contractor will hang. Verify with the owner prior to fixture hang that they do not have an alternate plot they want hung.
- 2. Theatrical Focus: The contractor shall be responsible to hang and focus all fixtures indicated on the bid drawings. Theatrical focus shall be directed by the owner or by a designated owner's representative.
- 3. In the event that there were previously removed theatrical style fixtures that are to be reinstalled, the contractor shall be responsible to rehang and focus all previously removed fixtures in a similar fashion as they were prior to the start of this project or as directed by the owner.

B. Focus Hours Required

- 1. Focus Day Requirements For 100 - 125 Theatrical Fixtures: The contractor shall be responsible for (2) two full days of focus (16 hours) and (3) three full days (24 hours) of programming maximum (in addition to any other programming requirements listed elsewhere in this specification). The contractor shall focus all fixtures with the owner or a designated owner's representative present.
- 2. Man-Power Requirements (Counterweight System): The contractor shall supply (3) three qualified lighting technicians for the day of focus and (4) four walkie-talkies or intercom belt packs, power supplies and all related required cabling. The contractor shall supply a manlift and either extension or stepladders for the day for focus.
- 3. Intent of Theatrical Focus: The intent of the theatrical focus is for the contractor to hang the fixtures indicated on the drawings to their related and indicated pipe batten & tormentor locations and then to focus or aim those fixtures in a logical fashion toward the stage or pit areas (depending on fixture location intents) in order to establish a base-line lighting plot for typical events. If a focus plot has been included, then this is what the contractor shall use as a basis for his rough focus. If the owner has a specific focus plot; however, that they wish executed, then the contractor shall focus all fixtures as directed by the owner (the owner's wishes shall supersede all directives here or on the drawings). This includes, but is not limited to, general area washes for the pit and stage areas, even borderlight style colored washes, lectern focus lighting, seamless cyclorama illumination, basic backlighting setups and general area lighting for choral events, orchestral events, lectures, worklight setups and basic stage usage events. The intent for this initial focus and hang is not for the contractor to generate and/or execute a detailed lighting plot for specific theatrical shows and performances. The intent is also not for the contractor to act as a lighting designer or technical lighting advisor. The focus day(s) may also require the contractor to swap barrels, relocate fixtures, swap color changing devices, etc. as directed by the owner.
- 4. Specific ladder style to provide depends upon accessibility and physical restrictions present in the auditorium. Stage fixtures are typically focused from a man-lift, scaffolding or stepladder. Tormentor position fixtures are typically focused with a stepladder on flat floor areas or with an extension ladder for sloped floor areas. All accessible areas reachable with a man-lift shall utilize a man-lift for both hang and focus as this presents the safest method of installation.

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Neither the contractor nor any related personnel shall be allowed to "ride" counterweight sets or motorized truss/stage electric sets or climb tormentor or Shakespeare assemblies in order to hang and focus lights in lieu of utilizing ladders or a man-lift to access lighting support positions.

C. ARCHITECTURAL CONTROL STATIONS:

1. All architectural control stations (pushbutton, key stations, LCD stations, etc.) shall be named in the Light Designer and Control Designer software so that they reflect the actual room and geographic locations within the room (i.e. Auditorium South Entrance, etc.).
2. Room, entry or other names and designations TBD by owner. The contractor shall obtain these descriptions from the owner in writing prior to ordering these faceplates or programming the architectural control system. All stations shall be labeled with the owner indicated names and with specific nomenclature as indicated on the bid drawings. No device model number names shall be allowed. Names shall be engraved on device plates with a high contrasting color in a legible, large enough font size so that they are easily seen and read. No black on black or self-adhesive tape labels shall be allowed.

D. ARCHITECTURAL SYSTEM PRESETS:

1. Architectural lighting will be included in the preset configurations.
 - a. The presets to be programmed by the lighting contractor will consist of no more than 10 presets for architectural lighting. The presets will be determined by the owner and consultant.
 - b. The contractor shall program the houselighting presets to minimize hotspotting, dark rows and large footcandle variations from row to row. Contractor shall coordinate preset setup with the owner and consultant. Preset looks shall be finalized only after most room treatments, etc. have been completed and with the consultant present.
 - c. All pushbutton stations shall be programmed so that, when no presets are selected and no lights are on, there is an led or button on each station that is lit at all times so that the stations are readily visible in the dark.
 - d. All faders shall be programmed per owner's instructions (typically faders control groups of similar fixtures and/or fixtures in similar locations as a group).
 - e. All pushbutton stations shall be programmed so that engaging any particular pushbutton toggles the associated preset on and off with subsequent pushes of that button. All preset pushbuttons shall trigger mutually exclusive presets (turning the previous preset off as it engages the selected preset) and shall not operate in a pile-on style hierarchy. In other words, if a user engages preset #1 by pressing the associated button, this should trigger all previous light levels or presets to "off" and turn "on" or trigger the lights and light levels associated only with that particular button and preset.
 - f. The architectural control system shall be programmed so that, whenever any preset or LCD station pushbutton is pressed, all relay modules powering any LED fixtures in the room are immediately powered on. These relay modules shall remain on and shall be turned off by astrological clock for overnight hours as indicated.
 - g. The dimming system shall be programmed so that, when the lighting control console is powered on, all relay modules are immediately energized (turned on).
 - h. Architectural Station Presets:
 - 1) All preset stations MUST be set up and loaded with the "looks" as directed by the owner. The contractor shall not decide for himself nor preload any temporary preset looks into the architectural control system that the owner hasn't desired. The contractor should obtain all of these programming directives in writing prior to system turn-on so that they can be easily programmed during commissioning, etc.
 - 2) All preset buttons located on pushbutton stations shall have the capability to respond to whichever preset the owner wishes, including conventional theatrical, houselighting and LED color mixing fixtures. In other words, the pushbutton stations shall not be restricted as to which system preset each button or class of stations can trigger.

- 3) UH10001 (1 Button Stations): If station(s) on stage, it should be programmed to turn on/off the stage worklights ONLY. If station(s) located in catwalk or at catwalk entrances, they should be programmed to turn on/off the catwalk worklights ONLY. If station(s) in the auditorium area, then they should be programmed to trigger one preset as directed by the owner.
 - 4) UH10005 (5 Button Stations): These stations are typically programmed to recall the first four system presets from the architectural controller and off. Contractor shall program each station to control presets as directed by the owner.
 - 5) UH10010 (10 Button Stations): These stations are typically programmed to recall the first nine system presets from the architectural controller and off. Contractor shall program each station to control presets as directed by the owner.
 - 6) Interactive Technologies (8 Button Stations): These stations are typically programmed to recall the first seven system presets from the architectural controller and off. Contractor shall program each station to control presets as directed by the owner.
- i. Ipad & Iphone Programming:
- 1) The contractor shall fully program and set up the iPad tablet to control both the lighting system console as well as the architectural control system. This includes fader pages, preset button programming, etc. This also includes purchasing the apps, setting up an Apple/Android ID/user account for the owner (if one does not already exist - or interfacing with owner personnel in order to obtain existing account login info), downloading the various control software apps (both architectural system and lighting control console interface apps) and setting up/training the owner on the apps and their use in the aud as a portable lighting system controller (both for the lighting console and the architectural control system).
 - 2) The contractor shall be responsible to setup and program up to (10) additional wireless devices by owner designated personnel that can control various aspects of the architectural control system or lighting control console. App purchases shall be the responsibility of the device owner for personal devices. The contractor shall simply assist in setting up presets, fader pages, etc.
 - 3) LCD Touchscreen: The LCD devices shall be programmed with preset and/or fader pages for the owner's use as described below and on drawings. LCD screens shall "mirror" each other as to the current "state of affairs" so that both screens look identical and that user selected moves are shown on both screens (just as if the user were controlling both) and so that there is a visual confirmation on both screens of the last user selected move, selection or parameter change.
 - a) Contractor shall provide the owner with a saved version of the final system configuration as a backup copy in case of system failure and/or system reset needs may arise. Provide two copies (one copy on each of two USB thumb drives. One copy to be placed in a Ziploc bag at or near the architectural control processor or lighting system control area and one copy to be located as per the owner's instructions – preferably in a separate, secure and remote part of the facility).
 - b) Contractor shall provide the owner with a complete hard-copy listing of all lockout values, unlock codes, visibility values & preset priority values used within the system configuration and with training on how to alter or change those codes. Contractor should also enter all passwords and lockout codes into the "Job Information" section of the Unison configuration file so that they will be saved along with the as-built system configuration.
 - c) Any disabling of the pushbutton stations by a password entry shall be reset at midnight of each day via the astrological clock function so that preset stations operate normally and are not locked out continually.

E. TOUCHPANEL SETUP:

1. Intent: Touchpanel screen layouts shall be similar to what is shown. Not all control screens have been shown, but a representative sample has been provided so that the contractor gets

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a real sense of the intent of the look and layout and feel of each touchpanel. Buttons shall be gel style as noted. Touchpanel background shall be a slate/silver grey color with a brushed aluminum look. Buttons shall be a royal blue color. All gel button text shall be black, unless otherwise noted. Dialing and QWERTY keypads, drop down dialog boxes, etc. shall be black background with white text and shall float over other control screens (feather backpanel edges as needed). All buttons shall be high-resolution, crisp edged buttons that do not appear with jagged edges, pixelization, etc. The control screen layout file shall be sized so that it fits onto the allotted memory inside the specified touchpanel. There may be additional screens and controls that the contractor will need to program into the touchpanel system that do not appear in the following descriptions or on the detailed screen layout drawings. The contractor shall provide all screens & programming necessary for a complete system and may need to field tweak or add/delete functionality to the touchscreen system based upon immediate user and consultant feedback. Color selections for screen background, font colors, etc. shown on the contract documents shall be followed unless the owner has a specific preference as to the color scheme, layout, etc.

2. The contractor shall be required to coordinate with other contractors providing touchscreens for this project so that the theme and layout of all touchscreens within this space match.
3. The info button on each screen, if touched, shall bring up a floating, pop-up window on top of and centered on the current screen that gives a brief, but detailed, explanation of the intents of the screen and the parameters the user must select.
4. Each touchpanel screen shall incorporate a standard "Home Screen" that uses the owner's logo as the background behind all button/preset display overlays. Actual logo to be used is TBD by the owner. Contractor is to obtain appropriate file from owner. Size logo on screen as directed by owner.
5. Each touchpanel screen shall incorporate a "Home" button or object on every screen (or physical button on unit – if screen is so equipped) that will take the user to the home screen (Main Menu) whenever this button is activated.
6. Each touchpanel screen shall incorporate a "Back" button or object on every screen, except the Home screen, (or physical button on unit – if screen is so equipped) that will take the user back to the previous page/screen whenever this button is activated.
7. All touchpanel buttons shall be programmed so that, when a button or preset is selected, the active icon highlights or changes color and becomes visually distinguished from all other buttons/presets on the page in order to easily identify and indicate which button or preset has been activated and is currently active.
8. Contractor is to submit all screen layouts (jpeg screen shots are acceptable) to the consultant for final approval prior to loading all software.
9. Contractor is responsible for all touchpanel and control system programming and final touchpanel screen looks, layouts and icons and for interfacing each piece of controlled equipment with the lighting control system and other related systems (such as Crestron interfaces, iPad, iPod, iPhone apps, etc.).
10. The contractor shall provide a minimum of two levels of password/passcode access to the touchscreens and their functionality. There shall be a user level password access, which limits those users to only certain functions. There shall be an administrator level password access, which provides those users with unlimited access to all system functions present and programmed.
11. The contractor shall provide all touchscreens to mirror each other and so that system selections, etc. performed on one screen automatically show up on all other architectural control screens.
12. The contractor shall provide, as part of his bid price, all touchscreen layout buttons, menus, background, layout, programming, etc.
13. All access to the LCD programming functions, preset changes, clock functions, recording capabilities, etc. shall be password protected.
14. Program the architectural control system LCD displays with a submasters page, rehearsal light preset, choral group preset, several houselighting presets, stage worklight preset, stage wash preset, colored stage wash preset(s) and other presets as determined by the owner or owner's

representative and as required in the written specifications. LCD displays shall be programmed so that users without a passcode are unable to access any incandescent houselighting fixtures except turning any included day-to-day fluorescent/LED houselight, catwalk worklight and/or stage & wing worklight fixtures on or off.

15. Create & setup at least 20 preset buttons on pages (10 per page and in addition to other presets as called for in the specifications) and there must be a record button on each page. The intent of this is so that the owner can easily, with password access, save/record "looks" to presets quickly & easily into the architectural control system.
 16. A secondary level of password protection shall be setup so that all other LCD and pushbutton stations can be locked out from functioning or altering the lights during an event. The intent of this feature is so that accidental activation of unwanted lighting fixtures during a performance is avoided. Program the astrological clock to reset all LCD and pushbutton station functionality (and deactivate lockout) at midnight of every day - 365 days per year.
 17. LCD touchscreens shall be located within the system topology in such a way as to allow snapshotting functions from the lighting control console into the architectural control system LCD and pushbutton units. All LCD touchscreens shall be mirror images of each other (both containing the same screens, information, etc.).
 18. LCD touchscreens shall recall all presets and shall incorporate fader and button pages, etc. See above and specifications for more information on LCD programming requirements.
 19. Program the LCD screens with basic "color chooser" pages for the LED fixtures (arranged by zone) so that the owner may quickly and easily pick one of 20 colors for any bank of LED's. Color chooser pages shall visually show thumbnails of colors (similar to the output color of the LED fixtures) and allow the user to touch a colored button in order to switch all of the LED's in that bank to that color.
 20. LCD screens shall have no limitations as to which fixtures or DMX universes they can access and/or control. I.E. they must be able to recall whatever preset looks the owner wishes them to recall.
- F. Sample Screen Shots: (See contract drawings for actual screen shot examples of the intents of the LCD screens that must be included and the general layout of each screen).
- G. DMX & UNIVERSE SETUP GUIDE:
1. The goal in setting up the DMX addresses for this project is to make things simple for the end user both in operation of the system and in finding fixtures, dimmers, relays, etc. This type of approach will embrace a compact setup/layout. It is our intention to outline a conceptual path forward without actually assigning universes and/or actual addresses. That will still be left up to the contractor to figure out and perform based upon the final fixture count, selections, owner input, etc.
 2. The initial objective is as follows:
 3. DMX Assignment Order (addressing given/shown on an ascending order priority basis) –
 - a. Dimmer rack and dimmed modules (incandescent fixture control)
 - 1) Beginning with DMX address #1 and continuing in ascending order without gaps in assignments until all dimmer rack/dimmed modules have been addressed.
 - b. Relay rack and non-dimmed and/or constant/relay modules (LED & moving head fixture control)
 - 1) Beginning with the next free address after the last dimmer rack/dimmed module address and continuing in ascending order without gaps in assignments until all non-dimmed, constant and relay modules have been addressed.
 - c. Addressing for theatrical fixture lighting devices
 - 1) Beginning with the next free address after the last non-dimmed, constant and relay module address and continuing in ascending order without gaps in assignments until all theatrical fixtures have been addressed.
 - 2) Fixtures should be addressed in the following ascending order: front of house (first cove, second cove, etc.), stage (1st electric, 2nd electric, 3rd electric, etc.), side house lighting (side galleries, Shakespeares, tormentors, balcony pipes, etc.) *.

- 3) Fixtures should be grouped by type and assigned DMX addresses as such at each location for ease of use (i.e. wash fixtures then ellipsoidal fixtures, then zoomable fixtures, etc.). The exception to this is stage LED strip borderlight style fixtures, which would typically be grouped into a range of DMX addresses so that they can be quickly and easily selected as an entire stage wash.
 - a) *As an alternative, the owner might select to have the side house lighting (galleries, forms, etc.) occur before the stage assignments.
- d. House and work lighting fixtures (incandescent, LED or 0-10V fixture control)
 - 1) All houselighting fixtures (at the top of the address order beyond all other utilized DMX addresses – and within the control system's capabilities).
 - 2) All worklighting fixtures (at the top of the address order beyond all other utilized DMX addresses, including houselighting assignments – and within the control system's capabilities).
4. The intent is that all DMX addressing should occupy as few universes of DMX control as is possible and without the facility's DMX addressing being spread over multiplied universes of control. What should be avoided is assigning each physical location to a different DMX universe (i.e. first electric DMX universe #1, second electric DMX universe #2, ... houselighting to DMX universe #7, etc.).
5. A typical layout would look like the following:

DMX Assignment Schedule				
<i>Description</i>	<i>Fixture/Dimmer #</i>	<i>DMX Channel Assignments</i>		
Dimmer Rack (DR1)	Dimmer Channels #1 - 35	1	-	35
	Relay/Non-Dimmed Channel #1 - 61	36	-	96
Cove/Catwalk - ETC ColorSource Spot LED	RGBL Front of House Cove Spot Fixtures #1 - 10	97	-	146
Cove/Catwalk - ETC ColorSource Par	RGBL Front of House Cove Wash Fixtures #1 - 6	147	-	176
Rear Torm - House Left - ETC ColorSource Spot LED	RGBL Rear Torm Spot Fixtures #1 - 3	177	-	191
Rear Torm - House Left - Philips Showline SL Punchlite 220	RGBL Rear Torm Remote Zoom Fixtures #1 - 3	192	-	245
Rear Torm - House Right - ETC ColorSource Spot LED	RGBL Rear Torm Spot Fixtures #1 - 3	246	-	260
Rear Torm - House Right - Philips Showline SL Punchlite 220	RGBL Rear Torm Remote Zoom Fixtures #1 - 3	261	-	314
Front Torm - House Left - ETC ColorSource Spot LED	RGBL Front Torm Spot Fixtures #1 - 3	315	-	329
Front Torm - House Right - ETC ColorSource Spot LED	RGBL Front Torm Spot Fixtures #1 - 3	330	-	344
Stage - First Electric - Philips Showline SL BAR640 Wash Borderlight Fixtures	RGBW Wash Fixtures #1 - 4	345	-	404

Stage - Second Electric - Philips Showline SL BAR640 Wash Borderlight Fixtures	RGBW Wash Fixtures #5 - 8	405	-	464
Stage - Third Electric - Philips Showline SL BAR640 Wash Borderlight Fixtures	RGBW Wash Fixtures #9 - 12	465	-	524
Stage - First Electric - ETC ColorSource Par	RGBL Stage Wash Fixtures #1 - 4 (Stage Electric #1)	525	-	544
Stage - Second Electric - ETC ColorSource Par	RGBL Stage Wash Fixtures #1 - 4 (Stage Electric #2)	545	-	564
Stage - Third Electric - ETC ColorSource Par	RGBL Stage Wash Fixtures #1 - 4 (Stage Electric #3)	565	-	584
Houselighting Fixtures	Rows #1 – 6	585	-	590
Worklighting Fixtures	Stage Hi-Bays	591	-	592
Worklighting Fixtures	Catwalk	593	-	593
N/A	Any required DMX addresses necessary in order to address and control the DMX or 0-10V misc. fixtures, outlets, etc.	As required		
This DMX Assignments Chart Is Intended To Be A Starting Point Or Failsafe In Case The Owner Has No Particular Addressing Preferences; However, The TC Shall Consult The Owner Prior To Addressing Any Fixtures With A Printed Copy Of This List And Work Out All Specific Assignments With The Owner Prior To Addressing Any Fixtures As The Owner's Wishes May Differ From What Is Shown Here. Get Owner Approved DMX Assignments In Writing Prior To Assigning Any Fixtures, Dimmers, Misc. Portable Devices, Houselighting Fixtures, Etc.				
DMX Assignments Approval:	Duly Authorized Owner Or Owner's Representative Signature:			
Approved As Indicated:	<div></div>			
Approved With Indicated Changes:	<div></div>			
Written Name:	<div></div>			
Date:	<div></div> / <div></div> / <div></div>			

† ALWAYS OBTAIN FINAL OWNER SIGN-OFFS FOR ALL DMX ASSIGNMENTS. FAILURE TO DO SO COULD RESULT IN THE CONTRACTOR HAVING TO REPROGRAM ALL OR LARGE PORTIONS OF THE LIGHTING SYSTEM IN ORDER TO ACCOMMODATE THE OWNER'S WISHES.

3.12 OWNER INSTRUCTION:

- A. The contractor shall provide a training program for the owner at the project location and with the project equipment (owner's equipment), consisting of the following hours/periods of instruction specifically and exclusively regarding the theatrical lighting systems and related equipment. This training time shall not exceed (36) hours. No training block shall be less than four hours in duration. This time is in addition to training times noted below.
- B. The contractor shall provide additional training for the owner of (12) hours specifically and exclusively for motorized zoom fixtures.
- C. The contractor shall provide additional programming time for the owner of (12) hours in adjusting basic settings to system presets, misc. reprogramming, etc.
- D. The contractor shall provide additional network gateway system software training for the owner of (12) hours in operating, configuring and programming in the Pathport Manager x.x (or equal compatible gateway software in the latest non-beta version) software and in operating, configuring, resetting, managing and changing all network and gateway parameters/assignments.
- E. See LightDesigner spec paragraphs in Section 2 above for additional required programming services specific to that software package.
- F. All owner instruction and reprogramming services shall be provided by the contractor as part of this contract shall be scheduled and performed within twelve months of the final system turnover date to the owner.
 - 1. The turnover date is defined as the date of completion of all open punch list items and final acceptance by the owner.
 - 2. Attendees/trainees shall be as designated by the owner and may consist of multiple groups requiring separate training sessions on the same topics (all sessions must fit into the training times as allotted above).
- G. All owner instruction training hours are exclusive of travel time. Training time hours will begin to elapse at the prearranged hour agreed upon by both the owner and the contractor.
- H. Training time may be utilized in any number of ways that may not relate directly to the hands-on training. These required hours can be utilized in order for the contractor to perform additional system programming, set manipulation, customizing layouts, control screen optimizations/changes or any other related work requested and approved by the owner – up to the “not to exceed” hour totals listed in these specifications. Additional training or programming work beyond that indicated in these specifications shall be at additional cost to the owner.
- I. It is understood that, if there are multiple spaces/locations (e.g., high school auditorium, middle school gym, elementary school cafeteria, etc.), the training sessions noted shall be required independently at each facility.

3.13 TRAINING:

- A. Training must provide useful information that covers all major topics of how a system would typically be used by an end user/owner. This also applies to documentation and video training.
- B. Provide training only at the request of the owner's authorized representative(s). Make clear (in writing) to the owner's authorized representative(s) that any training hours not formally requested, scheduled and performed within twelve months of the final system turnover date to the owner shall be forfeited.
- C. Track all training hours in writing and provide copies of attendance sheet sign-offs to the owner of who attended, how long each session lasted and what topics were covered.
- D. On a job-by-job basis the training sessions may vary significantly. The training hours allotted may be used by the owner as required for any purpose related to the system and in any number

of ways that may not relate directly to the hands-on training. These required hours can be utilized in order for the contractor to perform additional system programming, fixture manipulation, customizing layouts, control screen optimizations/changes or any other related work requested by the owner – up to the “not to exceed” hour totals listed in these specifications.

- E. Additional training or programming work beyond that indicated in these specifications or after the initial twelve-month period shall be at additional cost to the owner.
- F. Turn over copies of all video-taped training recordings to the owner as described below.
- G. It is recommended that most training be hands on with the owner’s personnel operating the equipment.

3.14 QUALIFICATIONS OF TRAINERS:

- A. All persons performing system training must be experienced operators of the specific equipment they are training others to use. If no one on the contractor’s staff has experience on a specific device or piece of equipment, then the contractor must provide qualified third-party personnel in order to perform those training sessions.

3.15 SCHEDULING FOR TRAINING:

- A. All training sessions must be scheduled with the owner and by the contractor with at least two weeks advanced notice.
- B. If the contractor arrives for a scheduled training session and the owner personnel are not present, then the contractor must notify the owner that a four-hour training segment has been forfeited.
- C. If a scheduled session lasts less than four hours, it will still expend four hours of allotted training time due the owner.
- D. Training session must be scheduled and performed at a time when the space is available and otherwise unoccupied.
- E. Coordinate all training sessions with the owner, all uses of the room, any related contractors, attendees, etc. Training sessions, especially those being videotaped, shall not be allowed while other uses of the room are in session, especially those involving the use of construction equipment, drills, saws, rehearsals, etc.

3.16 EXAMPLE TRAINING SCHEDULE:

Typical Training Hour Breakdown		Typical Content
	Hours	
<i>System overview and basic Training</i>	4	Full Walk around, system layout, power sources etc. And an overview of operation. Set up and loading, saving, etc. show files, cue stacks, etc. How to approach a new show.
<i>iPad remote access set up, operation, integration, etc.</i>	4	This session can be the same day as system overview if schedule allows. Understanding the file and Library system, how to update libraries, saving show template files, use of remote devices during show focus, etc.

<i>DMX/RDM Overview</i>	4	Training users on the overall concept of DMX addressing, DMX topology, RDM implementation & assignments, moving fixtures and relocating addresses, etc.
<i>Special Effects</i>	4	Using fixture and/or console special effects, color pickers, cue timing, etc.
<i>Assistance with setting up first Event</i>	4	Show files, presets, global techniques, etc.
<i>On site for first show as tech support</i>	4	
<i>On site for Second show as tech support</i>	4	
<i>Follow Up/Higher Level Training</i>	4	
	32	Total Allotted hours vary on each project, this is just an example.

3.17 INITIAL TRAINING:

- A. Walk through the facility and familiarize the owner with where all primary system equipment is and what it does. See below for additional instructions and requirements for training sessions, video recording/documentation, etc.
- B. Training on Lighting Control Console Operations (list is not exhaustive):
 1. Power up/power down sequences.
 2. Touchscreen setup and use.
 3. Magic sheet creation and use.
 4. Template and show file use.
 5. Setting up and using submasters.
 6. Setting up cues, scenes, presets, base show files, saving files, importance of backups, working from templates and other primary and commonly used functions.
 7. RDM access fixtures & programming.
 8. Patching the dimmer/relay racks to the console.
 9. Restore techniques for console (back to factory defaults).
- C. Training on Lighting Fixtures (list is not exhaustive):
 1. RDM access fixtures, on-fixture controls & programming.
 2. Fixture cleaning and maintenance.
 3. Specialty fixture specifics – moving heads, remote zoom, motor noises, fan speeds, move-in-black requirements, etc.
 4. DMX addressing conventions, how to implement changes when physically moving/relocating fixtures, etc.
 5. Boot up sequence timing, etc.
- D. Training on Lighting System Architectural Controls (list is not exhaustive):
 1. Touch screen controls & programming.
 2. Pushbutton/fader controls & programming.
 3. General station cleaning and maintenance procedures.
 4. Lockout functions and release.
 5. Use of astrological clock, timed events & sequences, etc.

3.18 VIDEO RECORDING OF TRAINING WITH OWNER – INITIAL TRAINING: THEATRICAL LIGHTING & CONTROL SYSTEMS

- A. Record all aspects of the initial owner training with the group of trainees present. A live training session by default may be interrupted with questions or unrelated discussions, which is acceptable. The camera should record through the entire session, unedited.
- B. Provide simple explanations of what each piece of lighting equipment does/what it is intended for, how to properly interface with that equipment (controls, consoles, stations, gateways, etc.), present an overview of general programming parameters as well as what an end user should do if a piece of lighting equipment fails, if the motorized fixtures (if present) were to be shut down or become non-functional, etc.

3.19 VIDEO RECORDING OF DEVICE TRAINING – SECONDARY TRAINING:

- A. Device specific training shall be recorded by the contractor independent of the initial training session. This recording should be performed in the contractor's shop, at the owner's site without trainees present or at another location as appropriate. The intent of this training is to give specific, guided instruction on each piece of equipment. Where manufacturer's professionally produced video trainings are available (via YouTube or manufacturer's website), these will suffice. The contractor should then supplement these with all other video training requirements presented in these specifications. The preference is for the contractor to offload manufacturer training videos onto a thumb drive to present to the owner; however, active links to these videos embedded in the final O&M documentation is an acceptable alternative.
- B. The secondary video training must provide:
 - 1. A video tour (walk-through) of the lighting system equipment present at the owner's site that clearly shows where all primary lighting system equipment is located, gives a brief overview description of what that equipment's primary functions are and what any related devices, screens or indicator lights look like when everything is working properly. This video should not exceed 30 minutes in length.
 - 2. A video tour (walk-through) of the lighting system related power panels, breakers and disconnects feeding the system equipment (dimmer/relay rack, ELTS2, EM devices, etc.), which breaker operates each power feed and what the normal state looks like. Room names, numbers and locations that conform to site nomenclature should be used throughout. This video should not exceed 10 minutes in length.
 - 3. For all lighting system elements note all control boxes, their use and how to check for trouble status in controls, how to initiate and complete any required reset procedures, etc. This video should not exceed 10 minutes in length.
 - 4. A separate video should include a discussion of emergency procedures, manufacturer 24-hour service hotline phone number, system reset procedures, meanings & intents of safety signage, safe "work-at-height" procedures, overall safety precautions and behaviors, etc. This video should not exceed 15 minutes in length.
 - 5. A separate video should include a series of quick start videos for someone who must use the lighting system equipment who has no idea how to operate any portion of it (A Beginner's Guide). Each related video clip should not exceed 5 minutes in length.
 - a. Example:

- i) How to boot up the console.
 - ii) How to access a show file.
 - iii) How to run a cue.
 - iv) How to navigate screen pages, how to find magic sheets and how to operate them.
 - v) How to navigate screen pages on individual fixtures (rear fixture control screen), determining and/or changing fixture DMX address, etc.
 - vi) Basics on lighting priority – why lights might still be on from the architectural control system and how to manage these conflicts, etc.
 - vii) How to shut down the console and the lighting system.
 - b. Additional information examples for anyone who needs to do the following:
 - i) RDM protocol and implementation, how to alter fixture DMX parameters via RDM, etc.
 - ii) Patch lights and dimmers, including RDM functions. This should include what to do when a fixture won't RDM properly.
 - iii) How to create a lighting cue and edit timing, etc.
 - iv) How to load faders and sub masters.
 - v) How to save a show to USB.
 - vi) How to load a show from USB.
 - vii) Patching and grouping – how and why to use groups.
 - viii) Color and focus functions – how and why to use.
 - ix) Differences in color gamut between manufacturers of LED's.
- C. Video recording general requirements (applies to all training & for record videos):
 - 1. Static shots: The video recording device (camera, tablet and/or phone) must be placed on a tripod or other fixed stand, situated on a stable base and remain in a location that offers a good view of the rigging system, locking rail, arbors and any related equipment or controls being discussed. Handheld video recording of static scenes shall be avoided.
 - 2. Roaming shots: The video recording device must employ motion stabilization (smart device app, post-production stabilization software or physical gimbal, etc.). Shaky, blurry videos shall not be acceptable.
 - 3. Lighting: The lighting must be consistent (training space must be well lit without interruption-supplementary video lighting may be required). Lighting must be adequate for the video recording device and so that final video presentation appears professionally lit and dim/dark views of equipment are avoided. Provide portable lighting as needed to accomplish this.
 - 4. Audio: The audio must be clear throughout (supplementary/advanced mic'ing techniques may need to be utilized), there must be no other noises on the video that mask the verbal communications (HVAC noises, whines, hums, equipment crashing, the use of any construction equipment or power tools, off camera voices, etc. Audio must be recorded so that the trainer's words are clear, are not muffled, so that vocals do not trail off and so all spoken portions of the training videos are easily understandable.
 - 5. Shot Composition: The video recording device must be pointed at the elements/objects being discussed (showing devices, screen shots, etc.). Utilize good framing techniques, close-ups as required and overall generalized shots where appropriate.
 - 6. Topics & Viewability: The topics explored and trained on in the video trainings must be clear, consistent and of value. Text on screens must be readable, so close-up shots will be required when discussing certain elements (especially when discussing user interface screens, touch controls, etc.).
 - 7. Typically, the video recording should be performed by a person other than the one doing the actual training. In this way, the operator can zoom to specific areas being discussed, etc. while the trainer continues presenting.

8. Editing/Final Presentation: All video recordings must be professional throughout from trainer presentation to video editing and final packaging. Video footage must be obtained and then "cut" together into a well-structured, chaptered format from which an owner can access whichever topic of interest or concern they may have without having to view or fast-forward through other discussions. Video edits should not end or cut off mid-sentence. Edit and title the final video training sessions into logical chapter format. The basis for titles, sections, chapters, etc. shall be the general content of the included equipment.
 9. The intent of training videos is for an end user to be able to watch these and to follow along with button pushes, menu choices, etc.; therefore, the videos cannot be shot in a manner where the trainer's body blocks major parts of the screen or where the trainer's back is turned towards the camera and hearing/understanding the trainer is difficult and distant or where screens/buttons cannot be read. In order to allow an end user a clear understanding of system training, additional video may need to be shot by the contractor and edited into the final product with picture-in-picture style or split screen style editing where close up shots are easily readable.
 10. The trainer/presenter for each session (especially for the secondary training section videos) must be articulate, speak clearly, properly enunciate his words and professionally present the information in a clear, concise and easily understood manner.
 11. Convert each recording to standard formats for playback on Mac/PC based platforms and write to the devices as described below.
 12. Provide all training videos on USB stick formats.
 13. On the USB stick, include a PDF document that contains all relevant links to the manufacturer's video training series for basic, intermediate and advanced topics/functions. Where manufacturer videos are available, provide these and/or the active links to these videos on the manufacturer's website and/or other relevant sites (YouTube) for the owner's future use and reference.
 14. In subsequent advanced training sessions with the owner's personnel, higher level functions may be covered. Some owners will not require this, but others will. The contractor is not required to video record subsequent sessions. The owner can record any session they want for future reference using their own equipment.
 15. Pre-recorded videos for some training sessions that are "canned" but appropriate for the equipment located in this facility are completely acceptable and need not be custom done for/at each and every facility; however, they must be custom compiled into a framework that fits all equipment in the owner's facility and must also include the initial training session(s) video footage.
- D. Provide (1) one copy (brand new and not previously used) of Stage Lighting: The Technicians' Guide: An On-the-job Reference Tool with Online Video Resources (provide the latest edition) by Skip Mort. This book shall remain with the owner as a reference manual.

3.20 FOLLOW-UP TRAINING SESSIONS:

- A. Follow-up sessions should be recorded on video for record only, except as noted elsewhere, and copies provided for the owner's records. These sessions are not to be confused with either initial or secondary system training intents.
- B. Follow-up sessions may include a re-presentation of any previous session's subject matter for a different group of end users or as a refresher to previously trained individuals.
- C. Often these sessions will be used for in-rehearsal or show sessions where the contractor is an advisor to the end users/operators during actual show setup and/or system use for the first performance with the new equipment. These sessions do not need to be videoed and/or recorded.

3.21 SIGNAGE:

THEATRICAL LIGHTING & CONTROL SYSTEMS

- A. A sign shall be posted in an accessible location (typically on the rack(s) or in the control booth) providing the name, address and phone number of the primary system contractor, manufacturer and supplier (if not already listed) of the system equipment.

3.22 WARRANTY AND SERVICE:

- A. The contractor guarantees all equipment, materials (excepting incandescent lamps) and workmanship to be free from defects for a period of one year from owner acceptance. This warranty supersedes all manufacturers warranties for the one-year period. Any manufacturer's warranty that exceeds the one-year will continue to be applicable. The contractor will replace any defective materials at no charge to owner. Any equipment replaced during the one-year warranty will have a new one-year warranty to the owner.
- B. The contractor guarantees all labeling to be free from defects for a period of two years from the date of owner acceptance. In cases where the label's adhesive fails or the label suffers from degradation causing it to become unreadable, the label will be considered defective and will be replaced at no cost to the owner.
- C. LED Fixtures and lamps that fail in the first 90 days will be replaced at no cost unless an electrical fault can be shown to have caused a major lamp outage or fixture failures.
- D. The contractor will respond by phone to requests for service within 2 business hours and respond with a technician being sent (if needed) within 1 business day.
- E. Any equipment that tends to "drift" or whose performance deteriorates during the warranty period will be considered defective, even if such drifting is normal during break in. This equipment will be readjusted by the contractor at no additional charge to the owner.
- F. Provide all service at the owner's location regardless of any manufacturer warranty terms regarding carry in service.
- G. During the warranty period if any equipment failed will take more than 24 hours to repair, the contractor will make available and interconnect at no cost to the owner suitable temporary equipment to maintain a fully operational system until repairs are complete.

3.23 DEMONSTRATION AND ACCEPTANCE:

- A. CONDITIONS FOR SCHEDULING FINAL ACCEPTANCE:
 - 1. The system is required to be complete and fully tested. Any failure that may have occurred between the contractor's final tests and the date of acceptance will be noted and can be corrected after that date
 - a. Final setup for the houselighting system must be scheduled so that the owner or owner's representative, consultant, contractor and factory technician are all present. This will also constitute the final acceptance meeting for the houselighting system and all related preset setups. A factory technician must be present at this time or no final setup or final acceptance will be performed. If the factory technician has to return for this meeting, it will be at no additional charge to the owner.
- B. PROCEDURE FOR SCHEDULING FINAL ACCEPTANCE:
 - 1. The contractor shall notify the owner and consultant of a proposed date and time for the final acceptance tests. The contractor shall include two alternate dates and times. The dates proposed will be a minimum of fourteen (14) calendar days from the date of the proposal.
 - 2. If none of the dates and times are acceptable, the owner and/or consultant will submit two alternate dates and/or times to the contractor.
- C. DATE OF TESTS:
 - 1. Sufficient personnel will be on hand so that final focus/adjustments can be made to the lighting fixtures.

2. The contractor will have the appropriate equipment available to focus/adjust the lights (for example, ladder, manlift, etc.).
3. Tools must be on hand to remove connector plates and provide for other possible inspections.
4. All racks must be able to be opened for inspection.
5. The contractor will demonstrate operation of all major components of the systems including, but not limited to, the following:
 - a. Demonstrate all system functions and presets.
 - b. Demonstrate programming input.
 - c. Demonstrate operations of all devices with the lighting console.

3.24 CONDITIONS OF ACCEPTANCE:

- A. It is understood that the consultant cannot inspect every aspect of the installation. The contractor is responsible for installation quality and methods, fabrication quality and methods, and performance of their work. Acceptance of the project will constitute an acceptance of the following:
- B. All specified equipment is installed, and the system is operating in an acceptable manner from a functional standpoint (See checklist below for specific functional requirements).
- C. Upon completion and acceptance of the project the contractor will provide to the owner a letter stating that all of the equipment and installation methods meet or exceed the specification requirements in all respects, and that the system as installed meets all of the applicable standards and codes required under the specification and meets applicable federal, state and local codes and laws.
- D. ACCEPTANCE TESTS CHECKLIST:
 1. Prior to acceptance testing there are a number of conditions that need to be verified. There are also site conditions required for the consultant to perform tests as indicated. The contractor shall ensure that every item on this checklist has been performed and verified prior to the consultant's acceptance tests can begin. Scheduling of the consultant to perform final acceptance tests must be coordinated with the owner, the project's construction manager (or clerk of the works), the contractor and the consultant (See paragraphs above for detailed requirements).
 2. GENERAL
 - a. No other contractors may be working within the rooms to be tested during tests.
 - b. The contractor must verify these conditions can be maintained during testing.
 3. STAGE LIGHTING – TYPICALLY TAKES 3 – 4 HOURS:
 - a. Required attendance – A technician fully capable of programming and operation on all software including the console, architectural controls and any other software must be on site. Personnel and equipment needed for focus also need to be on site.
 - b. Any remote programming software that requires an external computer to address the lighting system must be on site, on line and loaded into a laptop provided by the contractor and ready for use if system programming changes are required.
 - c. All lighting circuits tested and verified. Have factory test report available on site.
 - d. All fixtures burned in and installed, and all fixtures bench focused and installed.
 - e. Lighting control console set up, monitors in place and on mounts and all cabling and interconnections complete and neatly dressed.
 - f. All lighting console patching including color and any moving lights must be complete. Console patching for association of scrollers and lights to be completed.
 - g. Moving Lights: All parameters and categories tested.
 - h. All moving light settings shall be as determined by the owner and per the owner's requirements.
 - i. Architectural presets and control patching complete.
 - j. LCD screens completely programmed, mirror images of each other and fully functional, including password protection, astrological clocking functions, etc.
 - k. All lighting system labeling complete, including wire management, yoke and fixture labeling, portable cabling, etc.

THEATRICAL LIGHTING & CONTROL SYSTEMS

- l. All nodes and DMX distribution completely programmed and patched.
- m. Remote focusing device (RFU, RFR or other wireless console control devices) verified and operational.
- n. Emergency lighting transfer cabinet system tested and verified, including trigger from fire alarm with the resultant emergency circuits trigger.
- o. Fixture focus as required within specifications will be done at this time unless the owner chooses to take charge of and responsibility for this at another date.
- p. Verification, in the form of signed documents, that all portable equipment has been delivered to the owner per specs and drawings and stored as per the owner's instructions. Portable equipment must be available for visual inspection as well.
- q. Network configuration software set up and fully programmed.
- 4. HOUSELIGHTING – TYPICALLY TAKES 1 – 2 HOURS:
 - a. All houselighting circuits operational, all fixtures aimed and focused properly, all incandescent houselighting dimmers set to 95%, all houselighting presets programmed with the required fade up/fade down time, etc.
 - b. All LED houselighting circuits operational, all fixtures aimed and focused properly, all LED houselighting fixtures set to 80%, all houselighting presets programmed with the required fade up/fade down time, etc.
 - c. Emergency power sources available and tested. All related loads verified.
- 5. BACK STAGE & CATWALK/WORK LIGHTING – TYPICALLY TAKES 1 – 2 HOURS:
 - a. All fixtures, adaptor plates and cowls installed properly and functional.
 - b. All DMX assignments set up properly.
 - c. Worklighting preset stations programmed correctly.

3.25 CLOSEOUT DOCUMENTATION:

- A. All closeout documentation, including training videos, must provide the owner with usable content. The determination of acceptability will be determined by the Consultant. Poor quality training videos and documents will be rejected.
- B. Closeout Documentation is to be submitted within two weeks of system completion.
- C. Contractor must submit the following items. All items should be part of the O&M Manual. Provide the quantity and form (paper and/or electronic) of these closeout documents as is indicated in the contract front-end documentation. Physical copies shall only be required if front-end documentation requires them.
- D. System testing documentation as required by final testing and acceptance procedures outlined in this document.
 - 1. ALL paper copy O&M Manual submissions shall be in heavy-duty, D-Ring style, 3-Ring binders All electronic copies shall be "bound" in an Adobe Acrobat style portfolio (see below for more complete information).
 - 2. Complete technical manuals for all equipment installed.
 - 3. A full set of as built drawings (see requirements below).
 - 4. List of serial numbers of all equipment installed
 - 5. Warranty cards for all equipment.
 - 6. Manufacturer MSDS sheets for all applicable equipment.
 - 7. Operations & Maintenance Manuals shall include English and Spanish only.

8. Operations & Maintenance Manual: An operations and maintenance manual (or "Systems Manual") written in English on the safe use of a that particular site's lighting, dimming and controls system(s) shall be provided by the contractor to the owner. (provide separate manual sections for different spaces included in this project – each to be a separate, complete and distinct section in the manual for each differing or multiple system and location). This manual should include the following:
 - a. Table of contents.
 - b. A contractor written simplified guide to operating the system Include at minimum:
 - i) A contractor written simplified troubleshooting guide or what to check and where to check if no lights will come on. Provide this in a 2-column style format.
 - ii) How to power up and power down the console, lighting system, etc.
 - iii) Console touch screen set up and general info on how to access various screens.
 - iv) A key stroke guide on how to quickly get to menus to patch dimmers, RDM fixtures, address/patch LED's or other moving/specialty lights and accessories to the console.
 - v) Constructing and editing cues.
 - vi) Programming sub masters.
 - vii) Loading Faders.
 - viii) How to perform file saves, file loads, etc.
 - ix) A short list of the required software reset procedures for all lighting system related subsystems.
 - c. A simplified guide to operating the architectural control system, an understanding of pile on system architecture and where the button stations get their content. If editing has been made available on LCD screens, provide a guide on how to save over presets that affect button stations.
 - d. Microsoft Excel spreadsheets of all initial lighting system patch data, DMX assignments and fixture types at final set up.
 - e. Emergency contact number(s) and procedures to follow in the event of a catastrophic system failure.
 - f. One copy of the "Workbook" version of each of the following training guides used (only provide for levels trained on):
 - i) ETC Level 1 console training – Essentials.
 - ii) ETC Level 2 console training – Enhanced Skills.
 - iii) ETC Level 3 – Advanced Programming.
 - g. Maintenance procedures and recommended schedules required for equipment installed that requires regular scheduled maintenance.
 - h. A DVD (or set of DVDS, depending on requirements listed Under Training Sections above) and a USB thumb drive with all content included on it.
- E. As-Built Drawing Set requirements (required of all prime and sub-contractors):
 1. As-Built Drawings (AKA as fitted or as installed): This drawing package is a revised set of "red-lined" construction drawings submitted by each installing contractor upon completion of the project. These drawings must accurately record and reflect the equipment installed, all changes made during the construction process and must also show the exact dimensions, geometry and location of all elements of the work completed under the contract. As built drawings should be added to throughout the construction process as the project gets built.
 2. The as-built drawing package must include the following:
 - a. Clean, consistent look, layout and markup methodology across entire set
 - b. Conduit sizes
 - c. Wire types pulled (manufacturer, model, AWG, etc.)
 - d. All junction box locations, names, internal components, etc.

- e. Conduit routing (actual installation paths with notes as to elevation, access, etc.)
 - f. Panel and circuit numbers for all power related devices
 - g. Shop drawing changes
 - h. Extra work not originally included in the contract
 - i. Field changes
 - j. Design changes
 - k. Modifications
 - l. Labels and dates (attesting to when changes were made and why)
 - m. Locations and dimensions (if as designed, state such; if not, indicated all deviations). This should include heights AFF, etc.
 - n. Legend or Key explaining all markups, color codes, numbering sequences, etc.
 - o. Port assignments and related nomenclature (for all DMX, Data, 0-10V, IP, switches, etc.)
 - p. Embedment depth, type & size for rigging related anchors
 - q. Accurate details for all installed devices
 - r. Equipment relocations (due to required or requested field directives, owner requests, obstructions, etc.)
- 3. As built drawings must be written in legible, plain English without the use of shorthand, abbreviations, codes, etc. Descriptions shall be clear and concise.
 - 4. As built drawings can also be provided with electronic and technology driven interactions such as embedded photos, GPS data and active links to relevant material.
 - 5. Typical markups that would be expected in all as-built drawing sets:
 - a. RED markups indicate where something has been REMOVED, RELOCATED or CHANGED from the original design.
 - b. GREEN markups indicate where something has been ADDED to the original design.
 - c. YELLOW markups indicate actual routings, locations, etc.
 - d. BLUE markups indicate special information that has been included regarding the installation of equipment, conduit & wiring.
 - 6. An accurate and useful set of As-Built drawings includes preparation before the commencement of the project, during the installation process by all involved parties and after the final punch list items have been addressed and corrected.
 - 7. Only include drawings in the as-built set that are relevant to the installed systems. For example, the EC would not include detail drawing as-builts for systems or equipment that he had nothing to do with providing and/or installing (such as Brickhouse arbors or AV system touchscreen layouts).
 - 8. Do not include duplicate pages or pages without any markups. Every sheet included in the as-built set must include all relevant markups as listed above.
- F. O&M Manual pdf requirements: The contractor shall provide a pdf copy (with appropriate titles) for each piece of documentation listed above and bound together in a pdf portfolio/binder, labeled with the owner's name and with the submitting contractor's information. All electronic manuals shall contain only equipment and information that pertains to the project. Where factory manuals are available the contractor shall provide these. Where factory manuals are not available, the contractor shall provide high resolution (150 dpi minimum and fully optimized in Acrobat or equal), full page, properly and consistently oriented pages in a consecutive ascending order. All pdf portfolio and binders produced and submitted shall be professionally put together and presented well. All manuals shall be saved as standard Adobe Portable Document Format (PDF).

END OF SECTION

SECTION 19 30 00
THEATRICAL RIGGING AND CURTAINS

PART 1 - GENERAL

1.1 PROJECT INFORMATION:

- A. Owner: Elmira Central School District
Broadway 2026 Renovations
1000 Broadway Street
Elmira, New York 14904
- B. Architect: Hunt Engineers, Architects & Land Surveyors P.C.
Airport Corporate Park
100 Hunt Center
Horseheads, New York 14845
- C. Consultant: AVL Designs, Incorporated
1788 Penfield Rd, Suite 1
Penfield, New York 14526
Phone (585) 586-1100
- D. Contractor: The successful bidder for the work described herein. Also referred to as the Theatrical Contractor (TC), the lighting contractor, the lighting installer or the bidder.
- E. Others: Various companies doing construction work under the general contract.

1.2 PROFESSIONAL STANDARDS:

- A. The contractor is expected to install all work to the appropriate industry professional standards, manufacturer recommendations, and current applicable codes. If any work required exceeds the skills of the contractor, he will employ appropriate subcontractors for the scope required.
- B. The acceptability of materials and workmanship will be determined by the Architect, Consultant, and CM.
- C. Any work that might be damaged, be inadvertently painted, or become dirty during construction will be protected by the contractor. All responsibility for protection shall be by the contractor. The contractor will provide final cleaning and or repair of all equipment in their scope to like new condition.
- D. The contractor will attend and/or arrange meetings as required to make sure their scope is coordinated with all other trades. The contractor is responsible to make known to all other trades critically dimensioned items and locations to avoid conflicts. Where conflicts occur follow required procedures in the project manual to seek resolution.
- E. Where any substandard work is provided by related trades that impedes the work of the contractor, they will notify the CM, Consultant, Architect, or Engineer in writing as called for one the project manila to rectify the issue.
- F. Where work is provided by others, the contractor is responsible to verify installation conditions that relate to their work. If installation of related work is substandard the contractor shall generate a written RFI through proper channels based upon the project manual. The contractor shall not install their work to any substandard devices, etc. provided by others until such work has been resolved or until the contractor has received written authorization from the construction manager to proceed. If the contractor ignores substandard installation work by others and proceeds to install his devices to these items, then he accepts and bears sole responsibility to repair, reinstall and correct any found deficiencies to the satisfaction of the owner upon final inspections.

- G. The contractor will comply with the AHJ (Authority Having Jurisdiction) as it relates to programming any and all emergency interfaces.
- H. The contractor is expected to possess knowledge of the equipment of their industry and to provide all small items required to install the specified equipment. Provide small items such as rack rails, DIN rails, rack panels, power cords, connectors, wall-wart power supplies, crimps, Nicopress and other items that may not be called out on drawings or in specs but are required to support primary equipment.
- I. When in doubt about any aspect of the work the contractor should not proceed until they obtain clarification from the appropriate entity following procedures detailed in the project manual.

1.3 DEFINITIONS:

AFF	Above finished floor (finished walkable floor/platform surface referenced)
At Height/Working At Height	Working in any place or location and at a height AFF where a person could fall and potentially injure themselves; there is no minimum or upper limit to this height.
Code Requirements	Minimum requirements as specified by all applicable and published codes.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Diagrammatic	A diagram, paragraph, note or drawing serving to explain general intents and requirements (not necessarily an exact representation).
Devices	Any piece of gear, equipment, indicated component and any misc. related items required to implement and install a fully functioning system.
Equal or Equivalent	Equally acceptable as determined by Owner's Representative.
ETR	Existing to remain.
Extend	To increase the length(s) of any indicated conduit/wiring, etc. so as to reach a particular specified or implied point – including the provision of any misc. additional equipment as required for proper extension and to maintain full system functionality.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.

Furnish	Supply and deliver to installation location to the appropriate trade responsible for installation.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative
Install	Mount and connect equipment and associated items and make ready for use.
Labeled	Refers to classification by a standards agency.
Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional, Construction Management or Clerk of the Works.
Patching	Repair/repainting of holes, marks and damage/damaged surfaces left from removals or new installations work. Consult project manual for additional requirements.
Provide	Procure all required materials, labor, coordination and equipment and locate, install, connect and test ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Remove	Safely Disconnect including any and all wiring, hardware, conduit (except concealed), anchors, suspension hardware etc. Legally dispose of items not called out to be offered to or returned to owner.
Review	A general contractual conformance check of specified products.
Satisfactory	As specified in contract documents.

Shall	Indicates that the contractor must perform work and provide devices as indicated. This is a mandatory, obligatory, contractual requirement and is not optional in any way.
VIF (Verify in Field)	Verify in field (VIF) is understood to require the contractor to verify and obtain specific dimensions, locations, interconnections, configurations and other related details regarding the existing site conditions. It acknowledges that certain limitations may exist in the preliminary site surveys and existing documentation due to inaccessibility or unintended inaccuracies and explicitly transfers the responsibility to verify these items to the executing contractor. It requires the construction team to physically confirm these items on-site before fabricating components or proceeding with installation.

1.4 INTENT OF DRAWINGS:

- A. Throughout the contract documents there are various manufacturers and products referenced. It is understood that these products establish a basis of design that all other "or equal" substitutions must meet or exceed. All submitted devices must be the referenced product or approved equal.
- B. The drawings in this package are diagrammatic in nature, unless detailed dimensioned drawings are included. The drawings show the approximate locations of equipment and devices. The final and exact locations of all non-dimensioned devices are subject to the approval of the Owner or the Owner's Representative. Devices with detailed installation dimensions; however, are critically located and must be installed to those indicated dimensions unless alternate instructions have been given to the contractor in writing by the consultant.
- C. The contractor(s) shall inspect the entire building(s) with the Owner's representative prior to beginning any work and shall identify the exact locations and installation methods for all devices, conduit and wiring prior to beginning work.
- D. Typical details are shown for the installation of various devices. The details do not apply to all situations. Installation methods for all work shall be subject to the Owner's and construction manager's approval. Provide all work and equipment required for a professional, workman-like installation.

1.5 SECTION INCLUDES BUT IS NOT LIMITED TO:

- A. Removals – May include storage and reinstallation of some items.
- B. Provision of stage and/or house rigging system and related work scope as indicted on drawings.
- C. Furnishing some equipment for installation by others.
- D. Set up and commissioning.
- E. Training and closeout documents.

1.6 RELATED SECTIONS & DOCUMENTS:

- A. The contractors shall examine the full set of construction drawings and specifications and ascertain all aspects of the scope of work described within this specification. The contractor will be

responsible for cooperation with and adherence to the overall scope and intent of the project relative to the work being done by the contractor.

- B. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 0, 1, 11 and 26 specification sections apply to work of this section (related specification sections may vary depending upon the particular CSI format being adhered to). All related drawings, contract conditions and general requirements found in the project manual that apply to the general contract will apply to the work described in this specification. Examine all referenced documents for general project requirements relating to the work in this specification. Contact the architects, engineers and/or construction manager for any clarification required to properly bid this project. It is the contractor's responsibility to obtain necessary clarification before bidding.

1.7 RELATED WORK NOT INCLUDED:

- A. The contractor is responsible for all work on the TR series drawings and written specifications (unless indicated to be by others – EC, GC, etc.). Specific coordinated work shall be provided by the electrical contractor, general trades contractor or as indicated.
 - 1. Electrical – See Drawings
 - 2. Structural – See Structural Drawings

1.8 GENERAL REQUIREMENTS:

- A. ITEMS TO BE PROVIDED BY OTHERS:
 - 1. Structural steel (most ETR).
 - 2. Electrical services by Division 26 Contractor. See drawings for more information.
- B. Removals - Offer all existing portable and removed equipment to the owner prior to legally disposing of these items (counterweights, cheeseboroughs, booms, etc.). Obtain written permission from the owner for all existing removed items that they do not desire to retain prior to disposal.
- C. Provide all equipment outlined and described within this specification and assemble it into a complete, properly functioning system for use by the owner as described within this specification.
- D. It is the contractor's responsibility to clarify any misunderstandings or drawing-to-drawing/drawing-to-spec discrepancies prior to bid. In cases of a difference between stated quantities in drawings, specs or electrical drawings, the higher quantity will prevail.
- E. Check each component before installation as well as each portion of the project during installation to ensure that the intent of this specification is achieved.

1.9 BIDDER QUALIFICATIONS – SUBMITTALS:

- A. The bidder shall provide references of at least three (3) installations of comparable scope performed by the bidder, including location, system description, and name, address, and telephone number of the architects, consultants, and owners and the names of contract persons for each.
- B. The bidder must maintain service facilities and have service available on site within 24 hours. The bidder must be a factory authorized dealer for all products submitted and may be required to submit such proof of factory authorization in writing, or in the form of copies of authorized agreements with the various vendors.
- C. The bidder and all persons performing theatrical rigging system related work on this job must be ETCP certified (Entertainment Technician Certification Program) as a theater or arena rigger or under the direct supervision of an ETCP certified foreman. This applies to all theatrical rigging equipment installation and any other assemblies indicated as being provided or installed by the bidder. Proof of current certification MUST be provided in the submittals package (this is typically in the form of a pdf copy of the current and active certification certificates from PLASA). Out of date or expired certifications shall not be recognized as meeting the requirements of ETCP certification.

- D. The bidder must be the installing contractor or shall provide written documentation of any intended qualified subcontractors up front for approval. All subcontractors must be identified.

1.10 INQUIRIES AND COMMUNICATIONS:

- A. All questions shall be generated as called for in the project manual.
- B. Direct communications to the consultant via phone are recommended for initial discussion about intent or site issues. (unless prohibited in the project manual). No action may be taken based on verbal communications, they must be followed up in writing as called for in the project manual.
- C. Where discrepancies occur, and pre-bid instructions have not been obtained by written request, the contractor will abide by the owner's decision at no additional cost to the owner.

1.11 COORDINATION:

- A. Cooperate with other trades to achieve well-coordinated progress at all times. Notify the owner and consultant as often as necessary with regards to job progress or changes in the installation schedule. All conflicts will be reported to the architect, construction manager, owner, and consultant in writing. All reasonable attempts will be made to correct any difficulties.
- B. Staff the job site adequately at all times to maintain a progress in keeping with the total project progress.
- C. Provide all materials to be installed by others in a timely fashion based upon the related trades' schedules.
- D. The job site will be left in a clean safe condition at the end of any workday. All cleanup and debris removal to a site designated by the owner will be the responsibility of the bidder on a daily basis.
- E. All storage of tools and materials will be done by the contractor. No on-site storage security will be provided by the owner.
- F. The contractor will attend regular meetings with the architect, owner, general contractor, and the consultant when requested by any of the above, in order to achieve project coordination and progress.

1.12 DELIVERIES:

- A. It is each contractor's responsibility to receive all device shipments, equipment, deliveries, etc. for their own equipment on/at the job site personally. Each contractor shall be responsible to arrange for storage of all received materials on site until the appropriate time when they shall either turn them over to installing contractor or install them.
- B. If the contractor chooses to allow a third party to receive shipments on his behalf the contractor bears sole responsibility for any missing and/or damaged parts.
- C. Any equipment that is furnished by the contractor for installation by others shall be turned over to the installing contractor at a time that fits into their production schedule and the project's overall construction schedule.

1.13 STANDARDS REFERENCES:

- A. The contractor is responsible for the provision of material and methods installation of equipment conforming to the currently applicable standards of:
 - 1. ADA - Americans with Disabilities Act
 - 2. AISC - American Institute of Steel Construction
 - 3. AISI - American Iron and Steel Institute
 - 4. ANSI - American National Standards Institute
 - 5. ASME - American Society of Mechanical Engineers

6. ASTM - American Society for Testing Materials
 7. AWS - American Welding Society
 8. EIA - Electronic Industries Association
 9. ESTA - Entertainment Services and Technology Association
 10. FCC - Federal Communications Commission
 11. IEC - International Electronics Commission
 12. IEEE - Institute of Electrical and Electronics Engineers
 13. IFI - Industrial Fasteners Institute
 14. ISO - International Organization for Standardization
 15. NACM - National Association of Chain Manufacturers
 16. NEC - The National Electric Code
 17. NEMA - National Electrical Manufacturers Association
 18. NFPA - National Fire Protection Association
 19. OSHA - Occupational Safety and Health Association
 20. SAE - Society of Automotive Engineers
 21. SMPTE - Society of Motion Picture and Television Engineers
 22. TIA - Telecommunications Industry Association
 23. UL - Underwriters Laboratories (Electrical components, devices and accessories shall bear a UL label where applicable. UL listed and labeled as defined by NFPA70, article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.)
 24. USITT - United States Institute for Theater Technology "Recommended Guidelines for stage rigging and stage machinery-specifications and practices".
 25. Wire Rope User's Manual
 26. Manual of Steel Construction 15th Edition or later (aka the AISC Steel Construction Manual)
- B. Provide certification and labels where applicable. Comply with federal, state, and local regulations and applicable union regulations where required. All equipment will have the proper labels for New York State.
- C. Provide only equipment that is standard, new, previously unused equipment of the latest design or of the latest model of regular stock product and is supplied with all parts regularly used with the equipment offered for the purpose intended. No re-furbished or obsolete materials shall be permitted. The contractor guarantees that no modification of the equipment has been made contrary to the manufacturer's regular practice.
- D. Review all materials and equipment prior to installation and notify owner as to any changes or discrepancies between published specifications and the actual material and equipment to be installed.

1.14 EQUIVALENTS:

- A. The successful bidder shall submit any product equivalents prior to award of the contract detailing the kind, type, brand, manufacturer or equipment included in the base bid. Equivalent products must be highlighted on this list. When requested, the successful bidder shall also submit information, describing in specific detail, how the equivalent bid material differs from the appearance, quality and performance required by the base specification. Submittal of the manufacturer's advertising cut sheets alone is not acceptable for proof of equivalency.
- B. Proof of equivalency may require the bidder to provide physical samples, a full-sized mockup or specific manufacturer information detailing technical equivalency. Proof of equivalency shall be the burden of the submitting contractor/bidder and not that of the consultant. Proof of equivalency relates to all pertinent functions of the specified equipment, regardless of if that information is reflected on any manufacturer's issued cut sheets.
- C. If proposing equivalents that affect the system design as shown on the drawings, the bidder must submit flow charts, and any other drawings necessary to show differences in the system operation from the primary referenced system.

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- D. The bidder will pay for any and all changes to related work scope required by the equivalent products.
 - 1. This includes electrical, architectural, structural and other changes that might be needed to implement an equivalent product.
 - a. Some products with virtually identical functions have varying power requirements, physical dimensions, etc.
- E. The risk of whether bid equivalents will be accepted is borne by the contractor. See section 2.1 "Performance Requirements" for more information.
- F. No equivalents will be considered after the Contract award unless specifically provided for in the Contract Documents.
- G. Final judgment as to equality will be solely that of the consultant, architect, construction manager and owner.
- H. The costs for any changes by other trades required to implement the equivalents proposed will be borne by the contractor.

1.15 SUBMITTALS:

- A. Equipment: After bid award but before ordering any equipment or starting any work submit to the owner for approval a list of all equipment to be furnished showing types, models, quantities and manufacturer. Attach catalog sheets for all items submitted.
- B. The quantity and form (paper and/or electronic copies) of all submittal material required shall be provided by the contractor to the appropriate parties as is indicated in the contract front end documents (in addition to any requirements listed below). If there are no indications in the contract front-end documents, then the contractor shall submit (1) electronic copy of each area, category, etc. of items as listed below. All submissions are understood to be intended for approval by the construction manager, the architect, owner, general contractor and the consultant prior to any fabrication or installation of any devices.
- C. Submit a schedule for submission of drawings for fabrication and site work.
- D. Submit a complete submission package with all required paperwork.
- E. Submit curtain material samples (two for each different type of curtain indicated on contract documents), shell material samples and standard color selection charts (charts must be in color and manufacturer's actual cut sheet – no color selection charts in black & white or photocopies of original color selection charts shall be acceptable) for approval by the architect & owner prior to any fabrication or installation. These copies are to be submitted to the architect ONLY. The intent of these is for the charts and samples to be used for the selection of the curtain and shell colors. Submit documentation in the submittal package to the consultant that these have been delivered to the architect & owner.
- F. Submit a copy of the motorized winch manufacturer's written verification ("certificate of compliance") that all motorized hoists and related controls are fully compliant with the latest version of the ANSI motorized rigging standard.
- G. Submit each of the following as each pertains to this project. Provide a copy for each related person performing indicated work who holds these certifications:
 - 1. Current welding certifications
 - 2. Current training certifications.
 - 3. Current ETCP certification.
 - 4. Current manufacturer certifications.
- H. Submit material schedules, shop drawings, bill of materials, rigging system data/cut sheets and any applicable fire rating data or MSDS sheets for all rigging system components and curtains.

- I. Submit a complete set of rigging drawings* (each sheet bearing the signed stamp of and fully reviewed by a current New York State licensed professional engineer – i.e. a “stamped set” or “NYS PE stamped” set of drawings) of the proposed rigging system and related building components (including, but not limited to, the overhead rigging steel, floor construction and loading under locking rail, etc.).
 1. Technical Drawings:
 - a. The full set of submitted drawings and data sheets must be presented in a professional manner.
 - b. All shop drawings for submission must be CADD drawn (created with a computer aided drafting program). Hand drawings are not allowed. Illegible drawings shall not be acceptable.
 - c. All cut sheets for submission must be clean electronic (pdf) copies of the manufacturer’s actual data sheets. Mark up each sheet with highlights or boxes around submitted products, options, etc.
 - d. Provide a complete drawing package including attachment details, rigging details, suspension details & mounting and other required miscellaneous details.
 - e. Provide complete system drawings including plans, elevations, sections and details.
 - f. Provide complete fabrication and attachment method drawings.
 - g. Provide a separate cut sheet (manufacturer’s data sheet) for every piece of equipment being provided.
 2. * The intent of the stamped shop drawings is for the contractor to communicate to the consultant the exact proposed locations, materials and fabrication methods of all standard and custom items for all intended rigging system equipment as well as to have all proposed systems approved by a structural engineer as to loading, breaking strengths, embedment depths, loads imposed on building structure, etc.
- J. The intent of the submittal package is that it contain one copy of the appropriate cut sheet for each item that the contractor is proposing to use on this project as well as a complete set of stamped shop drawings that shows plan, section and elevation views and details of the entire rigging system. Typical drawings to include are as follows:
 1. Plan view drawings detailing set layouts & dimensions, batten and curtain lengths, locking rail and guide systems and all other related device locations.
 2. Individual elevation/section views that show set travel trims, tormentor/Shakespeare/truss locations and all other pertinent details.
 3. Detail drawings that show all typical attachments, trim chains, beam clamps, pipe assembly constructions, etc. as well as all custom fabricated devices, suspension intentions, etc.
 4. Manufacturer drawings of all required mechanical and electrical details that relate to any included motorized units and control systems. This set is to include plan/section/elevation views, flow diagrams, load ratings, ANSI compliance letter, etc.
 5. The PE review shall include an evaluation of all individual system components, the rigging components together as an interrelated system and a review of all related rigging steel, floor loading, system uplift on structure, etc. Submission of this package by the contractor is proof that the contractor has reviewed the entire system design, understands the intents and concurs that the designed system will actually function as laid out in the contract documents.

1.16 GENERAL SYSTEM DESCRIPTION:

- A. Theatrical Rigging System:
 1. Counterweight rigging system
 2. Dead hung rigging system
 3. Curtains, tracks, operating lines & pulleys (stage and/or window/door curtains)
 4. Tormentor welded lighting pipe assemblies
 5. Misc. required Unistrut, misc. metal, supports, hardware, etc.
 6. Safety signage

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

- A. The requirements of the referenced equipment are not generic in nature. Specific performance, control and routing capabilities are necessary for any alternate equipment. The details set forth herein and within the functional description of the system are the critical criteria for the selection of each piece of equipment.
- B. In bidding equivalent equipment from manufacturers other than those referenced on these contract documents, the contractor must be aware that all functional information included in this specification as well as the manufacturer's specifications, physical size, serviceability, warranty terms, product availability and other non-technical issues may be determining factors in product equivalency. Final judgment as to equivalency will be solely that of the owner, architect and consultant. Equivalent products shall be approved only at the contract bid price and shall not allow for additional costs to the owner, except as described in the contract manual.
- C. Substitution Criteria:
 - 1. Curtain & Track substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Product warranty period
 - b. Flame rating
 - c. Available colors & finishes
 - d. Sheen of fabric face
 - e. Material weight per square yard
 - f. Light blocking capabilities
 - g. Longevity
 - h. UV Resistance
 - i. General workability and finished appearance
 - j. Track construction, pulleys and material finishes available
 - k. Track weights, accessories and attachments
 - l. Rotator & brake operations and functionality
 - m. Load ratings of curtain track equipment
 - n. Curtain track and accessories available finishes
 - 2. Wire substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Jacket Type.
 - b. Number of Conductors.
 - c. Jacket Shape – i.e. round, twisted, etc.
 - d. Number of strands and gauge.
 - e. Flexibility.
 - f. Overall physical size of wire.
 - g. Capacitance and resistance conductor-to-conductor as well as single conductor.
 - 3. Miscellaneous rigging hardware (counterweight or dead hung) substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Product warranty period
 - b. Physical size.
 - c. Physical weight (self-weight of individual piece).
 - d. Stamping or other indications of load rating.
 - e. Sheave materials available.
 - f. Custom pieces available if need arises.
 - g. Sheave counts available.
 - h. Idler assemblies.
 - i. Critical spacing, line handling or physical size characteristics that may impact installation intents.
 - j. Load ratings and WLL capacities.

- k. Safety factors.
 - l. Sheave diameters.
 - m. Attachment methods.
 - n. Welding requirements.
 - o. Physical construction.
 - p. Rated and expected life duty cycles.
 - q. Part traceability.
 - r. Appropriateness or approval for overhead lifting use.
- D. All individual parts and overall assemblies shall additionally conform to the requirements listed below in the "Standards" section of these written specifications.
- E. No contractor-manufactured products shall be acceptable in place of referenced items except for those items enumerated in this specification as "custom."
- F. The current manufacturer's data sheet for each referenced piece of equipment in force at the date of printing of this specification shall be the basis for the specifications of the referenced equipment.
- G. Any necessary product accessories such as additional power outlets, power supplies, rack mount kits, connectors, adapters or other small items are the responsibility of the contractor to provide, whether or not they are called out in detail within these specifications. This may include additional electrical work, (also depending upon the differences between any substituted vs. specified equipment), junction boxes, breakers, disconnects, etc. and shall be the sole responsibility of the contractor to provide at no additional cost to the owner.
- H. Specification details are provided only for the features required for current and intended future uses of the products.
- I. Quantities:
 - 1. Where no quantity is indicated in the written specifications, the contractor shall supply quantities as indicated on drawings.
 - 2. Items not indicated on drawings but necessary for project completion shall be provided as required for project execution at no additional cost.

2.2 STANDARDS:

- A. Intentions of standards:
 - 1. This document establishes the minimum standards required for the specified rigging and related equipment installed in this facility as part of this specification and related drawings; however, the proper installation and operation of this equipment are equally important. Equipment shall be operated and maintained by (or under the supervision of) a competent person (trained and experienced personnel with the proper knowledge and training to understand stage rigging systems and to recognize all of the imposed hazards and functional requirements that these devices involve as it relates to this particular installation). Failure to adhere to these minimum standards could result in serious injury to operators or bystanders and/or substantial structural damage.
 - 2. These standards apply to rigging hardware only and not to the building or related structure from which the rigging components are supported/suspended.
 - 3. These standards DO NOT apply to raising, lowering, suspending or "flying" of people. None of the items listed within this specification or indicated on the contract documents is intended for the aforementioned rigging or attachment of a person to any portion of the stage rigging or related systems. RIGGING A PERSON TO/FROM THIS SYSTEM IS UNSAFE AND IS NEVER RECOMMENDED.
- B. All rigging systems shall be required to be inspected (as a minimum) to the standards set forth in ANSI E1.47 – 2017 (Entertainment Technology – Recommended Guidelines for Entertainment Rigging System Inspections) or the current version of the most recent standard revision.

- C. All manual counterweight rigging system components shall conform (as a minimum) to the standards set forth in ANSI E1.4-1 – 2016 (Entertainment Technology - Manual Counterweight Rigging Systems) or the current version of the most recent standard revision.
- D. All parts shall be industry standard load rated types. All hardware shall be rated for maximum possible load with an industry standard safety factor as per the codes and practices noted elsewhere within this specification. A list of load factors for all materials utilized shall be provided to the owner in the form of manufacturer data sheets.
- E. The list of major components that follows does not include all required items, only major system components. Field verify dimensions for all items and change as required to fit field conditions for flange sizes, headblock spacing, steel elevations, orientations, etc.
- F. Materials shall conform to the following ASTM and ANSI standard specifications:
 - 1. A-47 Specification for malleable iron casting.
 - 2. A-48 Specification for gray iron casting.
 - 3. A-120 Specification for black and hot-dipped zinc-coated (galvanized) steel pipe for ordinary use.
 - 4. B18.2.1&2 Specification for square and hex bolts and nuts.
- G. In order to establish minimum standards of safety, the following factors shall be used:
 - 1. Cables and fittings - 10:1 Safety Factor.
 - 2. Cable bending ratio - Sheave tread diameter is 30 times cable diameter or as recommended by wire rope manufacturer, whichever is more restrictive.
 - 3. Maximum fleet angle - 1-1/2 degrees.
 - 4. Steel - 1/5 of yield.
 - 5. Bearings - Two times required load at full speed for 2000 hours.
 - 6. Bolts - Minimum SAE J429 Grade 5 (ISO R898 Class 8.8), zinc plated.
 - 7. Motors - 1.0 Service Factor.
 - 8. Gearboxes - 1.25 Mechanical Strength Service Factor.
- H. COMPONENTS:
 - 1. All system components shall be designed, engineered and manufactured to withstand all design loads without deformation or damage to components and shall meet the requirements of the "Design Factors" section of the current ANSI codes for counterweight rigging systems.
 - 2. All housings and mounting components shall use materials having ductile properties that will deform plastically without fracturing.
 - 3. Unless specifically noted otherwise, fasteners shall have a minimum SAE J429 Grade 5 or ISO R898 Class 8.8 rating. Bolts in tension shall have nuts of equivalent rating. Fasteners shall be self-locking or secured by alternate means (moused) to prevent loosening. Fasteners shall be installed in accordance with the manufacturer's instructions. Attachments made through slotted, elongated or oversized holes (more than 1/16" over the fastener diameter) shall use flat washers.
 - 4. The maximum allowable fleet angle for lift lines and purchase line shall be in accordance with the requirements of the "Design Factors" section of the current ANSI codes for counterweight rigging systems, unless the grooves in the block, and the bearings, are designed to accept a greater side thrust without harming the wire rope.
 - 5. All welding shall be performed in accordance with current AWS standards as well as in compliance with any additional local, state or other standards. All field welds shall be certified and verified as required in the contract documents – at the bidder's expense.
 - 6. No quick links or quick link style sleeved and threaded coupler style links shall be allowed for overhead lifting under any circumstances – even if the parts are load rated.

2.3 MISCELLANEOUS RIGGING HARDWARE:

A. FRONT LOADING COUNTERWEIGHT ARBORS:

1. All counterweight arbors shall be Thern Brickhouse or similar front-loading arbors with internal weight shelves and front latching gate(s).
 2. Counterweight arbors shall be designed to hold weights for balancing loads in a manner that permits handling and access while retaining the counterweights within the arbor, even in the case of unexpected impact. Arbor frames and fittings shall be of materials having ductile properties that deform plastically without fracturing. The use of double nuts shall be permitted on arbor rods to satisfy fastener-locking requirements.
 3. All counterweight arbor tops shall be equipped with attachment points for the lift lines and purchase lines, and the attachment points shall be sized so that terminations do not rest on, pinch, or otherwise bind adjacent terminations.
 4. Counterweight arbors shall be designed to hold counterweights as described elsewhere in this specification and shall be designed to hold such counterweights without dislodging in the event of unexpected impact loads.
 5. The inside of the counterweight arbor frame and internal weight stacking shelves shall be configured so that there are a series of flat, stable surfaces on which the counterweights rest without rocking or slipping. Counterweights shall not be permitted to rest on any bolt, nut, fastener or other mounting hardware.
 6. The ends of any exposed threaded bolt or misc. fastener ends shall be free from the burrs/windings that are typical of these products as they feature sharp edges and tailings that can cut and puncture. Remove all such items prior to turn over to the owner.
 7. The arbor frame shall contain either bushings for wire guides, or UHMW guide assemblies for engaging guide rail systems. For wire guide applications, bushings shall be located near the top and bottom of the arbor frame and shall be constructed of friction reducing material. In guide rail applications, guide assemblies shall run freely and engage the rail assembly in a manner that prevents arbors from disengaging under normal usage. The guide assemblies shall be designed to minimize noise and friction (typically this is with replaceable UHMW shoes on the inner guide surfaces).
- B. HEAD, LOFT & MULE BLOCKS:
1. Block assemblies shall consist of a housing that support one or more sheaves with bearings, and one or more shafts. Lines shall be prevented from unintentionally leaving their grooves. Provisions shall be made for accurately mounting the block assembly to the structural framing.
 2. Shafts shall be fabricated from material with a minimum Yield Strength of 310,230 kPa (45,000 psi). Shafts shall be installed so that no thread contacts the bearing or sheave housing. Unless specifically designed to rotate, shafts shall be locked against rotation within the block housing. Shaft nuts shall have a minimum rating of SAE J995 Grade 2. Shafts shall not move axially.
 3. All grooves on a sheave shall have equal pitch diameters.
 4. Loft blocks shall meet the same requirements as listed above. Loft blocks shall be permitted to incorporate additional grooves in the sheave to support additional lift lines.
 5. Mule blocks shall meet the same requirements as listed above. If field conditions require, the assembly shall be adjustable to maintain fleet angle alignment of the lift lines. The block shall lock in position after final adjustment, so it is not supported by lift line tension. Brackets for the attachment of guide cables or other accessories shall be mounted on the assembly in a manner that permits the mule sheave, bearings, etc. to easily be removed for maintenance or repair. Any additional loads imposed by these assemblies shall be accounted for in the design of both the housing and mounting assembly.
- C. LIFT CABLES (WIRE ROPE):
1. All lift cables shall be 7 x 19 construction, galvanized aircraft cable, sized as required and with ultimate breaking strengths as follows:
 - a. 1/8" diameter — 2,000 pounds
 - b. 3/16" diameter — 4,200 pounds
 - c. 1/4" diameter — 7,000 pounds
 - d. 5/16" diameter — 9,800 pounds
 - e. 3/8" diameter — 14,400 pounds

2. Damaged or deformed cable shall not be used. All wire rope rigging shall be installed so as to prevent abrasion of the wire rope against any part of the building construction or other equipment.
 3. Wire rope shall not contact any part of the building structure, adjacent line sets or other equipment not otherwise intended for contact.
 4. Lift lines shall be fabricated of continuous un-spliced lengths of material.
 5. In applications where reverse bends are incorporated, the wire rope service life shall be decreased as determined by a qualified person.
- D. BRIDLES:
1. Bridle components, attachments, fittings, terminations and connections shall comply with all related and relevant requirements listed in this section. Bridles shall not be spliced to lift lines.
 2. Resultant load angles created by bridle assemblies shall not exceed 60-degrees (30-degrees from vertical) based upon the specific loading conditions of the application.
 3. Bridle connections at the batten shall be fixed in place in a manner that prevents slipping along the batten; however, the drilling of pipe battens and fixing bridle connection points (clamps) in place with bolts is not recommended due to potential derating. All bridle point connections with the pipe batten should be accomplished with a full pipe clamp or similar mechanical device properly installed as per the manufacturer's recommendations and guidelines.
 4. All bridled lines shall connect at the bridle point via a weldless ring or weldless pear-shaped link designed for bridle applications. All weldless rings or pear-shaped links shall be quenched & tempered alloy or forged carbon steel, shall be proof tested with certification certificate and meet the performance requirements of Federal Specification RRC-271D, Type VI (except for those provisions required of the contractor).
- E. CABLE & CHAIN FITTINGS & TERMINATIONS:
1. Swaged sleeve fittings shall be copper Nicopress. Swaged fittings shall be installed per the fitting manufacturer's instructions, using the appropriate tools, and checked with the appropriate Nicopress "Go - No - Go" gauge.
 2. All wire rope eyes shall be formed over galvanized metal wire rope thimbles that are sized in accordance with the wire rope diameter.
 3. All termination hardware shall be load rated and sized for the working load limit of the line it is used on. All hardware shall be installed and used in accordance with the manufacturer's recommendations.
 4. No Crosby wire rope clips or similar items shall be allowed.
- F. EYE BOLTS:
1. All eyebolts shall be The Crosby Group or equal.
 2. All eyebolts shall be:
 - a. Drop forged steel and hot dipped galvanized steel in construction or machinery type - quenched and tempered.
 - b. Fatigue rated.
 - c. Load rated.
 - d. Recommended for straight and in-line pulls only.
 - e. Where circumstances require angular loading, only shoulder eye or machinery bolts shall be used. For angular lifts, the contractor shall adjust size of eye bolts in order to maintain the proper working load limit and safety factor based upon manufacturer's standard deratings due to imposed angular forces/loads. Direction of pull of 45° will cause the adjusted working load to be 30% of the rated working load. Direction of pull of 90° will cause the adjusted working load to be 25% of the rated working load.
 - f. Regular nut eye bolts are not allowed and are strictly prohibited.
 - g. The shoulder shall always be secured flush against the load surface.
- G. SHACKLES:
1. All shackles shall be The Crosby Group or equal.
 2. All shackles shall be:

- a. Drop forged and hot dipped galvanized steel in construction.
- b. Screw pin or bolt type only.
- c. Provided with a redundant fixing means (moused), after pin insertion (this is to keep any and all threaded pins from backing out over time or due to vibration or rotation during use). The fixing method shall be performed in accordance with the manufacturer's recommendations. Mouse with galvanized wire or black nylon wire ties after final adjustment to prevent loosening.
- d. Fatigue rated.
- e. Load rated.
- f. Working load limit permanently shown on the body of the shackle.
- g. Quenched and tempered.
- h. Meet DNV impact requirements of 42 joules at -20°C.
- i. Furnished with certification certificates to design standards (ABS, DNV, Lloyds.) and proof tested.
- j. Meet the performance requirements of Federal Specification RR-C-271D, Type IVA/IVB, Grade A/B, Class 2/3 (except for those provisions required of the contractor).
- k. Rated for use in applications involving side-loading circumstances (with reduced load limits, depending on angle of loading).
- l. Where circumstances require angular loading, the contractor shall adjust size of shackles in order to maintain the proper working load limit and safety factor based upon manufacturer's standard deratings due to imposed angular forces/loads. Direction of pull of 45° will cause the adjusted working load to be 70% of the rated working load. Direction of pull of 90° will cause the adjusted working load to be 50% of the rated working load.
- m. Shackles shall never be used to join two bridled parts together.
- n. Angular loads that exceed 120° included angle shall never be imposed upon any shackle (and those that are at 120° included angle shall only be symmetrically loaded).
- o. Round pin shackles are not allowed and are strictly prohibited.

H. TURNBUCKLES:

1. All turnbuckles shall be The Crosby Group or equal.
2. All turnbuckles shall be:
 - a. Drop forged and hot dipped galvanized steel in construction.
 - b. Fatigue rated.
 - c. End fittings quenched and tempered.
 - d. Bodies heat treated by normalizing.
 - e. Feature UNC threads with modified UNJ threads on end fittings for improved fatigue properties.
 - f. Recommended for straight and in-line pulls only.
 - g. Meet the performance requirements of Federal Specifications FF-T-791b, Type 1, Form 1 – Class 2/4/7/8 (except for those provisions required of the contractor).
 - h. Provided with a redundant fixing means (moused), after pin insertion (this is to keep any and all threaded pins from backing out over time or due to vibration or rotation during use). The fixing method shall be performed in accordance with the manufacturer's recommendations. Mouse with galvanized wire or black nylon wire ties after final adjustment to prevent loosening.
 - i. Turnbuckles shall not feature hook end fittings. Hook end fittings are not allowed and are strictly prohibited.

I. GENERAL FITTINGS REQUIREMENTS:

1. Never use fittings that:
 - a. Show signs of wear or damage.
 - b. Where shafts are bent or eyes are elongated (past manufacturing tolerances).
 - c. Are underrated on their loading limits.
 - d. Are not designed to safely handle the loads imposed upon them.
 - e. Have been modified, undercut, shortened or otherwise altered by the contractor.
 - f. Have had a load applied to them suddenly.

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2. Always use fittings that:
 - a. Have clean threads, shanks and receiving holes.
 - b. Have been properly tightened and moused.
 - c. Have been properly seated as per the manufacturer's recommendations against the load.
 - d. Are designed to safely handle the loads imposed upon them, including angular lifts with appropriate deratings.
 - e. Have been shimmed with washers in order to change eye alignment to necessary orientation (if needed).
 3. All angular loads must be applied in the plane of the fittings' bow.
 4. Misc. fittings and parts shall not be allowed that are "consumer grade" non-load rated, purchased at a local box stores, etc. excepting that these parts shall meet or exceed all requirements as set forth in these specifications.
 5. No previously used parts or fittings shall be allowed. Only brand new, never before been installed parts shall be provided for this project.
- J. TRIM CHAINS:
1. Trim chains shall be 36" long, made of inherently black, 7 mm, hardened alloy chain (meeting OSHA 1910.184(e)(5) requirements. Connection between the end link and the lifting cable (wire rope lift line) shall be made with a thimble and copper Nicopress sleeve where the wire rope eye termination passes through the end link of the chain. Chains shall be wrapped one and one half turns around the batten and attached back to the thimble at the end of the lift line with a 1/4" forged shackle. Adjustment is made by connecting the shackle into a link along the return side of the chain.
 2. Provide and install one 3/8" diameter safety bolt, one nylon insert nut and two flat washers per trim chain after batten is leveled.
 3. Trim chains shall have a recommended working load of 3,250 lbs. (with a 4:1 safety factor).
 4. Trim chain assemblies shall be fabricated of chain approved by the manufacturer for the application.
 5. Trim chain links shall feature a date code for traceability (marked on every 10th link or similar).
 6. Trim chains shall be JR Clancy Alpha chain or equal.
- K. OVERHEAD LIFTING CHAINS:
1. Any overhead lifting chain must be a Grade 80 or Grade 100 (or higher) alloy chain approved for overhead lifting (with the exception of the Grade 63 trim chains which meet the OSHA requirements).
 2. All overhead lifting chain or chain assemblies or related components must meet the OSHA 1910.184(e)(5) and the ASME B30.9 standards.
 3. All overhead lifting chain or chain assemblies and related individual components that are visible shall be flat black, unless otherwise noted on the contract documents (excepting those portions that are buried within ceilings, etc. that cannot be seen from the audience areas of the facility).
 4. Any individual component manufactured for overhead lifting quality standards, if it is used as part of a lifting assembly, then the entire assembly must be tested and tagged before use.
 5. Chain assemblies shall not use horizontal angles of less than 30°.
 6. The overhead lifting assembly shall be rated for not more than the WLL of the weakest component in that assembly (that component with the lowest WLL).
 7. Side loading of any overhead lifting chain is not permitted.
 8. Any sharp edges which may contact any portion of an overhead lifting chain or assembly must be dulled and/or properly wrapped/padded in order to protect the chain and related components. Failure to do so will result in the installing contractor having to provide all new components and installation labor at his own cost.
 9. If the overhead lifting chain or any related assembly components have been exposed to high temperatures, water or corrosive materials, then any affected components shall be removed from service per OSHA and ASME standards and replaced by the contractor (up until the time of the official turnover of the space to the owner).
- L. SHEAVES:

1. Sheaves shall be of the following materials, as specified:
 - a. ASTM A-48 Class 30 grey iron castings
 - b. Nylatron or Polyamide Nylon (PA6-G)
 - c. Steel (only as specifically noted or indicated)
2. Groove depths shall be sufficient to encompass fully the cables and ropes. Grooves shall have sloped sides (8-degree minimum) and conform to rope and cable manufacturers' standards for groove shape and tolerance.
3. Sheaves shall be supported by bearings and a machined steel shaft, which shall be keyed to one side plate to prevent rotation. Proper adjustment of the bearing shall be accomplished by means of a fine thread, self-locking nut on the opposite end of the shaft. Each sheave shall run plumb and true without rubbing its side plates when rotated.

M. LOCKING RAILS:

1. The locking rail shall be constructed from structural steel shapes and shall consist of a top railing and its supports. The rail top shall be drilled to receive the rope locks on the required centers. The rail shall be designed to accept either the anticipated loads imposed by the counterweight sets, or 23 kg (50 pounds) per rope lock plus concentrated loads of 227 kg (500 pounds) at the midpoint between each locking rail upright, whichever is greater. It shall also be designed to absorb a horizontal load as dictated by system design and applicable codes.
2. The locking rail assembly itself shall be attached to the building structure using weldments, bolts or anchors specifically sized and designed for the loads, mounting surfaces and conditions present in the field or shall be welded to appropriate substrates (if they exist). Any weldments indicated on the drawings or otherwise required must be provided by the contractor or by a qualified sub-contractor. Any weldments needed shall be specified by the manufacturer(s) and shall meet or exceed minimum industry standards and those standard practices set forth within related contract weldment specifications. No weldments noted shall be negotiable or optional. See structural and TR series drawings as well as structural specifications for more information on mounting details, attachment methods and requirements, embedment depths, etc. The preferred method of attachment is to weld the locking rail stanchions to existing steel channel (flush mounted in floor). If this does not exist, then locking rail shall be attached with epoxy anchor bolt method. See project structural engineer for embedment depth, exact type of anchor, drilling procedures, etc. as well as manufacturer's recommendations for expected loading imposed. All welding shall be performed by the installing rigging contractor or qualified sub-contractor, as per current AWS (or other required) standards. Manufacturer shall specify weld.
3. Any customizations of locking rails shall be performed and provided by a manufacturer. Customized locking rails must be engineered by a manufacturer, delivered to the jobsite and installed to be a single functioning unit. The contractor shall not be allowed to augment, alter or modify a locking rail in order to meet maximum loading forces or any other parameters.

N. CAM-STYLE ROPE LOCKS:

1. Rope locks shall remain locked until released, once the rope lock handle is placed in the locked position. A rope lock shall sustain an out of balance condition of 23 kg (50 pounds).
2. Housings shall be made of a material having ductile properties that will deform plastically without fracturing.
3. Housings shall have integral holes on both side plates and in front of the rope lock "home/locked" handle position that can accommodate locks in order to prevent unauthorized use.
4. An adjustment mechanism on the rope lock shall permit adjustment of the clamping members for worn ropes or ropes of differing diameters.
5. Rope locks shall have an integral thumb release button mechanism located on the top of the operating lever and that is designed to prevent accidental release.
6. Rope locks shall have a 3-way roller friction system that is used to hold the operating line rope in a static position. There shall be two passive, non-moving rollers and one cam mounted active roller. This shall create a three-bend holding format into the operating line, which shall not crush the rope. Crushing style rope locks shall not be allowed.

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7. Rope lock handles shall need to be moved to a position that is approx. 5 degrees offstage and past top dead center in order to fully engage the rope lock and spring-loaded keeper pins.
 8. Attachment of the lock to the locking rail shall be such that loads imposed on the lock are safely transferred to the locking rail structure.
 9. Rope locks shall be positioned to impose minimal wear on the operating line as it passes through the system. Rope locks shall not be welded to the locking rail.
- O. PURCHASE LINES (OPERATING ROPE LINES):
1. Purchase lines shall be made of synthetic or premium grade manila and shall conform to all applicable design factors.
 2. The minimum nominal rope diameter shall be no less than 19 mm (3/4 inch).
 3. All operating rope lines shall be terminated with a knot or splice that maintains a minimum 60% of the rope's tensile strength. The termination shall not interfere with adjacent equipment and shall be finished in a manner that prevents fraying or unraveling of the rope ends, loosening of the termination and shall be done in accordance with the rope manufacturer's recommendations. (Typically, rope is finished at all cut ends with a tight wrapping of several layers of gaff or electrical tape or with rope wax).
 4. The purchase line shall be installed so that it freely runs through the tension block, head block and arbor blocks (if used). With the exception of the rope lock, the purchase line shall not contact any part of the building structure, adjacent line sets or other equipment.
- P. FABRICATION:
1. The mechanical fabrication and workmanship shall incorporate best practices for good fit and finish. There shall be no burrs or sharp edges to cause a hazard nor shall there be any sharp corners accessible to personnel.
 2. All moving parts shall have specified tolerances. Sheaves shall run plumb and true and shall not scrape housings.
 3. All equipment shall be built and installed to facilitate future maintenance and replacement.
- Q. FINISHES:
1. Paint shall be the manufacturer's standard finish and color except as noted.
 2. All turnbuckles, clips, tracks, chains and other items of incidental hardware shall be furnished plated or painted.
- R. RECOMMENDED WORKING LOAD (RWL):
1. This specification calls for minimum recommended working loads for many hardware items. This is the maximum load which the manufacturer recommends be applied to properly installed, maintained and operated new equipment. Manufacturer's recommended working loads shall be determined by calculations by a Licensed Professional Engineer and destructive testing by an independent testing laboratory. These calculations and reports shall be available for review.
 2. All rigging hardware, rigging assemblies, etc. noted in this specification shall bear a maximum of 1/10th of the MBS (minimum breaking strength) for the weakest component. The minimum safety factor for any rigging related devices or assemblies in this project shall be 10:1 (MBS vs. actual imposed load per location), unless otherwise noted and regardless of the manufacturer's safety factor.
 3. Any contractor fabricated or erected assemblies must feature a 10:1 safety factor. It shall be the sole responsibility of the fabricating and installing contractor to verify that the entire assembly meets this minimum 10:1 safety factor, regardless of what pieces may be noted on the contract drawings. If the contractor finds that undersized hardware was specified, then it is his responsibility to provide upgraded/larger sized hardware in order to maintain the noted 10:1 safety factor.
 4. All misc. hardware, bolts, shackles, pairing rings, turnbuckles, nuts, washers, etc. shall be as manufactured by The Crosby Group, Inc. or equal, shall be load rated, shall be recommended for the usage imposed and shall be a minimum of Grade 5 or equal. All noted RWL's shown in the table below are based upon The Crosby Group, Inc. published data tables.

S. MINIMUM RECOMMENDED WORKING LOADS PER PART:

1. Description	2. Shank Diameter (in/mm)	3. Working Load Limit (WLL) ton
4. Screw Pin Anchor Shackle (forged)	5. 3/16"	6. 1/3
7. (reference d product forged, G-209/S-209)	8. 1/4"	9. 1/2
	10. 5/16"	11. 3/4
	12. 3/8"	13. 1
	14. 7/16"	15. 1.5
	16. 1/2"	17. 2
	18. 5/8"	19. 3.25
	20. 3/4"	21. 4.74
22. Shoulder Nut Eye Bolt (forged)	23. 6.35 mm	24. .29
25. (reference d product forged, G-277)	26. 7.94 mm	27. .54
	28. 9.53 mm	29. .70
	30. 12.7 mm	31. 1.18
	32. 15.9 mm	33. 2.35
34. Machinery Eye Bolt (forged)	35. 6.35 mm	36. .29
37. (reference d product forged, S-279 UNC)	38. 7.94 mm	39. .54
	40. 9.53 mm	41. .70
	42. 12.7 mm	43. 1.18
	44. 15.9 mm	45. 2.35
46. Jaw & Eye Turnbuckle (forged)	47. 1/4"	48. .23
49. (reference d product)	50. 5/16"	51. .36

forged, HG-227)		
	52. 3/8"	53. .54
	54. 1/2"	55. 1
	56. 5/8"	57. 1.59
	58. 3/4"	59. 2.36

- 60.
61. The above chart is only for the most commonly used hardware specified and is not an all-inclusive or comprehensive list. For any hardware specified that is not listed here, the contractor shall refer to the ratings shown in the latest Crosby Group hardware catalog.
62. Recommended Working Load (RWL) and Working Load Limit (WLL) are understood to be synonymous terms.
63. Fatigue load rating on most Crosby hardware is 1.5 times the Working Load Limit.
64. Maximum Proof load rating on most Crosby hardware is 2.0 times the Working Load Limit.
65. Minimum Ultimate load rating of most Crosby hardware is 5.0 times the Working Load Limit minimum.
66. All tonnage is understood to be a standard ton (2,000 lbs.).
67. Verify all load limits with the manufacturer's most recent publications.
68. All hardware must be hot dipped galvanized.

2.4 NYLATRON UNDERHUNG HEAD BLOCK: REFERENCED PRODUCT THERN STAGE HB12 SERIES UPRIGHT/UNDERHUNG SINGLE PURCHASE HEAD BLOCK

- A. Underhung head block shall be equipped with 12" diameter Nylatron GSM sheave with (six, eight or ten – per drawing requirements) 1/4" wire rope grooves and one 3/4" purchase line groove machined so that the pitch diameters of all grooves are equal. Cast iron sheaves shall not be acceptable. Machine face and concentrically bore hub for installation of a steel bearing support insert. Machine each end of insert for roller bearing cup and external retaining rings. Install tapered roller bearing cone and cup on 1" diameter steel shaft. Sheaves with bearing cups pressed directly into the synthetic material shall not be acceptable. Lock shaft to side plate on head end with 1/4" keeper pin to prevent rotation. Provide washer and fine-threaded nylon insert lock nut on threaded end. Shaft threads shall not bear on side plates.
- B. Ten-gauge side plates shall be welded and bolted to 2" X 2" X 1/4" steel base angles, 34" long. Provide six 1" notched tubing spacers and six 5/8" tubing spacers fastened with 3/8" bolts and lock nuts, forming a rigid housing and preventing the purchase line and cables from leaving their grooves. Locate mounting holes in each base angle to allow proper placement under head beam. Attach to beam using four 1/2" welded steel bar clips, fabricated with offset to match head beam flange, and four 1/2" diameter SAE J429 Grade 5 bolts, nuts, flat washers and lock washers.
- C. Head block assembly shall be designed for a working load limit of 3,000 pounds at 300 feet per minute.
- D. Headblock shall weigh 56 – 64 lbs. (depending on quantity of grooves).

2.5 NYLATRON TENSION FLOOR BLOCK: REFERENCED PRODUCT THERN STAGE FB12 SERIES SINGLE PURCHASE TENSION BLOCK

- A. Provide tension block with 12" diameter ASTM A 48, Class 30-35 gray iron sheave with lathe-turned groove for 3/4" rope. Concentrically bore hub for installation of two sealed precision ball bearings on 5/8" diameter steel shaft. Lock shaft to side plate on head end with 3/16" keeper pin to prevent rotation. Provide washer and fine-threaded nylon insert lock nut on threaded end. Shaft threads shall not bear on side plates.

- B. Ten-gauge side plates shall be bent to form a 1/4" x 12 1/8" steel backing plate and 1/4" x 2" steel tabbed front kick plate, forming a rigid housing. Front plate shall have bent toe plate to ease movement of tension block. Provide three 5/16" bolts and spacers to keep rope from leaving groove. Entire assembly shall weigh in excess of 44 pounds and ride between tee guides on two guide shoe assemblies.
- C. Provide two shoe guides per tension block. Each assembly shall be constructed from two 1/2" x 6" HDPE guide plates and one 1/4" x 2" HDPE spacer plate, sized to properly ride between tee guides located on 6" or 8" centers. Provide two 1/4" x 2" steel backing plates to support guide material, and three 3/8" diameter SAE J429 Grade 5 bolts to attach entire assembly to tension block housing.

2.6 NYLATRON UNDERHUNG THROAT CUT LOFT BLOCK: REFERENCED PRODUCT THERN STAGE LB8-F SERIES THROAT CUT UNDERHUNG LOFT BLOCK

- A. Underhung loft block shall be equipped with 8" diameter Nylatron GS sheave grooved for 1/4" cable to meet wire rope manufacturers' recommended practice for both clearance and 30-degree throat taper. Install two sealed precision ball bearings on 5/8" steel shaft. Lock shaft to side plate on head end with 3/16" keeper pin to prevent rotation. Provide washer and fine-threaded nylon insert lock nut on threaded end. Shaft threads shall not bear on side plates.
- B. Ten-gauge side plates shall be notched on the load-bearing side to fit up to 3/8" thick loft beam flange and shall be welded to 1" X 1" X .120" steel tube. Provide FIVE 5/8" tubing spacers fastened with 5/16" Grade 5 bolts and lock nuts, forming a rigid housing and preventing the cable from leaving its groove. Secure block to beam with a 5/16" x 2" formed steel "L" clip and 3/4" bolt, nut and lock washer.
- C. Entire loft block assembly shall be designed for a working load limit of 875 pounds for 1/4" cable at 300 feet per minute.
- D. Provide blocks with quantity of grooves as indicated on the contract drawings (up to a max of 9).
- E. Provide blocks with Thern LB2 series Nylatron idler assemblies with quantity of grooves as indicated on the contract drawings (up to a max of 9).

2.7 NYLATRON UNIVERSAL LOFT BLOCK: REFERENCED PRODUCT THERN STAGE LB8-R/D SERIES LOFT BLOCK

- A. Upright or underhung loft block shall be equipped with 8" diameter Nylatron GS sheave grooved for 1/4" cable to meet wire rope manufacturers' recommended practice for both clearance and 30-degree throat taper. Install two sealed precision ball bearings on 5/8" steel shaft. Lock shaft to side plate on head end with 3/16" keeper pin to prevent rotation. Provide washer and fine-threaded nylon insert lock nut on threaded end. Shaft threads shall not bear on side plates.
- B. Ten-gauge side plates shall be notched on the load-bearing side to fit up to 3/8" thick loft beam flange and shall be welded to 1" X 1" X .120" steel tube. Provide five 5/8" tubing spacers fastened with 5/16" Grade 5 bolts and lock nuts, forming a rigid housing and preventing the cable from leaving its groove. Secure block to beam with a 5/16" x 2" formed steel "L" clip and 3/4" bolt, nut and lock washer.
- C. Entire loft block assembly shall be designed for a working load limit of 875 pounds for 1/4" cable at 300 feet per minute.
- D. Provide upright/underhung loftblocks with the quantity of wire rope grooves as indicated on the contract drawings (up to a max of 9).

- 2.8 NYLATRON WIRE ROPE IDLERS: REFERENCED PRODUCT THERN STAGE LB2-L SERIES LOFT BLOCK IDLERS
- A. Loft block idlers shall be provided to carry the weight of the cables and prevent rubbing against adjacent block side plates. They shall not be installed to carry line loads or to act as deflectors or mule blocks.
 - B. Provide idler assembly attached to the side of each loft block to support and guide all cables as they pass adjacent to the block. Each cable shall be supported by an individual 2" diameter sheave of Nylatron GS molded around steel ball bearing.
 - C. The sheaves shall have 1/4" cable grooves and two sealed, precision ball bearings and shall ride on a 1/4" shaft inserted through the block housing.
 - D. A 3/16" diameter spacer shall mount in the housing and captivate the cables in the grooves.
 - E. All nuts shall be of the nylon insert self-locking type.
 - F. Idlers shall be mounted to sides of loftblocks as needed, depending on liftline count. Idler sheave counts shall decrease as liftline count lowers (i.e. the last loft block of each set should have no idlers, the second to the last one should have three, etc.).
 - G. Provide idler assemblies with the quantity of wire rope grooves as indicated on the contract drawings (up to a max of 9).
- 2.9 FRONT-LOADING COUNTERWEIGHT ARBOR: REFERENCED PRODUCT THERN BRICKHOUSE ARBOR
- A. Counterweight arbor shall be a Brickhouse Series arbor as manufactured or supplied by Thern Stage Equipment of Winona, Minnesota. Only products meeting or exceeding these specifications shall be accepted as alternates. The arbor shall be:
 - B. FL6 series for 8-inch center wire-guide wall.
 - C. FL4 series for 6-inch center wire-guide wall.
 - D. The arbors shall be single or double purchase (see contract drawings for specific style to be provided)
 - E. The arbor shall be a front-loading type. Side loading arbors are not acceptable.
 - F. The arbor shall enclose the counterweight bricks on three sides. Arbors that do not enclose the counterweight bricks are not acceptable.
 - G. The arbor shall have a spring activated self-closing lock bar to prevent bricks from sliding out the front of the arbor. The lock bar shall engage and lock in the slot or indentation at the front of the counterweight bricks in the event the bricks slide forward in the arbor.
 - H. The arbor shall have shelves welded in place no more than 24 inches apart. Arbors requiring spreader plates are not acceptable. Arbors without shelves are not acceptable.
 - I. The arbor shelves shall impose an angle on the counterweight bricks causing them to be slanted toward the back of the arbor.
 - J. The arbor shall not have bolt heads, bolt shanks or nuts protruding from the sides of the arbor.
 - K. The arbor shall be single purchase and shall have tie off points for up to 10 loft lines and for one 3/4 inch purchase line.
 - L. The arbor shall be delivered at pipe weight. Pipe weight may be achieved by the delivering an arbor that is pipe weight and/or by the addition of counterweights.
 - M. The arbor shall be sized to accommodate counterweights as indicated on the contract drawings.

- N. The arbor shall be designed in such a way that up to three arbors can be bolted together and operated as a single arbor, with each arbor carrying full compartments of counterweight bricks.
- O. Counterweight arbors shall be designed to hold weights for balancing loads in a manner that permits safe handling and easy access while retaining the counterweights within the arbor, even in the case of unexpected impact. Arbor frames and fittings shall be of materials having ductile properties that deform plastically without fracturing.
- P. All counterweight arbor tops shall be equipped with attachment points for the lift lines and purchase lines, and the attachment points shall be sized so that terminations do not rest on, pinch, or otherwise bind adjacent terminations.
- Q. Counterweight arbors shall be designed to hold counterweights (either standard or suitcase style) and shall be designed to hold such counterweights without dislodging in the event of unexpected impact loads.
- R. The inside of the counterweight arbor bottom frame shall be configured so that the counterweights rest without rocking. Counterweights shall not be permitted to rest on any bolt, nut, fastener, or other mounting hardware.
- S. The arbor frame shall contain guide assemblies for engaging guide rail systems. Guide assemblies shall run freely and engage the rail assembly in a manner that prevents arbors from disengaging under normal usage. The guide assemblies shall be designed to minimize noise and friction.

2.10 COUNTERWEIGHT SYSTEM LOCKING RAIL ROPE LOCK: REFERENCED PRODUCT THERN BRICKHOUSE ROPE LOCK

- A. Rope locks shall remain locked once the rope lock handle is placed in the locked position.
- B. Rope locks shall not require two hands to unlock and operate.
- C. A rope lock shall be able to sustain an out of balance condition of 22.6 Kg (50 pounds).
- D. Rope lock shall allow the handline to slip when the preset imbalance limit has been exceeded so as to indicate an imbalance prior to becoming unmanageable.
- E. Rope locks shall allow slippage of the handline above the preset imbalance limit without degradation of the rope.
- F. Rope locks shall have an integral mechanism designed to prevent accidental release.
- G. Rope locks shall allow for lock out in both the open and closed position.
- H. Housings shall be made of a material having ductile properties that will deform plastically without fracturing.
- I. An adjustment mechanism on the rope lock shall permit adjustment of the clamping members for ropes of differing diameters.
- J. Attachment of the lock to the rail shall be such that loads imposed on the lock are safely transferred to the rail structure.
- K. Rope locks shall be positioned to impose minimal wear on the operating line as it passes through the system.
- L. Rope locks that squeeze the rope to hold it in place shall not be allowed.
- M. Rope locks shall not be welded to the locking rail.
- N. See Section labeling and Marking for labeling requirements.

2.11 COUNTERWEIGHT: REFERENCED PRODUCT THERN BRICKHOUSE SUITCASE STYLE COUNTERWEIGHTS

- A. Counterweights shall be made of steel or other materials having ductile properties that will deform plastically without fracturing.
- B. The weights shall be free from sharp edges, gouges, slag spatter, etc. and shall be smooth all around with eased edges and corners. Weights that are missing chunks or have any damage in any way shall be replaced (and never put into service).
- C. The counterweights shall have an oblong shaped hole to be used as a handle cut toward one end. The same end shall have a slight notch cut. This notch accommodates the locking gate.
- D. Counterweights shall be of dimensions and shapes that can be safely handled by an average worker and shall vary in size by no more than 3 mm (1/8 inch).
- E. Individual counterweights shall not weigh more than 13.6Kg (30 lbs.).
- F. The use of cast iron or other materials shall be acceptable only when specifically called out on the contract drawings.
- G. There shall be spare counterweights supplied (see contract drawings for exact amount). This amount will be in addition to the counterweights required to achieve pipe weight balance on the counterweight sets.

2.12 OUTRIGGER BRACKETS: REFERENCED PRODUCT JR CLANCY 15-96

- A. Angle iron outrigger brackets shall be made of 3/16" x 1-3/4" x 1-3/4" angle and spaced not more than 10 feet apart. The brackets shall be attached to the wall battens of the arbor guide system so that the batten is located 10 feet above the gallery or stage floor. The brackets shall include clamps for attaching the batten.
- B. The outrigger batten shall be made from 1-1/2" I.D., schedule 40 pipe extending the full length of the locking rail. Specifications are the same as other battens.

2.13 INDEX LIGHT: REFERENCED PRODUCT SSRC LED-IRL-XX LED

- A. Outrigger batten shall be mounted so it does not interfere with the movement of purchase lines, or other building equipment. The batten shall be rigidly mounted to the guide wall, or directly to the building structure.
- B. Each index light unit shall consist of a sheet steel housing containing a continuous row of both blue and white LED lights. Entire system shall be fully dimmable.
- C. Units shall be constructed so as to light the locking rail and prevent light from spilling on stage. The exterior of the index strip light shall be painted a matte black, the interior shall be white. Units shall be supplied in section lengths as indicated.
- D. Provide all related electrical work, dimmer boxes, interfaces, conduit, wiring, etc. as needed and indicated.
- E. Provide set numbering on outer shell of index lighting reflector as indicated.
- F. Provide the length of index lighting to match the locking rail(s) length(s), unless otherwise indicated.
- G. Provide a local dimmer box controller for each index lighting system provided.

2.1 TORMENTOR LIGHT LADDER PIPE ASSEMBLY: REFERENCED PRODUCT SSRC-STYLE LIGHT LADDER

- A. The light ladder assemblies (tormentor and/or Shakespeare pipe assemblies) shall be constructed of 1 1/2" nominal black iron pipe with a matte black finish. All assemblies shall be of welded construction and shall be attached to the walls with 8" x 8" SSRC style wall flanges

(unless otherwise noted on the bid drawings). All pipe assemblies shall be attached with load rated anchors appropriate for the substrate they are mounted into. See T series drawings details for more information on pipe assembly construction, mounting requirements and exact mounting locations. Nominal diameter is the ID size of the pipe. Actual OD shall be larger.

2.2 WALL FLANGE ASSEMBLY: REFERENCED PRODUCT SSRC-8" X 8" WALL FLANGE

- A. The wall flange shall be constructed of an approx. 1.6" OD (to accept a 1 1/2" nominal "leg") black iron pipe welded to an 8" x 8" flat steel plate. Pipe shall be perfectly centered in the steel plate. Steel plate shall feature (4) 3/8" punched holes for bolts – each spaced approx. 3/4" in from each plate edge. Entire plate shall be factory finished with a matte black finish.

2.3 BEAM CLAMP: REFERENCED PRODUCT ANVIL INTERNATIONAL FIG. 133 STANDARD DUTY BEAM CLAMP

- A. The beam clamp shall be a two-part, formed, 3/8" standard duty, carbon steel beam clamp #133 series style beam clamp (with grade 8 bolt and spacer). Beam clamp shall be available in sizes from 4" to 12" and shall accept a maximum flange thickness of 7/8" and a maximum flange width of 8". Beam clamps shall be rated for a WLL of 1,000 lbs. each. Beam clamps must captivate both sides of each beam flange. The system components shall be two half-clamps, one pipe spacer and one bolt with nut. UL listed when used with 3/8" and 1/2" rod. Clamp complies with Federal Specification A-A-1192A (Type 21), WW-H-171-E (Type 21), ANSI/MSS SP-69 and MSS SP-58 (Type 21). Available in plain or galvanized finish. The contractor shall provide galvanized finished and shall apply at least (1) coat of rust inhibiting primer and (2) coats of flat black rust inhibiting paint to all sides of each beam clamp part. Use Rust-O-Leum, Krylon or equal. No paint drips, smudges, etc. shall be allowed.

2.4 BATTEN CLAMP: REFERENCED PRODUCT H&H SPECIALTIES MODEL #680 BATTEN CLAMP

- A. All batten clamps shall be made from steel or other ductile materials. Clamps shall fully wrap the perimeter of the batten cross-section and shall provide a positive resistance to rotational loads. The clamps shall permit attachment to the lift line using hardware specifically designed for the connection type indicated. Batten clamps shall not have sharp edges or corners. No half clamps shall be allowed.
- B. Batten clamps shall be constructed of 10-gauge steel and shall be furnished with 3/8" x 1" Grade 5 hex bolts with locknuts and a hole for the attachment of cable, chain, shackle, turnbuckle, thimble or other fittings.
- C. Beam clamps shall be for use on standard 1 1/2' schedule 40 pipe battens.
- D. Batten clamps shall have a WLL of 1,400 lbs.

2.5 GRADED TRIM CHAIN: REFERENCED PRODUCT PEERLESS INDUSTRIAL GROUP GRADE 63 ALLOY CHAIN

- A. The trim chain shall be 7 mm (0.279" or 9/32") black alloy chain suitable for rigging and overhead lifting. Inside link dimensions: 0.827" nominal length; 0.405" nominal minimum width. Chain MUST be inherently black and cannot be silver, gray, yellow or any other color.
- B. The trim chain shall be Grade 63 low weight special analysis alloy steel chain meeting or exceeding all existing OSHA, government, NACM and ASTM specification requirements.
- C. The trim chain shall be suitable for use with 1/4" hardware.
- D. The trim chain shall feature a date code on at least every 10th link for traceability.
- E. Load limits and safety factors for the chain shall be as follows:

1. Working load limit (WLL): 3,250 lbs.
 2. Proof tested load: 6,500 lbs. minimum
 3. Ultimate breaking strength: 13,000 lbs. minimum
 4. Elongation at break: 20% minimum
 5. 4:1 minimum safety factor
- F. Trim chain installation shall be industry standard and as follows: the end link on one end of the trim chain shall be captured directly with the lift line cable thimble. The trim chain shall be wrapped one and a half turns around the associated pipe batten and be terminated into a load rated forged screw pin anchor shackle. The shackle shall be routed through the same thimble which captures the end link of the chain.
- G. The contractor shall adjust the overall trim chain length as needed. Some sites with limited overhead height may need the trim chains to be "choked" shorter than normal. This will require the contractor to custom cut the overall length of each trim chain (they all must match and render the related pipe batten level with the stage floor).
- H. The contractor shall provide Grade 5 minimum hex head safety bolts with washers, nylock nuts, etc. as is noted on the contract drawings.
- I. No chain link shall exhibit cracks, voids, burrs, grooves or excessive weld flash. All links shall be uniform and symmetrical with no sharp edges, discontinuities or excessive tooling marks.
- J. Ratings: Zinc plating per ASTM B633 Type II CL FE/ZN8; ASTM B30.9; ISO 9001 Quality Assurance Procedures; OSHA 1910.184.
- K. No proof coil or shiny, metal colored trim chains shall be allowed.

2.6 PIPE BATTENS:

- A. All battens shall be 1-1/2" nominal diameter, schedule 40 (schedule 80 only as specifically called out on the contract drawings) black iron pipe in lengths as shown on the drawings. Nominal diameter is the ID size of the pipe. Actual OD shall be larger.
- B. Any batten exceeding one standard pipe length (typically approx. 20') shall be joined using internal splicing sleeves. (All joints shall be spliced with 18" long splicing sleeves with 9" extending into each pipe and held by two 3/8" hex bolts and lock nuts on each side of the joint. Splices shall not occur at lift points. See drawings for more information and requirements for batten splices, bolt orientation and interchangeability.) Threaded couplers shall not be permitted. All batten splices shall have at least the same overall capacity, deflection and strength as the component pipe and shall be interchangeable with any other batten splice provided as part of this project. Each batten shall be coated with a rust resistant finish.
- C. A minimum of 100 mm (4 inches) at each end of the batten shall be durably marked with an approved OSHA color (by use of an item such as a safety yellow vinyl end cap "batten cap" that fits snugly over the end of the batten), except in architecturally sensitive areas.
- D. Each batten shall be capable of supporting at minimum 45 kg/m (30 lbs/ft) of uniformly distributed load. Each batten shall be capable of sustaining a point load of 45 kg (100 pounds) at mid-span between any two lift lines with a maximum span deflection of 1/180 of the span (unless specifically noted elsewhere in these written specifications or on the contract documents).
- E. The typical batten shall be fabricated using materials that support the design loads in accordance with the requirements of this standard.
- F. See Section Labeling and Marking for labeling requirements.

2.7 COUNTERWEIGHT OPERATING LINE: REFERENCED PRODUCT MULTILINE II/SUREGRIP SYNTHETIC

A. Multiline II Synthetic:

1. Hand line shall employ a 3-strand composite construction combining filament and staple/spun polyester wrapped around fibrillated polyolefin (except in ropes smaller than 1/2" diameter, which have no polyolefin core).
2. The rope shall hold knots well, be easily spliced and be dense enough to allow it to be clamped in a rope lock without damage. Rope shall not be subject to rotting, mildew, or moisture damage nor shall its length be affected by changes in humidity.
3. Tape ends before cutting. Attach to arbor with two half hitches or bowline and tape end to standing line with electrical tape.
4. Length does not change with temperature or humidity.
5. Use only where specifically called out or in locations where rope larger than 3/4" diameter is required.
6. Provide rope in colors as indicated on the drawings and in specs. This is to ease in instant identification of linesets as to their type and purpose.
7. Rope Information:

Description	RWL	Weight
5/8" (16 mm) Diameter Multiline II 600' Roll (183 m)	823 lbs. (373 kg)	0.10 lb./ft. (0.13 kg/m)
5/8" (16 mm) Diameter Multiline II 1200' Roll (366 m)	823 lbs. (373 kg)	0.10 lb./ft. (0.13 kg/m)
5/8" (16 mm) Diameter Multiline II, Black 600' Roll (183 m)	823 lbs. (373 kg)	0.10 lb./ft. (0.13 kg/m)
5/8" (16 mm) Diameter Multiline II, Black 1200' Roll (366 m)	823 lbs. (373 kg)	0.10 lb./ft. (0.13 kg/m)
7/8" (22 mm) Diameter Multiline II 600' Roll (183 m)	1550 lbs. (703 kg)	0.18 lb./ft. (0.27 kg/m)
7/8" (22 mm) Diameter Multiline II 1200' Roll (366 m)	1550 lbs. (703 kg)	0.18 lb./ft. (0.27 kg/m)
1" (25 mm) Diameter Multiline II 600' Roll (183 m)	1870 lbs. (848 kg)	0.22 lb./ft. (0.33 kg/m)
1" (25 mm) Diameter Multiline II 1200' Roll (366 m)	1870 lbs. (848 kg)	0.22 lb./ft. (0.33 kg/m)

8. RWL is based on manufacturer's 10:1 safety factor

B. SureGrip Synthetic:

1. Hand line shall employ a 3-strand composite construction combining filament and staple/spun polyester wrapped around fibrillated polyolefin core.
2. The rope shall hold knots well, be easily spliced and be dense enough to allow it to be clamped in a rope lock without damage. Rope shall not be subject to rotting, mildew, or moisture damage nor shall its length be affected by changes in humidity.
3. Tape ends before cutting. Attach to arbor with two half hitches or bowline and tape end to standing line with electrical tape.
4. Length does not change with temperature or humidity.
5. Tracer tape located inside strands for use as a "wear indicator"
6. 3/4" diameter rope shall be used on all arbor sets.
7. Provide rope in colors as indicated on the drawings and in specs. This is to ease in instant identification of linesets as to their type and purpose.
8. Rope Information:

Description	RWL	Weight
3/4" (19 mm) Diameter SureGrip 600' Roll (183 m)	1050 lbs. (476 kg)	0.13 lb./ft. (0.19 kg/m)
3/4" (19 mm) Diameter SureGrip 1200' Roll (366 m)	1050 lbs. (476 kg)	0.13 lb./ft. (0.19 kg/m)
3/4" (19 mm) Diameter SureGrip, Black 600' Roll (183 m)	1050 lbs. (476 kg)	0.13 lb./ft. (0.19 kg/m)
3/4" (19 mm) Diameter SureGrip, Black 1200' Roll (366 m)	1050 lbs. (476 kg)	0.13 lb./ft. (0.19 kg/m)

9. RWL is based on manufacturer's 10:1 safety factor

C. OPERATING LINE COLOR CODING:

1. All Curtain Sets: Blue Operating Lines
2. All Counterweight Electric Sets: Red Operating Lines
3. All Scenery & Other (Scrim, Cyc, Etc.) Sets: White Operating Lines

2.8 METAL FRAMING SYSTEM: REFERENCED PRODUCT UNISTRUT METAL FRAMING

A. All contractor provided metal framing, metal channel or miscellaneous support systems indicated on the drawings shall be Unistrut Framing Systems 1 5/8" width series channel and related nuts & hardware as manufactured by Unistrut Corporation or equal.

B. Framing Members:

1. Unistrut channel members and continuous inserts shall be fabricated from cold-formed to size from structural grade, low carbon strip steel.
2. Welding: All spot-welded combination members (except P1001T) shall be welded on 3" (76 mm) maximum centers.
3. Curved channel: All curved Unistrut channel noted on the drawings shall be curved to the radius specified by the manufacturer. No contractor bent or curved channel shall be acceptable.
4. Raw steel shall conform to the following ASTM specifications:
- 5.

6. GAGE	7. FINISH	8. ASTM NO.
9. 12	10. GR & HG	11. A1011 SS GR 33
	12. PG	13. A653 GR 33
14. 14	15. GR & HG	16. A1011 SS GR 33
	17. PG	18. A653 GR 33
19. 16	20. GR & HG	21. A1011 SS GR 33
	22. PG	23. A653 GR 33
24. 19	25. GR	26. A1008

C. Nuts & Bolts:

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1. Unistrut nuts shall be made from steel bars. After all machining operations are complete, they shall be thoroughly case hardened. Nuts shall be rectangular with ends shaped to permit a quarter turn clockwise in the framing member after insertion through the slotted opening in the channel. Two toothed grooves in the top of the nut shall engage the in turned edges of the channel and, after bolting operations are completed, will prevent any movement of the bolt and nut within the framing member. All bolts and nuts shall have unified coarse screw threads. The standard framing nuts shall conform to ASTM Specification A1011 SS GR 33 (material only). Screws shall conform to SAE J429 GR.
2. Bolt Torque: Bolt torque values are given to ensure the proper connection between Unistrut Metal Framing components. It is important to understand that there is a direct, but not necessarily consistent, relationship between bolt torque and tension in the bolt. Too much tension in the bolt can cause it to break or crush the component parts. Too little tension in the bolt can prevent the connection from developing its full load capacity. The torque values given have been developed over many years of experience and testing.

3.

Bolt Torque						
Bolt Size	1/4" – 20	5/16" – 18	3/8" – 16	1/2" – 13	5/8" – 11	3/4" – 10
Rec. Torque Ft./Lbs. (N*m)	6 (8)	11 (15)	19 (26)	50 (68)	100 (136)	125 (170)
Max Torque Ft./Lbs. (N*m)	7 (9)	15 (20)	25 (34)	70 (95)	125 (170)	135 (183)

4.

5. These are based on using a properly calibrated torque wrench with a clean dry (non-lubricated) Unistrut fitting, bolt and nut. A lubricated bolt or nut can cause extremely high tension in the connection and may lead to bolt failure. It must be noted that the accuracy of commercial torque wrenches vary widely and it is the responsibility of the installer to ensure that proper bolt torque has been achieved.

D. Fittings:

1. Unistrut fittings, unless noted otherwise, shall be punch-press made from hot rolled, pickled and oiled steel plates, strip or coil, and shall conform to ASTM specifications A575, A576, A635 or A36. The fitting steel shall also meet the physical requirement of ASTM A1011 SS GR 33. The pickling of the steel shall produce a smooth surface free from scale.

E. Loading:

1. All loading characteristics shall meet or exceed those published in the Unistrut catalog for each associated member including, but not limited to, beam loading, uniform loading, cantilever loading, column loading, deflection, shear, pull-out force, etc.
2. Load Data: All beam and column load data pertains to carbon steel and stainless steel channels. Load tables and charts are constructed to be in accordance with the "Specification For The Design Of Cold-Formed Steel Structural Members 2001 Edition" published by the American Iron And Steel Institute Using ASD Method.

3.

4. Type of Load	5. Safety Factor to Yield Strength	6. Safety Factor to Ultimate Strength
7. Beam Loads	8. 1.67	9. 2.0
10. Column Loads	11. 1.80	12. 2.2

F. Finish:

1. The Unistrut channel, nuts, bolts and all fittings shall be finished with a durable, multi-step process that provides resistance to corrosion, chalking, checking, fading, etc. (unless unfinished, stainless steel or aluminum channels are specifically called out elsewhere within these specifications or on the drawings). All portions of the Unistrut that are visible below ceiling surfaces, etc. shall be painted by the contractor as noted on the drawings (typically this is in a flat black finish, smooth and even, with no brush marks, drips, runs or other visible finish marks showing). In instances where the finish must match a specific adjacent surface, the contractor shall obtain the exact finish color from the architect and the finish paint from related contractors (typically the painting contractor). Finished other than dark colors may also require the contractor to lightly sand all surfaces for maximum paint adhesion, provision of primer coats, provision of finish coats, etc. In order to properly finish all metal framing system parts, the contractor may be required to spray all parts individually in a spray booth.
2. Unless otherwise indicated, all metal framing system parts shall be finished in Unistrut Perma-Green III (GR) or equal high-performance coating. No bare metal finishes shall be allowed where Unistrut channel framing system parts have been called out.
3. Any cut ends, drilled holes or any significant scratches in the finish of metal framing members shall be "touch-up" finished by the contractor with appropriate layers of primer (Rustoleum or Krylon clean metal primer) and finish coats (Rustoleum or Krylon flat finish) of the appropriate matching color (or as close as is possible).
4. Perma-Green III (GR) Technical Data:
 - a. Steel Substrate Preparation:
 - 1) Ten stage continuous cleaning, phosphate process.
 - 2) Substrate after "prep": sealed zinc phosphate conversion coating.
 - b. Coating:
 - 1) Thermoset acrylic
 - 2) Color: Federal highway green; color tolerance chart; PR color No. 4.
 - 3) Hardness: 2H.
 - 4) Coating Process: Cathodic Electrodeposition.
 - 5) Performance:
 - a) Salt Spray: Scribed – exceeds 400 hours per ASTM B117 (1/8" creep).
Unscribed – exceeds 600 hours per ASTM B117 (6% red rust).
 - b) Chalk: Nominal at 1,000 hours per weatherometer G023 test.
 - c) Checking: None at 1,000 hours per weatherometer G023 test.
 - d) Fade: Less than 50% compared to standard epoxy E.C. coatings.
 - 6) Environmental Issues:
 - a) Formulated as a "heavy metal" free coating (trace elements only).
 - b) Outgassing in service: Essentially none at 350° for 24 hours.

2.9 CURTAIN OPERATING LINE: REFERENCED PRODUCT JR CLANCY STAGE-SET-X

- A. Hand lines shall have a parallel filament core constructed of high-tenacity filament polyester. The core shall remain firm and round under all load conditions. The core shall be wrapped in polyester tape to provide the core with protection against external damage and wear. The braided polyester outer jacket shall be constructed of spun polyester for good gripping.
- B. Provide 3/8" diameter rope and with a black jacket.
- C. The rope shall hold knots well, be easily spliced. Rope shall not be subject to rotting, mildew or moisture damage nor shall its length be affected by changes in humidity.

2.10 CURTAIN TRACKS: REFERENCED PRODUCT ADC MODEL 280 SILENT STEEL

- A. Curtain tracks shall be of 14 gauge galvanized steel construction, entirely enclosed except for slot in bottom, each half to be in one continuous piece except where splicing clamps are required. Each curtain carrier shall be spaced on 12" centers and shall be of nylon (Or steel) construction supported from a ball-bearing by two polyethylene wheels held to ball-bearing by rustproof nickel-plated rivet, such wheels rolling on two separate parallel treads. Each curtain carrier shall consist of a free-

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moving plated swivel and sufficient trim chain to accommodate curtain snap hook. End pulley blocks shall be adjustable and shall be equipped with sleeve-bearing wheels adequately guarded. A rubber bumper shall be attached to each curtain carrier to function as noise reducer. The manufacturer shall furnish two end stops for placement at each track end and a tension floor pulley for increasing or decreasing cord tension. Stretch-resistant operating cord shall have synthetic center and shall be of 3/8 diameter, extra quality yarn.

2.11 DETACHABLE FLOOR BLOCK AND PLATE: REFERENCED PRODUCT ADC DFB-3 WITH DFB PLATE

- A. Floor block shall feature an 8" diameter nylatron ball-bearing wheel (entire assembly shall be flat black).
- B. Floor block keyed floor plates shall be constructed of flat stock painted steel (flat black). Requires recess of 1/4" for mounting of plate with 3/8" channel at center to allow for floor block keys.

2.12 MISCELLANEOUS HARDWARE:

- A. It is the responsibility of the contractor to provide all necessary hardware needed in order to complete this project and all related installations, even if it is not specifically called out or called for on the bid drawings. This includes, but is not limited to, any miscellaneous supplementary steel needed to provide appropriate pickup points, beam clamps, threaded rod, angle iron supports, wall anchors or toggles, bolts, nuts, washers, suspension chain, wire rope and related Nicopress thimbles and closures, brackets, pipe clamps, custom fabricated metal hangers and clips, bracing channel, tube or studs back to substantial structure and all related installation labor. Any and all necessary hardware provided that has not been specifically called out or for on the drawings shall be installed by the contractor in a conscientious manner with respect to symmetry, aesthetics, related surfaces, plumbness and levelness. Obtain written approvals from architect, consultant and owner on these types of items prior to installation where appropriate. No haphazard, crooked or otherwise unsightly installation and related hardware shall be acceptable. Any items installed in this manner shall be fixed and/or replaced by the contractor at no additional expense to the owner.
- B. **TRADITIONAL CABLE MANAGEMENT FOR ELECTRICS**
 - 1. Load circuits and data wiring shall be fed to a standard stage distribution trough by multi-conductor SO cable supported by cable cradles suspended from one of the Prodigy hoist lift lines. The SO cable shall be held in place at the distro by means of a dedicated strain relief assembly.
 - 2. Single or multiple multi-conductor SO cables and multiple cable cradles can be suspended from a single lift line so long as the Working Load Limit (WLL) of the lift line is not exceeded.

2.13 BATTEN MOUNTED CABLE MANAGEMENT CLAMP: REFERENCED PRODUCT SSRCCP SERIES

- A. There shall be a series of clamps sized to fit multiple cable diameters and/or multiple cables in managing cables as they relate to a typical pipe batten.
- B. The cable clamps shall be manufactured products which hold the related cable in line with (parallel) the batten it is attached to.
- C. The cable clamps shall feature the following construction:
 - 1. 3/16" (7 gauge) thick steel painted eggshell black
 - 2. 5/16"-18 Grade 5 hex head cap bolts with hex nut, flat washer and lock washer at each bolt through location.
 - 3. Steel bent into shape on a press brake machine.
 - 4. Tack welds as needed for back-to-back portions.
 - 5. Bent to mount to 1 1/2" schedule 40 black iron pipe battens.
 - 6. All bends neat and clean.
 - 7. All clamp edges eased with no sharp edges, burrs or protrusions.

- D. Cable clamps shall be available in the following configurations and sizes. The contractor shall provide the type(s) of clamp(s) specified and/or needed per the installation requirements. Provide enough clamps to properly manage all cabling along battens as is noted in the contract documents.
1. CCP Clamp – A clamp with a single bay to mount to a pipe batten and a single bay for the management of one SO style cable (from $\frac{3}{4}$ " – 2" diameter).
 2. CCP2 Clamp – A clamp with a single bay to mount to a pipe batten and (2) stacked single bays for the management of one SO style cable each – total of two (each from $\frac{3}{4}$ " – 2" diameter).
 3. CCP3 Clamp – A clamp with a single bay to mount to a pipe batten and (2) stacked bays (one single and one double) for the management of three SO style cables – one in bottom bay (from $\frac{3}{4}$ " – 2" diameter) and two in top bay (from $\frac{3}{4}$ " – 1 $\frac{1}{4}$ " diameter each).
 4. CCP Mini Clamp – A clamp with a single bay to mount to a pipe batten and a single bay for the management of one small diameter "light" power or control style cable (up to $\frac{1}{2}$ " diameter).
 5. CCP Flat Clamp – A clamp with a single bay to mount to a pipe batten and a single bay for the management of up to six flat SO style cables (from $\frac{1}{4}$ " high x 1 $\frac{3}{8}$ " wide each).
- E. All clamps shall be manufacturer furnished. No contractor fabricated devices shall be acceptable in lieu of the specified clamps. No cable management clamps shall be allowed that mount perpendicular to the batten or that support the cable along the side of any associated batten. All cable clamps must support and hold the cable along the top of the related batten. Any sharp edges that exist must be eased by the contractor (if not done by others) and black plastidip applied to all exposed bolt ends. Deburr prior to application.

2.14 STAGE CURTAINS:

A. GENERAL:

1. All draperies shall be supplied in accordance with the specifications. Colors shall be selected by the Owner from fabric samples supplied by the contractor. All draperies shall be flame retardant in conformance with applicable codes.
2. All traveler, cyc, scrim, scenery drop, walk-alongs or similar sets are to be trimmed so that they are approx. $\frac{1}{2}$ " – $\frac{3}{4}$ " AFF. This is especially critical in dead-hung situations where curtain set cannot be raised/lowered. The contractor shall be responsible to trim these curtains as indicated and to make one return trip to the jobsite in order to retrim them, if necessary, due to building settling, snow loading, etc. within 6 months of completion of project.

B. Materials:

1. All materials shall be new. The largest width of the material specified shall be used with continuous materials for the full height of the curtain. No cross seams or horizontal splices shall be acceptable. All fabric used for a particular set of curtains shall be from the same dye lot. No color differences from mixed dye lots will be acceptable.

C. FABRICATION:

1. All curtains shall be sewn with a single needle lockstitch (a style of stitching that cannot easily be removed by pulling a single thread). All seams shall be inspected after curtain fabrication in order to insure that there are no broken or missing stitches. All thread colors shall match the color of the face fabric. All thread shall be cotton covered polyester or equal for strength and longevity.
2. The top edge of each drape shall be sewn flat to a 3.5" heavy-duty jute webbing. Jute webbing shall be double stitched to the top edge of each curtain with 2" of face fabric turned under the webbing.
3. Contractor shall provide appropriately sized brass grommets for the size and weight of the specified curtains (i.e. #2 grommets for flat sewn, lightweight curtains, #4 grommets for heavy-weight pleated curtains). Brass grommets shall be set through the webbing $\frac{3}{4}$ " from the top edge on 12" centers (place grommets on 6" centers only as required due to curved track radius issues and as recommended by track manufacturer). All grommets shall be rolled rim style grommets and inserted using an electric/pneumatic machine. No hand inserted or loose grommets shall be acceptable.

4. Curtains to be located on battens shall have a length of tie line attached to each grommet (Tie line shall be 36" long #4 braided cotton). The tie line at the center of a curtain shall be a different color to indicate the curtain's centerline.
 5. Curtains to be located on tracks (i.e. bi-parting valance, travelers or scenery drops) shall have a plated S hook inserted into each grommet and closed at the grommet.
 6. Curtains specified with added fullness shall have box pleats sewn on 12" centers. No lap or pinch pleats shall be acceptable.
 7. All curtain lining shall be provided in the same fullness as the associated curtain and shall finish 2" shorter than the face fabric. The lining shall be attached to the face fabric at seams along the bottom hem line and at intervals on the side hems by 4" sections of 3/4" wide heavy-duty woven tape.
 8. All additional fullness as indicated below shall be in addition to any allowances for seams, hems and turnbacks.
 9. All fabric seams shall be concealed as much as is physically possible within the curtain's vertical pleats in order to hide the seams (especially at the curtain's top edge).
- D. TRAVELERS (OR OTHER BI-PARTING STYLE CURTAINS):
1. Traveler curtains shall be sewn from materials as indicated on the curtain schedule and shall be lined with a flame retardant or Inherently Flame retardant material as noted below, unless otherwise specified.
 2. The main traveler curtain shall incorporate a 75% additional fullness. All other traveler curtains shall incorporate a 50% additional fullness.
 3. Travelers shall be sewn in two identical panels and allow a 24" overlap at center stage.
 4. Traveler side hems: Leading edges shall have turnbacks of 1/2 standard width of the face material. Turnbacks shall have no machine stitching other than the bottom hem. All other side hems shall have a 2" hem with the line of stitching close to the selvedge edge of the fabric. All side hems shall maintain a straight and plumb appearance.
 5. All bottom edges shall have a 6" hem with a separate 3" internal chain pocket incorporating a continuous, zinc plated No. 8 jack chain weight with the ends tacked to prevent bunching. Each chain pocket shall be stitched so that the chain rides 2" above the finished bottom edge of the curtain. Lead tape weights shall not be acceptable. Note that all chain must be removed from pocket when curtains are cleaned.
- E. MAIN VALANCE/BORDERS:
1. The main valance and border curtains shall be sewn from materials as indicated on the curtain schedule. Each curtain shall have a minimum 3" turnback on vertical edges.
 2. All bottom edges shall have a 6" hem no internal chain pocket or jack chain unless otherwise specified.
 3. The main valance curtain shall incorporate a 75% additional fullness.
 4. All border curtains shall incorporate a 50% additional fullness.
- F. LEGS:
1. Leg curtains shall be sewn with only full widths of fabric. No partial or multi-panel leg curtains shall be acceptable. Legs shall be sewn from materials as indicated on the curtain schedule. Each leg shall have a minimum turnback of 6" on vertical edges.
 2. All bottom edges shall have a 6" hem with a separate 3" internal chain pocket incorporating a continuous, zinc plated No. 8 jack chain weight with the ends tacked to prevent bunching. Each chain pocket shall be stitched so that the chain rides 2" above the finished bottom edge of the curtain. Lead tape weights shall not be acceptable. Note that all chain must be removed from pocket when curtains are cleaned.
 3. The leg curtains shall incorporate a 50% additional fullness.
- G. SCENERY DROPS, SCRIMS & CYCLORAMAS:
1. All scenery drop, scrim and cyclorama curtains shall be sewn from materials as indicated on the curtain schedule. All curtains shall be fabricated from one piece of material with no seams whatsoever.

2. All scrim and cyclorama curtain bottom edges shall have a 6" hem with a separate 3" internal pipe pocket and a 1" heavy-walled EMT style continuous conduit (couplers are acceptable on 10' centers. Smooth all edges so that fabric does not tear). Each pipe pocket shall be stitched so that the pipe rides 2" above the finished bottom edge of the curtain. Both ends of related pipe pockets shall be open and not sewn closed and shall incorporate snap closures to aid in the removal of the pipe when curtain is not in use. Pipe shall be stored at the base of the rear stage wall when curtains are in the up/stored and unused position. Lead tape weights shall not be acceptable. Note that all pipe must be removed from pocket when curtains are cleaned.
3. All scenery drop curtains intended for double-tracked scenery sets shall have bottom edges with a 6" hem and a separate 3" internal chain pocket with a continuous, zinc plated No. 8 jack chain weight with the ends tacked to prevent bunching. Each chain pocket shall be stitched so that the chain rides 2" above the finished bottom edge of the curtain. Lead tape weights shall not be acceptable. Note that all chain must be removed from pocket when curtains are cleaned.
4. All scenery drop curtains intended for attachment directly to a pipe batten shall incorporate hems and chain pockets in a similar fashion to those of the scrim and cyclorama curtains.
5. Provide curtains (attached directly to battens) with a length of tie line attached to each grommet (Tie line shall be 36" long #4 braided cotton). The tie line at the center of a curtain shall be a different color to indicate the curtain's centerline.
6. All scenery drop, scrim and cyclorama curtains shall be flat and shall not incorporate any additional fullness.
7. Scenery drop, scrim and cyclorama curtains shall ONLY be fabricated with an apron finish if specifically noted elsewhere in the bid documents. If such a finish is required (on either the side or bottom edges of the curtain), then the curtain shall be fabricated with a 2" strip of jute webbing sewn to the backside of the bottom or side hem(s). Brass grommets shall be located in the middle of the webbing on 12" centers and furnished with tie lines at every grommet location. This is in addition to the pipe or chain pocket indicated above.

H. WALK-ALONGS:

1. Walk-along curtains shall be sewn with a single panel-finished side facing center stage.
2. Walk-along curtain panels shall be sewn from materials as indicated on the curtain schedule.
3. The walk-along curtains shall incorporate a 25% additional fullness.
4. Walk-along curtains shall be sewn in two identical panels. Leading edges of curtains shall have turnbacks of 1/2 standard width of the face material.
5. All bottom edges shall have a 6" hem with a separate 3" internal chain pocket incorporating a continuous, zinc plated No. 8 jack chain weight with the ends tacked to prevent bunching. Each chain pocket shall be stitched so that the chain rides 2" above the finished bottom edge of the curtain. Lead tape weights shall not be acceptable. Note that all chain must be removed from pocket when curtains are cleaned.
6. Walk-along curtains located on tracks shall have a plated S hook inserted in each grommet and closed at the grommet. Each S hook shall then be attached to a length of jack chain to the carriers. Gap between carriers and curtain top shall not exceed 24". Curtains specified with added fullness shall have box pleats sewn on 12" centers.
7. SEW-ON VELCRO -
 - a. 1.5" - DuraGrip Brand Sew-On Hook - Black
 - b. Made from 100% Nylon 8 mil Monofilament with 280 hooks/sq. inch, binder coat prevents unraveling when cut.
 - c. Cycle Life: 20,000 operations min.
 - d. Shear Strength: 14.15 per square inch (avg.)
 - e. Peel Strength: 0.68 per inch of width (avg.)
 - f. Selvage: 3/32" max.
8. PRESSURE-SENSITIVE VELCRO -
 - a. 2" - Velcro® brand Pressure Sensitive Adhesive Hook: Rubber - Black
 - b. 6 mil Monofilament and are binder coated to protect against fraying when cut. They also offer excellent durability and have a high cycle life. The rubber-based pressure sensitive

adhesive is designed for a medium temperature range that performs well on many substrates, especially uneven or rough surfaces.

- c. Adhesive shall be Industrial Strength extreme, UV resistant and offer superior holding power without the needs of mechanical fasteners or epoxy resins.
- d. Operating Temperature Range: -40 F to 120 F
- e. Closure Shear Strength: 14.0 psi
- f. Closure Peel Strength: 1.2 psi
- g. Closure Tension Strength: 6.5 psi

I. MAINTENANCE PROCEDURES:

- 1. Contractor shall instruct the owner on all pertinent points of proper care and maintenance of the stage curtains including, but not limited to, routine curtain inspections, proper fabric tear repair techniques (i.e. no tape repairs – all repairs to be made by either machine sewing or good hand stitching by a qualified professional), standard retrimming practices to keep hems off floor, storage parameters, storage bag types & folding techniques, proper wrinkle removal techniques with hanging durations, irons or steamers, the danger of water contact and steam with FR curtains, retreatment schedules (if applicable) and routine dry cleaning intervals.
- 2. All FR material types (those materials that have been treated with a flame retardant chemical and are not inherently flame retardant by themselves) are recommended to be tested annually by qualified personnel using the NFPA 705 (1997 or later) field test method for textiles in order to accurately quantify the material's current flame resistance characteristics. These materials must be retreated on a regular basis (maximum of 5 year spans).

J. MATERIAL TYPES:

- 1. CURTAIN LINING DETAILS (UNLESS OTHERWISE NOTED ELSEWHERE)
 - a. MAIN VALANCE UNLINED
 - b. MAIN TRAVELER UNLINED
 - c. ALL OTHER TRAVELERS UNLINED
 - d. BORDER CURTAINS UNLINED
 - e. ALL LEG CURTAINS UNLINED
 - f. SCRIMS & CYCLORAMAS UNLINED/SEAMLESS
 - g. OTHER SPECIALTY CURTAINS UNLINED
 - h. WALK-ALONGS LINED/UNLINED
- 2. IFR VELOUR STAGE CURTAINS: REFERENCED PRODUCT KM FABRICS CHARISMA/FRED KRIEGER EPIC VELOUR
 - a. Unit Weight: 24/25 oz. (per linear yard)
 - b. Color TBD by architect/owner.
 - c. Inherently Flame Resistant.
 - 1) Meets the minimum requirements of flame resistance established by the following: ASTM E-84 (a/k/a NFPA 255, UL 723 or UBC 8-1) for flame spread and smoke generation: NFPA 701 (small scale test); Meets British FR Standards for Drapery Fabrics.
 - 2) This fabric was manufactured and tested under the supervision of a General Applicator registered as #GA-0358.01 by the Fire Marshall of the State of California.
 - 3) Woven with non-combustible filament, it is inherently and permanently flame resistant for the life of the fabric. This flame resistance will NOT wash out by water washing.
 - 4) This fabric is rated Class A (Class 1) for flame spread and smoke generation for interior wall & ceiling finish.
 - d. Fiber Content: 100% Trevira CS (polyester).
- 3. IFR SCRIM: REFERENCED PRODUCT IFR SHARKSTOOTH SCRIM
 - a. Unit Weight: 32 oz. (per linear yard)
 - b. Color: Black or White (color TBD by Owner).
 - c. Inherently Flame Resistant.
 - 1) Meets the minimum requirements of flame resistance established by the following: NFPA 701 (1996 ed. - small scale test); NFPA 705 (1999 ed. - field test).

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- 2) Woven with non-combustible filament, it is inherently and permanently flame resistant for the life of the fabric. This flame resistance will NOT wash out by water washing.
- d. Fiber Content: 100% polyester.
4. IFR CYCLORAMA: REFERENCED PRODUCT IFR MUSLIN
 - a. Unit Weight: 8.85 oz. (approx. weight per square yard)
 - b. Color: White (Bleached white).
 - c. Flame Resistant. This fabric has been treated with a flame retardant chemical such that it:
 - i) Meets the minimum requirements of flame resistance established by the following: NFPA 701 (1996 ed. - small scale test); California Administrative Code Title 19, Paragraph 1237.1 – small scale; Boston Fire Department IX-1.
 - ii) This fabric is registered with the California Department of Forestry & Fire Protection (Office of the State Fire Marshall) as #F-54505.
 - iii) This fabric is rated Class A (Class 1) for flame spread and smoke generation for interior wall & ceiling finish.
 - iv) The flame retardance has an expected lifetime of at least one (1) year, but is likely to be effective for much longer. The flame retardance will withstand up to three (3) dry cleanings or non-water washing processes.
 - v) The flame retardant chemical WILL be removed by water washing (CURTAINS ARE NOT TO BE WATER WASHED).
 - vi) Heavy paint treatments MAY recrystallize the FR chemical salts, so the owner is to be instructed on special techniques to avoid this when applying heavy paint to muslin.
 - d. Fiber Content: 100% Trevira CS.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Contractor shall adhere to all requirements of the general contract for this project as called for in the project manual.
- B. All liability for rigging, fastening, and other installation methods shall be borne by the contractor alone. The fact that the specification calls for any equipment to be installed does not constitute an approval by the consultant or owner of any method for accomplishing the mounting or installation of the device or the suitability of the device for mounting in the manner, which the contractor has proposed in shop drawings. If the contractor has a reason to believe safety will be compromised in the installation of any of the specified equipment, they must note this at the time of bid and offer alternatives in writing.
- C. Assess life safety implications of all installation methods and verify there is no compromise of life safety issues.
- D. Any dangerous work areas marked or roped off in a manner, which will inform all persons as to potential danger regardless of sensory handicaps.
- E. Maintain M.S.D.S. for all materials used where applicable and submit same to architect.
- F. Maintain integrity of all fire-walls and doors during construction and upon completion.
- G. The contractor will verify all on site dimensions prior to ordering or installation of critically dimensioned equipment and wiring or any of the rigging system equipment. In a case of discrepancy between these documents and attached drawings, construction documents, and actual on-site dimensions the contractor will notify the owner and consultant before making any changes in intended work. The owner and consultant will determine the correct modification to the work to be

done. No additional payments will be made for material or equipment improperly ordered or sized due to site variations.

- H. Any equipment, hardware, wiring harnesses, or other items not specifically included in this specification but required for the system to function as called for within this document will be the responsibility of the contractor at no extra cost to the owner.
- I. Provide all hardware and all other required parts to provide a complete system to the extent that such items are not provided by others.
- J. All methods must be cosmetically acceptable to the owner. All equipment will be installed neatly, with respect to level, sight lines, and finish. All wiring must be neatly run and concealed in an orderly fashion and attached to appropriate support structures.
- K. Moderate changes or moves necessary to accommodate other equipment, coordination with other trades, or for pleasing appearance will be made without claim for additional payment.
- L. Coordinate all work with other on-site trades in order to achieve a coordinated progress at all times.
- M. If specific elevations of dead hung sets are not indicated on the contract documents, it is the responsibility of the contractor to obtain these elevations in writing from the consultant prior to any set installation. Any installation of sets without proper knowledge and written documentation of the actual and exact set trim heights intended will result in the contractor rehangng all such improperly installed sets to the intended trim heights. The contractor shall be solely responsible for all removal and reinstallation labor, hardware, etc. as is needed in order to rehang all improperly installed sets at the intended trim heights.

3.2 WIRING AND RACKS:

- A. The contractor shall field verify all locations where contractor provided wiring shall be run in order to determine each space's "plenum status." If any wiring noted on the drawings must be run through an air plenum space, then the contractor must provide plenum rated wiring for all such locations, even if the wiring noted on the drawings is non-plenum rated or spaces have ducted air. The contractor shall provide plenum rated wiring matching the specified wiring as closely as is possible. This applies to both EC provided wiring and other wiring to be installed by theatrical or A/V specialty prime contractors and subcontractors.
- B. All wiring shall be neatly tie wrap bundled (or as indicated otherwise on contract drawings) with wires parallel and perpendicular to device sides (i.e. no random angle wiring).
- C. All related SO style, cable reel, pantograph track or other control and power wiring related to the motorized units shall be strain relieved to structure (unless otherwise indicated).
- D. Pantograph wiring shall be dressed neatly, shall be cut to length (including additional wiring required for full track travel). The contractor shall not bundle flat cables together in large stacks or bunches that could result in overheating of conductors, false triggers, etc.
- E. All loose control or power cables & wiring must be dressed neatly with tie wraps & eyes or ring runs & tucked up against underside of lighting countertop. No dangling and loose cabling shall be allowed underneath the lighting control area. This means that the contractor shall not be allowed to simply coil up excess cable and lay it on the floor or hang it from the wall or over a junction box. All cabling shall be cut to length (unless specifically indicated to be of certain lengths on the drawings) and all excess to be securely mounted so that it cannot become caught, snagged or otherwise engaged by operators, legs, chairs, etc. All cabling not handled as described above shall be fixed by the contractor at no additional cost to the owner. No excessively long cables (except those called out by length on drawings) shall be allowed.
- F. No undue stress shall be placed on any connection by a lack of support of the wiring within the rack, junction box, devices, etc.

- G. Any equipment having accessible controls that are not normally used during system operation will have its controls capped or otherwise locked such that they are not adjustable. If no other means is feasible the use of security covers is mandated. Rack doors are not acceptable as means of tamper resistance for controls.
- H. Provide blank and/or vent panels as needed to complete each rack with no unfilled spaces, as per rack elevations or as required by alternates to equipment specified. No racks with unfilled panel spaces shall be allowed.
- I. Wiring Standards - Plenum Rated Cable: Unless specifically noted on the drawings, all low voltage wiring is to be CL2/CL3 wiring. Where specific plenum conduits exist, it has been noted to use a plenum rated cable. Where wiring runs occur in concealed spaces – walls, ceilings, etc. - and are not enclosed in conduit the EC must verify the space is not being used as a plenum path. Any areas encountered that are plenums must have plenum cable or the wiring must be contained in conduit rated for the plenum application. Field verify conditions prior to ordering or installing cabling.
- J. All conduits indicated on the drawings shall terminate directly into racks, control panels, motor control junction boxes, wireways, etc. as shown – top, bottom or at any of the provided knockout locations (unless otherwise and specifically indicated on the drawings as otherwise) and so as not to obstruct access to the racks or adjacent walkways or approaches. Route conduits into devices with as few bends as possible – use sweep elbows where necessary. No loose or dangling or drooping wiring/cabling draped, dropped or festooned into the devices from dead-ended conduits or overhead cable tray systems shall be acceptable. All wiring shall be protected in conduit until it has reached the internal space of the indicated device(s).
- K. ELECTRICAL & GROUNDING:
 - 1. Grounding of shields and chassis will adhere to industry standard practice and as required by the rigging and motorized systems manufacturer.
 - 2. Verify that all hot, neutral and ground conductors are tightened at least 5 days after initial installation and landing of line & load conductors.
 - 3. Any AC service shall be installed by the EC to standard Edison U-Ground style outlets at the locations noted on the electrical drawings. Where racks are located the service is to be run to the interior of the rack. This service should be capable of powering all system equipment at 100% of rated power.
 - 4. Internal rack AC distribution is the responsibility of the contractor. Acceptable methods: Rack mount power strips, rack mounted power distribution devices, Wiremold style outlet strip. All shall be provided by the contractor as needed.
 - 5. Install all internal AC rack/device power with all switches and controls carrying hazardous voltage housed in steel enclosures within the rack. Provide positive electrical grounding for all steel enclosures. All AC service will incorporate separate hot, neutral and ground for each device. All grounds and neutrals will be appropriately bonded and connected to earth as required by codes and normal practice.
- L. CONDUITS (OR ASSOCIATED RACEWAY/WIREWAY):
 - 1. Use separate conduits for data/control and power cabling and as per NEC code.
 - 2. All wiring in conduit shall be rated as necessary for full load continuous operation of the wiring within the conduit.
 - 3. All conduits shall be concealed unless the owner has been notified in writing and accepts by written approval the location of all exposed conduits.
 - 4. No conduit shall be allowed that is loaded beyond 50% fill. The contractor responsible for installing the indicated conduits shall upsize as needed any conduit found to be too small at no additional cost to the owner.
 - 5. A pull string shall be left in place by the installing contractor (typically the EC) after pulling all wiring through each conduit. This pull string shall be tied off at both ends and left for future use.
 - 6. All lines, cabling or wiring in any conduit run must be free from any splices or junction points.

7. All lines, cabling or wiring must be free from damage. Any that exhibits stress, damage, intermittent signal problems, data errors or other anomalies due to excessive pull torque shall be replaced by the installing contractor at no additional cost to the owner.
- M. JUNCTION/GANG BOXES:
1. Unless otherwise specified all controls, receptacles, user interface stations, plugs and outlets shall be located in an appropriately sized gang box. No multi-gang backboxes with raised, tile ring, extension ring or mud ring style reducers to obtain the specified faceplate gang size shall be acceptable in lieu of the indicated device backbox. Any multi-gang devices with these extension rings used shall be replaced and the specified backbox sizes provided by the EC at no additional cost to the owner.
 2. Any junction (i.e. terminal blocks, punch down blocks etc.) shall be housed in metal enclosures with an attached ground. No such connections may be made in ceiling spaces or other areas without the use of a steel enclosure.
 3. Any added junction boxes shall be sized and located for ease of troubleshooting access and all connections within shall be connected on terminal strips, which are clearly identified, in a logical, consistent & permanent manner.
- 3.3 ASSEMBLY AND PRETEST:
- A. All rigging equipment shall be assembled per manufacturer's instructions and tested prior to installation.
 - B. All controls and motorized elements shall be tested prior to installation.
- 3.4 FINISHES & CLEANING:
- A. All finishes shall be returned to their original finish and condition after any temporary machining or other work.
 - B. Cover any walls, furniture, finished floors and carpeted areas to catch all metal particles, grit, etc. that may occur during installation.
 - C. Cover and protect all equipment left or installed on site during construction.
 - D. Provide thorough cleaning of all work areas including vacuuming, spray cleansers and dust removal as required. Clean all equipment fan filters before final acceptance tests.
 - E. Maintain clean work areas, removing all debris daily.
 - F. Finishes:
 1. All welds (and the surrounding area) must be touched up by the contractor to match adjacent undisturbed finishes. No bare metal, unfinished welds, weld spatter or other welding debris, weld "heat" or scorch marks, etc. shall be allowed.
 2. All finishes which are disturbed during shipping and installation shall be touched up to match the original.
 - G. Provide a thorough cleaning of all rigging system equipment and related devices, including but not limited to, blocks, pulleys, sheaves, battens, arbors, guide system, locking rail, FOH devices, catwalk pipes, rigid coves/positions, motorized devices/remotes/controls, misc. related cabinets, cable trays, pantographs, etc. regardless of status (new or existing to remain/reuse). Cleaning shall be after all dust/dirt creating work has been completed and just prior to walk-through/punch list and turnover to the owner.
 - H. No curtains shall be installed prior to the stage floor being swept and wet mopped by the rigging installer in order to remove all dirt, dust, misc. spilled items, etc. Alternatively, the rigging installer may cover the entire stage floor with a single layer (overlapped 12" as needed) of new, clean, heavy-duty, clear plastic prior to the installation of stage drapery (the rigging installer shall also be responsible for the removal and legal disposal of this covering as well as obtaining written

permission by the owner, architect and/or construction manager to install it). Any curtains installed so that portions of the curtain drag across or touch the floor or become dusty, cob-webbed or soiled by any means during construction and prior to turning the room over to the owner shall be completely cleaned, repaired (if damaged) and retrimmed by the rigging contractor at no additional cost to the owner. The rigging contractor shall clean all dirt, dust, etc. from curtains that may have accumulated on them just prior to turning the room over to the owner.

- I. The rigging contractor shall wipe clean (with a clean, damp cloth) all pantograph tracks, motorized truss, tormentor, Shakespeare, gallery, catwalk, rigid cove or any other pipe batten, pipe-style or ladder assemblies, motor control or operator control panels, stage pipe battens, remote control devices, locking rail, arbors, rope locks, index lighting system, floor blocks, tension floor pulleys, etc. just prior to turning the systems over to the owner. Upon cleaning, all items shall appear in as new condition and without scratches, blemishes, dirt, dust, debris, chalking, paint marks, etc. on them.

3.5 LABELING:

- A. All labeling and signage shall comply with the requirements of the following recognized national standards, where such requirements can be implemented with rigging components, assemblies and systems:
 1. ANSI Z535.1-2006, Safety Color Code
 2. ANSI Z535.2-2006, Environmental and Facility Safety Sign
 3. ANSI Z535.3-2006, Criteria for Safety Symbols
 4. ANSI Z535.4-2006, Product Safety Signs and Labels
- B. All signs or labels shall be in English. If operating personnel are not familiar with English, additional signs or labels in the appropriate language shall be permitted.
- C. The working load limit, manufacturer's name or grade reference mark shall be permanently displayed on each piece of equipment and hardware. Chain, rope and wire rope shall be exempt from this requirement. If the hardware or equipment is size-specific (e.g. wire rope clips), then the size shall be displayed on the product. Where permanent labeling or marking of individual components is impractical, then the load, manufacturer, or grade reference information shall be indicated in the system reference documents.
- D. Each set in the system shall have an engraved affixed number (excepting a pipe grid system).
- E. All locking rails shall have an individual, permanent number or name displayed at each rope lock. Provisions shall be made for the temporary display of secondary descriptions.
- F. A sign shall be displayed at each locking rail stating the capacity of the line sets, electrics, bridges or other equipment controlled from that position. See below for safety signage required and specific locations.
- G. Locking rails used with wire-guided arbors shall have a sign displayed that warns against excessive tension in the wire guides.
- H. Operating and loading bridges shall have a sign stating permissible counterweight storage parameters and limits in pounds per square foot. A professional engineer shall approve the stated parameters or the sign shall clearly state "CAPACITY UNKNOWN". A warning not to stack counterweight above the toe board shall also be included. The mass of each counterweight type and size provided in the system shall also be included.
- I. Counterweight Rigging Systems: Each batten shall be marked and labeled with its set number, maximum arbor/batten capacity (see tables below), stage centerline and lift line locations. Batten labels shall be marked on the bottom of the end of each set pipe batten clear of the batten end cap and in 2" high lettering. Lettering shall be Arial Bold Black. Cover labels with clear heat-shrink tubing after application and heat tubing until it firmly adheres to pipe (all of label must be covered after tubing has been heated and shrunk into place). See drawings for more details and intents of batten

labeling. This applies to all rigging systems except pipe grid systems. Maximum arbor/batten capacities shall be based upon manufacturer's standard printed data and similar to those capacities listed below. The contractor shall cross reference and mark each batten with the appropriate maximum capacity based upon the arbor and counterweight sizes listed on the bid documents and as shown in manufacturer's standard printed capacity tables. Maximum capacities as marked on each batten shall be reflective of the batten's capacity (in double purchase systems this shall be half of the arbor's capacity).

J. Load Types Defined:

1. Dead loads are those static forces that are relatively constant for an extended period of time. This includes typical structural elements like the pipe batten, trim chains, lift lines, turnbuckles and shackles, etc. These are items that are structurally related to the working mechanics of the sets.
2. Live loads are typically unstable loads or loads that are moving. These are also sometimes called dynamic loads and typically include items such as fixtures, clamps, power supplies, curtains, speakers, hanging mics, etc. These are items that are taken off and put on battens on a semi-regular basis as the look, theme or focus of each show is restruck.
3. Cyclic loads are typically moving loads that are associated with a motor. These loads would include those presented by the use of curtain draw machines, motorized winches, motorized trusses, moving lights, etc.

K. Each J-guide arbor shall have a sign affixed to the back plate at 2-foot intervals stating "CAUTION: Locate spreader plate here." Systems employing wire guide type arbors shall have readily visible signs stating that spreader plates shall be located at 2-foot nominal intervals. Each arbor shall have the set number on the front face of the arbor near the top.

L. Any equipment requiring lubrication shall be identified in the maintenance manual stating quantity, type of lubricant and frequency of lubrication. Lubrication points shall be clearly indicated. Lubrication points shall be accessible without major disassembly of the related component.

M. Each curtain, leg, electric and border light set shall be so designated.

N. A wall plaque/sign shall be placed at the locking rail indicating standard rigging system operations and methods, as well as load capacities for the sets, basic system operation etc. See paragraphs below for additional and job specific safety signage requirements.

O. All curtains shall have a label affixed as to the date of flame-retardant treatment (and/or current IFR status) and the life cycle of the treatment. This label shall not be visible from the audience. Label location shall be on the lower rear hem of curtains so that it is readily visible from backstage without lowering a set or climbing a ladder.

P. The contractor shall flag all counterweight set operating (purchase) lines as detailed below. All "flags" shall be made from a soft, flexible, durable cloth that will not damage or degrade the operating lines or other related system components that it may come into contact with. Method of insertion shall be by carefully inserting cloth through the middle of the operating line rope braiding (without damaging, unbraiding or unraveling the rope) in such a way as to leave a short strip of cloth dangling from either side of the operating line and in full, easy view of set operators. These cloth "flags" or "spike" markers shall be utilized by operators in order to visually indicate all sets "normal" fly-in locations as well as typical arbor locations when shells & projection screens are in use (where applicable). When sets are in correct locations, flag markers shall just clear the top of the rope lock mechanisms. Flags shall be approx. 1/2" x 4" cloth strips. Flag all sets with colors as follows:

1. Bright (safety) yellow flags for all "normal" set operating positions (i.e. traveler and leg curtains flown all the way in, border curtains in typical masking locations, shell and unused scenery sets flown all the way out, etc.).
2. Bright red flags for all sets when in use with the shells deployed and in typical performance position (this includes curtain, scenery and shell sets).

Q. SIGNAGE:

1. Provide safety signs for loading areas as indicated on the contract documents. See the TR series drawings for sample safety signage, verbiage, quantities, etc. Obtain owner desired installation location sign-offs, in writing, prior to installing signage. Signage information is to be job specific. Signage should include procedures for loading and unloading sets, curtains, electrics, etc. as well as standard safety and operational procedures. Specific load ratings shall be detailed for the system designed as indicated on the bid documents and may not exactly reflect the information on the signage sample pictured below. Signage sample, text and title below is for illustrative purposes ONLY and does not include all job specific information or weight related data for this system that should appear on each sign. Signage sizes may be longer than noted below if more room for pertinent safety text is required; however, the signage size indicated is the MINIMUM size allowed. Signage to be printed with permanent, non-smudging ink. No smudges or high gloss surface treatments will be allowed. Contractor is to obtain specific weight related information and pertinent operational procedures for this system from bid drawings and manufacturer's recommendations and is to obtain weight stacking information from the architect and the designed load capacities of the stage floor at each weight stacking location. Spare weight stacking locations are TBD by the owner, architect or owner's representative. Contractor is to submit sample signage to the consultant for approval of text and information prior to ANY sign fabrication, ordering or installation. These signs are in addition to standard safety and operational signage that should be included. Contractor is to obtain exact signage locations and mounting heights from the architect, owner and any applicable codes relating to safety signage placement. Signs should be placed in locations where they will not be obstructed and are highly visible and readable. FOAM CORE SIGNAGE IS NOT ACCEPTABLE.
2. Provide standard counterweight operations signs and motorized hoist signs as required in written specifications and on drawings.
3. Provide custom "Rigging Inspections" signs that detail the ANSI E1.47-2017 "Entertainment Technology-Recommended Guidelines for Entertainment Rigging Systems" recommendations. Signage shall be similar to other safety signage for this project and per contract document details.
4. Provide signage for individual pieces of motorized equipment and controls/interfaces as specified per the contract documents. Signage shall read *"CAUTION! WARNING! There are no user serviceable parts within this enclosure. Only factory authorized personnel are allowed to access the components inside of this box. Failure to adhere to this warning may result in damage to equipment and/or severe injury to personnel."*
5. A sign shall be posted in an accessible location providing the name, address and phone number of the primary system contractor, manufacturer and supplier (if not already listed) of the system equipment.
6. Fire curtain signage with basic operating instructions and warnings shall be posted in the area where the equipment will be operated. Signage shall be in conformance with ANSI-Z535.

3.6 RIGGING:

- A. The following minimum standards apply in addition to the standards referenced elsewhere within this specification. These guidelines do not negate the standards referenced elsewhere within this specification. The standards indicated are minimum standards and do not supersede the requirements of the structural engineer to meet appropriate codes and standards.
- B. All equipment not described as portable in this specification will be rigidly held in place.
- C. All equipment will be supported at a minimum of three (3) points plus a backup. The contractor shall be responsible to provide backups as required, even if those backups do not appear in plans or on the detail drawings.
- D. Each point shall be able to carry the entire rated load with a safety margin of at least five (5) times the rated load. All methods shall incorporate an independent safety backup with a safety margin of at least five (5) times the rated maximum load as installed in case of failure of any rigging component.

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1. In the case of counterweight rigging systems, utilize industry standard practices for lift lines gauges and conform to all applicable codes.
- E. All rigging and related fastening methods must be treated as permanent. All threads shall be treated with vibration compounds such as Vibratite or Loctite as per manufacturer's recommendations.
- F. All rigging hardware shall be load rated with the load rating or approval stamped on each piece of hardware.
- G. No chain of any type will be acceptable for the primary hanging or backup support of any equipment, unless specifically noted on the drawings. (Trim chains and fire curtain chains excepted)
- H. No fabric devices, polyester roundslings, ratchet straps, webbing, wire mesh slings, wire rope core windings with fabric jackets, natural or synthetic corded or devices incorporating cam or buckle parts shall be considered as acceptable methods of hanging of any equipment excepting curtains.
- I. No stainless-steel rope shall be secured with threaded compression type fittings alone. Compression type closures such as Nicopress with copper sleeves only must be utilized. All wire rope where connected to turnbuckles, trim chain or eyes will have strain relief/minimum bend radius thimbles installed. A go-no-go calibration toll must be on the job site and closures checked during installation.
- J. All loose ends of the wire rope shall be neatly taped down after Nicopress is installed and crimped. No frayed rope ends shall be allowed under this specification.
- K. The contractor shall be responsible for how installed devices (even those provided by others but intended to be used in conjunction with the related rigging equipment) affect any rigging related system he has provided and installed (i.e. rigid coves, pipe battens, FOH cove positions, balcony pipes, tormentors, catwalk battens, etc.). If devices provided by others causes battens or related structure, strut channel systems, etc. to bend, twist, warp, rotate, etc., then the contractor shall be responsible for all additional or replacement hardware, return visits and labor necessary in order to remedy any unnatural, abnormal or otherwise unacceptable anomalies and in order to bring the related rigging equipment pipes, strut channel, structure, etc. back into a standard, flush/plumb/level and non-rotating condition.
- L. All Nicopress or equal compression connections and wire rope swaging products utilized on this project shall be required to pass field gauge tests as to their proper terminations and compression (typically referred to as go-no-go gauge tests). Due to the sheer quantity of manufacturer's and the varying types/styles of compression tools in use, this will require the contractor to provide the proper go-no-go gauge during acceptance testing (punch list) for each different compression tool utilized on the project (typically a specific gauge is provided with each tool purchased). This gauge will be turned over to the consultant for use in verifying that the correct compression has been performed on the oval sleeves. It is understood that the consultant cannot test every single oval sleeve but will, instead, check a random percentage of sleeves that will be assumed to be typical of all similar compression fittings on this project. It is the contractor's responsibility to verify, during installation, that every oval sleeve has been compressed properly and that it passes the go-no-go gauge test. Improperly swaged oval sleeves pose a serious risk to stage personnel. Improperly swaged oval sleeves shall be replaced by the contractor as required, even if that means that the associated wire rope and other related hardware must also be replaced.
- M. All Nicopress of equal compression connection thimbles shall be loaded (mounted) only on a round shaft. Thimbles through a punched hole or other where the thimble encounters an edge shall not be allowed.
- N. Nothing shall be allowed into the interior of any Nicopress or equal compression connection oval sleeves except the wire rope itself. Any taping of wire rope ends shall be performed only after all compression connections are properly swaged.

3.7 ROUGH-IN:

- A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. DO NOT SCALE PLANS. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the owners representative for approval before proceeding.
- B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.
- C. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.
- D. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owners representative or other contractor for any "rough ins" that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by the electrical contractor at no expense to the Owner.
- E. For equipment and connections provided in this contract, prepare roughing drawings as follows:
 - 1. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.
 - 2. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings.
- F. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.
- G. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation.

3.8 CUTTING AND PATCHING:

- A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction" for additional requirements. Patch all cut or abandoned holes left by removals of equipment or devices. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering or other finished surfaces. Patch openings and damaged areas equal to existing surface finish (i.e. "patch to match existing"). If no instructions exist in the contract documents addressing these issues, then the

contractor shall contact the architect and construction manager in writing prior to proceeding with any work in order to obtain written instructions regarding this type of work.

3.9 CONCEALMENT:

- A. Conceal all contract work visible in architecturally sensitive areas above ceilings and in walls, below slabs and elsewhere throughout building (this does not pertain to stage rigging, pipe assemblies, motorized trusses or other items that are normally visible). If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review and written authorization and instructions on how to proceed. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance. Obtain and maintain written records and approvals for all work exposed work performed or devices installed.

3.10 PERFORMANCE:

- A. All batten ends must line up with each other (for all battens of similar length).
- B. All battens of similar trim (both high and low trims) must be even with each other $\pm 1/2"$.
- C. The rigging system must operate without binding of lift or operating lines, scraping of lines against any structural or other members, etc.
- D. All system travel shown on the contract documents is approximate and may need to change depending upon actual building conditions, final steel heights, etc. The intent is for the in and out trim heights and the total system travel to be as close as is physically possible to those shown on the drawings.
- E. All arbors shall be properly installed so that the arbor bottoms rest squarely on top of the lower arbor stop/hardwood bumper and so that the top of the arbor engages the upper arbor stop/hardwood bumper. No arbors shall be allowed to stop short of either arbor stop (i.e. "hovering" above the locking rail or batten restricting arbor movement) and no arbor attachment hardware shall be allowed to engage the headblocks or headblock sheaves in any way.
- F. All wire guide systems shall have properly installed turnbuckles on the guidelines. The intent is for the guidelines to be installed with a turnbuckle at the lower termination points so that the guidelines may be tensioned properly (approx. 100 lbs. per line of tension according to the manufacturer). This shall be accomplished by the TC utilizing load rated jaw-eye turnbuckles. Guidelines shall be terminated directly to the upper eye of the turnbuckle and the jaw portion affixed to the floor block/locking rail. The front guideline turnbuckles must be shorter than the rear ones due to the physics of the system and the size and location of system components. A smaller front turnbuckle will allow ample room for swaging the wire rope without it conflicting with the lower resting position of the arbor on top of the locking rail. Guidelines shall be cut, terminated and installed so that there is at least $1 1/2"$ of additional take-up room in the body of the turnbuckle for future adjustments. See detail drawings for more information on intent.
- G. All stage battens shall be trimmed in such a way so that, regardless of system travel, low trim and high trim heights shown on contract drawings, no battens or related attachment hardware shall be allowed to engage the loftblocks, idlers or loftblock sheaves in any way. Upon finished installation, the stage side Nicopress fittings at the end of each liftline should stop shy of the loftblock sheaves by 2-3" (or greater depending upon total allowable system travel). The intent is to realize all of the system travel as is physically possible while still allowing the arbors to rest on the locking rail lower arbor stop when fully in and to engage the upper arbor stop when fully out.
- H. All sets shall be installed so that no arbor, batten, pipe clamp, shackle, nicopress fitting, cable cradle, trim chain, turnbuckle or misc. hardware can engage a loftblock, idler assembly, headblock or sheave in any way. Positive stops are to be present in the form of a 2" x 2" hardwood stop block for all J-Guide systems and on wire guide locking rails and in the form of a sandwiched fiberguide material (or equal) assembly on each of the guidelines of a wire-guide system or a U-bracket with

bumper attached to each headblock. Maintain manufacturer recommended clearances between the top of all arbors and the base angles or sheaves of each headblock.

- I. The loft blocks and headblocks shall be free of binding, scraping, etc.
- J. All curtains shall be installed only after all dirt and dust creating work and paintwork has been completed and cleaned up. Curtains must be installed very near the end of the job but before all final acoustic testing, AFC tuning and sound system tuning have been performed. This will require the rigging installer to coordinate with all related trades and their schedules in order to install curtains at the appropriate times.
- K. All rope locks must operate without excessive force to lock or unlock the set.
- L. No battens shall be allowed to have threaded ends or threaded couplings at all.
- M. No battens shall be allowed to have plug welded splices at all.
- N. No field modifications of the locking rail shall be allowed, especially if these modifications are intended to correct an installation error.
- O. Any installation errors or variance in installation methods from standard industry practices and standards shall be corrected by the contractor at no additional cost to the owner, even if that means that the contractor must remove and reinstall the entire rigging system (and with the owner's schedule in mind).
- P. All arbors must travel without hitting adjacent sets.
- Q. All arbors must be balanced for their loads as curtains, connector strips and other items are applied.
- R. All wire guide system guidelines (2 per arbor) shall be installed vertically, plumb and with equal tension on all lines. Guideline system tension shall be as recommended by the manufacturer and shall restrict the arbor side-to-side "swing" movement so that they arbor cannot swing into adjacent arbors.
- S. All safety devices shall be demonstrated individually to verify performance.
- T. All electric winch devices, cove truss devices and/or motorized projection screen winch assemblies shall operate as the manufacturer intended and shall not engage other sets during their normal range of operations. Related SO cables or pantograph mechanisms shall not become entangled in any other set(s) or other items during use.
- U. All locking rail floor blocks must be level and even with each other (vertically) and so that they are not located too close to the floor. Do not final cut or dress operating line ropes until all floor blocks have been properly located.
- V. If trim chains have been noted on the drawings, but the end result is a batten that rotates when "top loaded" with dimmer strips or fixtures, then the contractor shall replace all trim chains with JR Clancy full batten clamps in lieu of the specified trim chains at no additional cost.
- W. All loftblocks shall be clipped onto beams with one side of plate throat into beam flange and the other side captured by an angle iron & threaded rod assembly toe clip system. The contractor shall not overtighten toe clips to the point of deforming them, angling them or bending the threaded rod. Nut should be brought up tight to angle iron but should not be overtorqued to the point where vertical angle iron leg goes out of plumb. Verify exact installation techniques & torque ratings, etc. With the manufacturer and install in such a way as to not cause a derating of the blocks ultimate load carrying capacity or holding power. Install all similar. Toe clips should be tightened so that they closely match the visual depiction shown here.
- X. All connector strips suspended from wire rope pickups such as on a stage rigging system or at a front of house position (and unless specifically shown graphically on the contract drawings with any other configuration), regardless of whether they have been furnished by others, others have

furnished misc. connector strip brackets or if they and their related hardware have been listed as existing to remain, must be suspended from inline "centering" strap steel connector strips brackets. U bolt style brackets or any other bracket style that skews the hang shall not be allowed. The rigging system provider/installer shall provide all inline "centering" strap steel connector strips brackets that either do not exist or that are not furnished by others and in sufficient quantities to properly suspend all connector strips.

- Y. Do not tighten turnbuckles to the point of deforming/deflecting the Unistrut channels upwards or causing them to "hump up" at the connection point(s).
- Z. Final curtain presentation requirements:
 - 1. All curtains must be hung properly and per industry standards and shall not feature excessively long jack chains, tie offs, etc.
 - 2. All traveler curtains shall be secured on the off-stage end so that the curtain cannot track completely onto the stage while leaving an exposed section into the stage wing areas.
 - 3. All curtains must be hung for long enough so that wrinkles/folds/creases from storage & shipment are removed. Final curtain presentation, upon turning the room over to the owner, shall be smooth, flat, non-wrinkled (wrinkle & crease free) curtains. If, after installation of the curtains on stage, the curtains display wrinkles, creases, folds or any other such visual anomalies, then the contractor shall provide additional labor, etc. as needed in order to iron or steam (or other approved and recommended procedures appropriate for the fabric) any such wrinkles, folds, creases, etc. from the curtains prior to turning the room over to the owner. No curtains displaying wrinkles, folds, creases, etc. or other such visual anomalies shall be allowed or accepted.
 - 4. All traveler curtains must be fabricated so that there is a 24" overlap at the center of the stage without any undue stress on the other ends of the curtains, excessive pulling or tensioning of the curtains or connection points or stretching of the additional fullness in order to accomplish this. Any curtains not having the proper center overlap shall be re-fabricated by the contractor at no additional cost to the owner.
 - 5. The bottom edge of all curtains shall be level with the stage floor for its entire length across the stage and shall not deviate from stage level more than 1/8".
 - 6. All curtains shall be trimmed so that the bottom of each clears the floor by 1/2" - 3/4". This is especially critical on dead hung systems where curtains cannot be retrimmed by readjusting the counterweight arbor. Curtain fullness and potential roof snow loading conditions shall be calculated and considered prior to the curtains' final installation. This will require the contractor to provide one additional trip to the site during the winter season and with snow load on the roof in order to re-trim curtains as and if needed in order to account for snow loading deflection of the rigging steel and so that curtains do not drag on the floor.

3.11 INITIAL POST COMPLETION TESTS & SET UP:

- A. Verify that all sets have been balanced properly (if sets must be left slightly out of balance, then it is required that they be slightly arbor heavy).

3.12 OWNER INSTRUCTION:

- A. The contractor shall provide a training program for the owner at the project location and with the project equipment (owner's equipment), consisting of the following hours/periods of instruction specifically and exclusively regarding the stage/house rigging systems and related equipment. This training time shall not exceed (4) hours. No training block shall be less than four hours in duration. This time is in addition to training times noted below.
- B. All owner instruction shall be provided by the contractor as part of this contract shall be scheduled and performed within twelve months of the final system turnover date to the owner.
 - 1. The turnover date is defined as the date of completion of all open punch list items and final acceptance by the owner.

THEATRICAL RIGGING & CURTAINS

2. Attendees/trainees shall be as designated by the owner and may consist of multiple groups requiring separate training sessions on the same topics (all sessions must fit into the training times as allotted above).
- C. Training time may be utilized in any number of ways that may not relate directly to the hands-on training. These required hours can be utilized in order for the contractor to perform additional system programming, set manipulation, customizing layouts, control screen optimizations/changes or any other related work requested and approved by the owner – up to the “not to exceed” hour totals listed in these specifications. Additional training or programming work beyond that indicated in these specifications shall be at additional cost to the owner.
- D. All owner instruction training hours are exclusive of travel time. Training time hours will begin to elapse at the prearranged hour agreed upon by both the owner and the contractor.
- E. It is understood that, if there are multiple spaces/locations (e.g., high school auditorium, middle school gym, elementary school cafetorium, etc.), the training sessions noted shall be required independently at each facility.

3.13 TRAINING:

- A. Training must provide useful information that covers all major topics of how a system would typically be used by an end user/owner. This also applies to documentation and video training.
- B. Provide training only at the request of the owner’s authorized representative(s). Make clear (in writing) to the owner’s authorized representative(s) that any training hours not formally requested, scheduled and performed within twelve months of the final system turnover date to the owner shall be forfeited.
- C. Track all training hours in writing and provide copies of attendance sheet sign-offs to the owner of who attended, how long each session lasted and what topics were covered.
- D. On a job-by-job basis the training sessions may vary significantly. The training hours allotted may be used by the owner as required for any purpose related to the system and in any number of ways that may not relate directly to the hands-on training. These required hours can be utilized in order for the contractor to perform additional system programming, set manipulation, customizing layouts, control screen optimizations/changes or any other related work requested by the owner – up to the “not to exceed” hour totals listed in these specifications.
- E. Additional training or programming work beyond that indicated in these specifications or after the initial twelve-month period shall be at additional cost to the owner.
- F. Turn over copies of all video recorded training to the owner as described below.
- G. It is recommended that most training be hands on with the owner’s personnel operating the equipment.

3.14 QUALIFICATIONS OF TRAINERS:

- A. All persons performing system training must be experienced operators of the specific equipment they are training others to use. If no one on the contractor’s staff has experience on a specific device or piece of equipment, then the contractor must provide qualified third-party personnel in order to perform those training sessions.

3.15 SCHEDULING FOR TRAINING:

- A. All training sessions must be scheduled with the owner and by the contractor with at least two weeks advanced notice.
- B. If the contractor arrives for a scheduled training session and the owner personnel are not present, then the contractor must notify the owner that a four-hour training segment has been forfeited.

- C. If a scheduled session lasts less than four hours, it will still expend four hours of allotted training time due the owner.
- D. Training session must be scheduled and performed at a time when the space is available and otherwise unoccupied.
- E. Coordinate all training sessions with the owner, all uses of the room, any related contractors, attendees, etc. Training sessions, especially those being videotaped, shall not be allowed while other uses of the room are in session, especially those involving the use of construction equipment, drills, saws, rehearsals, etc.

3.16 EXAMPLE TRAINING SCHEDULE:

RIGGING SYSTEM:

Typical Training Hour Breakdown		Typical Content
	Hours	
<i>System overview and basic Training</i>	4	Full Walk around, system layout, any related power sources etc. and an overview of general system operation, terminology, usage, etc.
<i>Emergency Procedures</i>	4	This session can be the same day as system overview if schedule allows. Understanding what to do in a runaway set situation, methods to employ to avoid accidents, standard safety procedures & protocols, etc.
<i>Setting up a stage</i>	4	Training users on the overall concept stage layout, stage setup, set pieces and related elements, attaching scenery, tripping up softgoods, etc.
<i>Motorized Rigging</i>	4	Power sources, all related cabling, motor starter cabinets and their use, operator control interfaces and their use, pendant remote usage, stage safety procedures with hoists, batten learning, load limits, reset procedures, etc.
<i>Assistance with setting up first Event</i>	4	Show files, presets, global techniques, etc.
<i>On site for first show as tech support</i>	4	
<i>On site for Second show as tech support</i>	4	
<i>Follow Up/Higher Level Training</i>	4	
	32	Total Allotted hours vary on each project, this is just an example.

3.17 INITIAL TRAINING:

- A. Walk through the facility and familiarize the owner with where all primary system equipment is and what it does. See below for additional instructions and requirements for training sessions, video recording/documentation, etc.
- B. Training on Counterweight Operations (list is not exhaustive):

1. Overall safety instructions.
 2. Set loading & unloading procedures for all scenery, curtains and electrics.
 3. Operating limits of rope locks.
 4. How to check the balance condition of a set prior to movement.
 5. Operational norms – verbal commands on stage.
 6. How to deal with large load changes such as curtain removals.
 7. Runaway set procedures.
 8. Storage of stage counterweights.
 9. Cyclorama, scrim and backdrop fabric intents & limitations and how to prepare these materials for use after a prolonged period of storage/non-use (where materials may have taken on wrinkles, creases, etc. during the storage period).
- C. Training on Dead Hung Operations (list is not exhaustive):
1. Overall safety instructions.
 2. Set loading & unloading procedures for all curtains and tracks.
 3. Operational norms – verbal commands on stage.
 4. Storage of stage curtains.
 5. Operation of ropes, pulleys, etc.
 6. Usage of flat fabric strap tiebacks, etc.
 7. Rigging inspections requirements.
- D. Training on Motorized Rigging Operations (list is not exhaustive):
1. Overall safety instructions.
 2. System reset and overload procedures.
 3. Operational norms – system extents, limits and functional procedures.
 4. Operational norms – verbal commands on stage/house.
 5. Ground focus intents and tips for successful implementation.
 6. Motorized unit failure, malfunction or lockup procedures.
 7. Required system inspection and maintenance intervals and procedures.
 8. A written simplified guide to the use and maintenance of each motorized unit type/category and related controls.
- 3.18 VIDEO RECORDING OF TRAINING WITH OWNER – INITIAL TRAINING:
- A. Record all aspects of the initial owner training with the group of trainees present. A live training session by default may be interrupted with questions or unrelated discussions, which is acceptable. The camera should record through the entire session, unedited.
- B. Provide simple explanations of what each piece of rigging equipment does/what it is intended for, how to properly interface with that equipment (controls, levers, ropes, counterweights, etc.), present an overview of general stage etiquette as well as what an end user should do if a piece of rigging equipment fails, if the motorized portions (if present) were to be shut down or become non-functional, etc.
- 3.19 VIDEO RECORDING OF DEVICE TRAINING – SECONDARY TRAINING:
- A. Device specific training shall be recorded by the contractor independent of the initial training session. This recording should be performed in the contractor's shop, at the owner's site without trainees present or at another location as appropriate. The intent of this training is to give specific, guided instruction on each piece of equipment. Where manufacturer's professionally produced video trainings are available (via YouTube or manufacturer's website), these will suffice. The contractor should then supplement these with all other video training requirements presented in these specifications. The preference is for the contractor to offload manufacturer training videos onto a thumb drive to present to the owner; however, active links to these videos embedded in the final O&M documentation is an acceptable alternative.

B. The secondary video training must provide:

1. A video tour (walk-through) of the rigging system equipment present at the owner's site that clearly shows where all primary rigging system equipment is located, gives a brief overview description of what that equipment's primary functions are and what any related devices, screens or indicator lights look like when everything is working properly. This video should not exceed 30 minutes in length.
2. A video tour (walk-through) of the rigging system related power panels, breakers and disconnects feeding the system equipment (motorized hoists, index lighting, lifts, roll drops, curtain draw machines, etc.), which breaker operates each power feed and what the normal state looks like. Room names, numbers and locations that conform to site nomenclature should be used throughout. This video should not exceed 10 minutes in length.
3. For all motorized elements note the control boxes, their use and how to check for trouble status in controls, how to initiate and complete any required reset procedures, etc. This video should not exceed 10 minutes in length.
4. A separate video should include a brief discussion of the ANSI/ESTA standards for rigging systems inspections, frequency of inspections, why periodic inspections should be considered mandatory life-safety events, what procedures to follow should any rigging equipment malfunction and the necessity contacting the system installer if anything should fail or go wrong with the rigging system or any related devices. This video should not exceed 15 minutes in length.
5. A separate video should include a discussion of emergency procedures, run-away set procedures, system reset procedures, meanings & intents of safety signage, safe "work-at-height" procedures, overall safety precautions and behaviors, etc. This video should not exceed 15 minutes in length.
6. A separate video should include a series of quick start videos for someone who must use the rigging system equipment who has no idea how to operate any portion of it (A Beginner's Guide). Each related video clip should not exceed 5 minutes in length.
 - a. Example:
 - i) How to properly operate a set.
 - ii) How to calculate loading on each arbor/batten set, how to determine how many counterweights to add to the arbor and the safest procedure for doing this.
 - iii) How to navigate and safely operate stage rigging sets during a show and in a near blackout conditions.
 - iv) Standard verbal stage call-out terminology to employ during set movements.
 - v) Necessity of spotters during all set movements.
 - vi) How to properly store curtains for short/long term storage.
 - vii) How to strike a stage after the final performance.
 - viii) Basics on system maintenance.

C. Video recording general requirements (applies to all training & for record videos):

1. Static shots: The video recording device (camera, tablet and/or phone) must be placed on a tripod or other fixed stand, situated on a stable base and remain in a location that offers a good view of the rigging system, locking rail, arbors and any related equipment or controls being discussed. Handheld video recording of static scenes shall be avoided.
2. Roaming shots: The video recording device must employ motion stabilization (smart device app, post-production stabilization software or physical gimbal, etc.). Shaky, blurry videos shall not be acceptable.
3. Lighting: The lighting must be consistent (training space must be well lit without interruption-supplementary video lighting may be required). Lighting must be adequate for the video recording device and so that final video presentation appears professionally lit and dim/dark views of equipment are avoided. Provide portable lighting as needed to accomplish this.
4. Audio: The audio must be clear throughout (supplementary/advanced micing techniques may need to be utilized), there must be no other noises on the video that mask the verbal communications (HVAC noises, whines, hums, equipment crashing, the use of any construction equipment or power tools, off camera voices, etc. Audio must be recorded so that the trainer's

- words are clear, are not muffled, so that vocals do not trail off and so all spoken portions of the training videos are easily understandable.
5. Shot Composition: The video recording device must be pointed at the elements/objects being discussed (showing devices, screen shots, etc.). Utilize good framing techniques, close-ups as required and overall generalized shots where appropriate.
 6. Topics & Viewability: The topics explored and trained on in the video trainings must be clear, consistent and of value. Text on screens must be readable, so close-up shots will be required when discussing certain elements (especially when discussing user interface screens, touch controls, etc.).
 7. Typically, the video recording should be performed by a person other than the one doing the actual training. In this way, the operator can zoom to specific areas being discussed, etc. while the trainer continues presenting.
 8. Editing/Final Presentation: All video recordings must be professional throughout from trainer presentation to video editing and final packaging. Video footage must be obtained and then "cut" together into a well-structured, chaptered format from which an owner can access whichever topic of interest or concern they may have without having to view or fast-forward through other discussions. Video edits should not end or cut off mid-sentence. Edit and title the final video training sessions into logical chapter format. The basis for titles, sections, chapters, etc. shall be the general content of the included equipment.
 9. The intent of training videos is for an end user to be able to watch these and to follow along with button pushes, menu choices, etc.; therefore, the videos cannot be shot in a manner where the trainer's body blocks major parts of the screen or where the trainer's back is turned towards the camera and hearing/understanding the trainer is difficult and distant or where screens/buttons cannot be read. In order to allow an end user a clear understanding of system training, additional video may need to be shot by the contractor and edited into the final product with picture-in-picture style or split screen style editing where close up shots are easily readable.
 10. The trainer/presenter for each session (especially for the secondary training section videos) must be articulate, speak clearly, properly enunciate his words and professionally present the information in a clear, concise and easily understood manner.
 11. Convert each recording to standard formats for playback on Mac/PC based platforms and write to the devices as described below.
 12. Provide all training videos on USB stick formats.
 13. On the USB stick, include a PDF document that contains all relevant links to the manufacturer's video training series for basic, intermediate and advanced topics/functions. Where manufacturer videos are available, provide these and/or the active links to these videos on the manufacturer's website and/or other relevant sites (YouTube) for the owner's future use and reference.
 14. In subsequent advanced training sessions with the owner's personnel, higher level functions may be covered. Some owners will not require this, but others will. The contractor is not required to video record subsequent sessions. The owner can record any session they want for future reference using their own equipment.
 15. Pre-recorded videos for some training sessions that are "canned" but appropriate for the equipment located in this facility are completely acceptable and need not be custom done for/at each and every facility; however, they must be custom compiled into a framework that fits all equipment in the owner's facility and must also include the initial training session(s) video footage.
- D. Provide (1) one copy (brand new and not previously used) of the Stage Rigging Handbook (provide the latest edition) by Jay O. Glerum. This shall be turned over to the owner and used as the instructional text for training of the designated operators of the stage rigging equipment. This book shall remain with the owner as a reference manual.
- 3.20 FOLLOW-UP TRAINING SESSIONS:
- A. Follow-up sessions should be recorded on video for record only, except as noted elsewhere, and copies provided for the owner's records. These sessions are not to be confused with either initial or secondary

system training intents.

- B. Follow-up sessions may include a re-presentation of any previous session's subject matter for a different group of end users or as a refresher to previously trained individuals.
- C. Often these sessions will be used for in-rehearsal or show sessions where the contractor is an advisor to the end users/operators during actual show setup and/or system use for the first performance with the new equipment. These sessions do not need to be videoed and/or recorded.

3.21 SIGNAGE:

- A. A sign shall be posted in an accessible location (typically on the rack(s) or in the control booth) providing the name, address and phone number of the primary system contractor, manufacturer and supplier (if not already listed) of the system equipment.

3.22

3.23 WARRANTY AND SERVICE:

- A. The contractor guarantees all equipment, materials, and workmanship to be free from defects for a period of one (1) year from owner acceptance. This warranty supersedes all manufacturers warranties for the one (1) year period. Any manufacturer's warranty that exceeds the one (1) year will continue to be applicable. The contractor will replace any defective materials at no charge to owner. Any equipment replaced during the one (1) year warranty will have a new one (1) year warranty to the owner.
- B. The contractor guarantees all labeling to be free from defects for a period of two years from the date of owner acceptance. In cases where the label's adhesive fails, or the label suffers from degradation causing it to become unreadable, the label will be considered defective and will be replaced at no cost to the owner.
- C. The contractor will respond by phone to requests for service within two (2) business hours and respond with a technician being sent (if needed) within one (1) business day.
- D. Any equipment that tends to "drift" or whose performance deteriorates during the warranty period will be considered defective, even if such drifting is normal during break in. This equipment will be readjusted by the contractor at no additional charge to the owner.
- E. Provide during the warranty period one (1) service inspection for preventive maintenance, at six (6) months after acceptance. This will include but not be limited to a full system operational and safety check and tightening of manila operating lines as required.
- F. Provide all service at the owner's location regardless of any manufacturer warranty terms regarding carry in service.

G. INSPECTIONS:

- 1. The contractor shall be responsible to inform the owner in person and in writing of the necessity and critical nature of having their stage rigging systems inspected per the latest ANSI E1.47-2017 "Entertainment Technology-Recommended Guidelines for Entertainment Rigging System Inspections" guidelines. This shall also be reflected in safety signage as specified.
- 2. General inspections:
 - a. Each system component shall be inspected by a qualified person on a recurring schedule as recommended by the manufacturer and ANSI E1.47-2017.
 - b. All installations and equipment shall be visually inspected and shall be tested for operation in a non-destructive manner.
 - c. All systems and equipment shall be inspected after installation and prior to user operation. Inspections shall meet the requirements of this section, but additional requirements shall be permitted.
 - d. Qualified persons shall either perform or oversee the inspection and testing process and shall certify that all inspection requirements have been met.

- e. Inspection procedures and results shall be fully documented. The testing supervisor, the installer and the system owner shall retain complete copies of the test documentation.
- f. Any lineset not meeting the prerequisite requirements detailed above shall be tested by applying a controlled test load at no less than 150% of the design load.

3.24 DEMONSTRATION AND ACCEPTANCE:

A. CONDITIONS FOR SCHEDULING FINAL ACCEPTANCE:

- 1. The system is required to be complete and fully tested. Any failure that may have occurred between the contractor's final tests and the date of acceptance will be noted and can be corrected after that date. All of the following conditions must be met before scheduling an acceptance test:
 - a. The contractor shall inspect, completely verify and submit signed documentation that all system components meet all applicable current ANSI, ESTA & PLASA rigging standards as well as all of the performance criteria set forth within this specification.

B. PROCEDURE FOR SCHEDULING FINAL ACCEPTANCE:

- 1. The contractor shall notify the owner and consultant of a proposed date and time for the final acceptance tests. The contractor shall include two alternate dates and times. The dates proposed will be a minimum of fourteen (14) calendar days from the date of the proposal.
- 2. The owner and consultant will respond within two (2) business days as to whether the date and time for final acceptance tests has been approved.
- 3. If none of the dates and times are acceptable, the owner and/or consultant will submit two alternate dates and/or times to the contractor. The contractor will respond within two (2) business days as to whether the dates and times for acceptance tests are acceptable.
- 4. If the dates and/or times proposed by the owner and/or consultant are not accepted, the contractor, owner, and/or consultant will continue to alternate per these procedures until an acceptable date and time has been found.

C. DATE OF TESTS:

- 1. The contractor will demonstrate operation of all major components of the systems including, but not limited to, the following:
 - a. Demonstrate the operation of the counterweight rigging system.
 - b. Demonstrate the operation of the motorized rigging system components.
 - c. Demonstrate operation of all curtains and tracks.
 - d. Provide proof of flame certifications.

3.25 CONDITIONS OF ACCEPTANCE:

- A. It is understood that the consultant cannot inspect every aspect of the installation. The contractor is responsible for installation quality and methods, fabrication quality and methods and performance of their work. Acceptance of the project will constitute an acceptance of the following:
 - 1. All specified equipment has been installed and the system is operating properly.
- B. Upon completion and acceptance of the project the contractor will provide to the owner a letter stating that all of the equipment and installation methods meet or exceed the specification requirements in all respects, and that the system as installed meets all of the applicable standards and codes required under the specification and meets applicable federal, state and local codes and laws.
- C. ACCEPTANCE TESTS CHECKLIST:
 - 1. Prior to acceptance testing there are a number of conditions that need to be verified. There are also site conditions required for the consultant to perform tests as indicated. The contractor shall ensure that every item on this checklist has been performed and verified prior to the consultant's acceptance tests can begin. Scheduling of the consultant to perform final acceptance tests must be coordinated with the owner, the project's construction manager (or

clerk of the works), the contractor and the consultant (See paragraphs above for detailed requirements).

2. GENERAL

- a. No other contractors may be working within the rooms to be tested during tests.
- b. No rehearsals or other activities may take place during tests.

3. RIGGING SYSTEM – TYPICALLY TAKES 2 - 4 HOURS.

- a. Required attendance – Adequate Personnel from the rigging contractor to operate sets, answer specific system installation questions and verify all installation details.
- b. Curtains and all required lighting fixtures installed to battens.
- c. All sets installed level, true and plumb.
- d. All sets balanced and working smoothly.
- e. All curtain tracks checked for end stops and binding on tracks.
- f. All cable drops for stage electrics properly dressed and not tangling during travel.
- g. All audio drops properly dressed onto battens.
- h. Verification that all portable equipment has been delivered to the owner per specs and drawings. Portable equipment must be available for visual inspection as well.
- i. All locking rail cards and pipe batten end identifications installed & properly labeled.
- j. All Nicopress or equal compression sleeves have been properly swaged and tested by the contractor with a go-no-go gauge and found to comply with recognized standards and specification requirements.
- k. All spare weights neatly stacked in approved locations per the project structural engineer.
- l. All arbor "static" weights painted as per specifications and drawings.
- m. All curtain track tension floor pulleys (or sandbag pulleys) properly installed and fully functional.
- n. All curtains hung, clean, wrinkle-free & crease-free and with the proper documentation on site as to their flame-retardant characteristics.
- o. All shackles and turnbuckles properly moused with all wire ties clipped short and clean (with no protruding ends).
- p. All batten end caps installed.
- q. All standard and custom safety signage correct, site specific and properly installed in all locations called for in the written specifications.
- r. All locking rail cards and pipe batten end identifications installed & properly labeled.
- s. Motorized hoist equipment fully functional and control system installed and fully functional (including handheld pendant remote).
- t. All batten end caps installed.

3.26 CLOSEOUT DOCUMENTATION:

- A. Contractor must submit the following items. All items should be part of the O&M Manual. Provide the quantity and form (paper and/or electronic) of these closeout documents as is indicated in the contract front-end documentation. Physical copies shall only be required if front-end documentation requires them. If the owner requests physical copies, these shall be provided at an additional expense to the owner.
- B. System testing documentation as required by final testing and acceptance procedures outlined in this document.
- C. ALL paper copy O&M Manual submissions shall be in heavy-duty, D-Ring style, 3-Ring binders (provide size most appropriate for the quantity of paperwork included) with front plastic display pocket and internal side pockets. NO PAPER FOLDERS SHALL BE ALLOWED. All electronic copies shall be "bound" in an Adobe Acrobat style portfolio (see below for more complete information).
- D. Complete technical manuals for all equipment installed.
- E. List of serial numbers of all equipment installed and the specific location of each piece of equipment.

- F. Warranty cards for all equipment or classes of equipment (if warranty cards exist, otherwise provide copies of the manufacturer's warranty policies).
- G. Curtain flame resistance certificates.
- H. Manufacturer MSDS sheets for all applicable equipment.
- I. Sign Off, Programming & Inspection Sheets:
 - 1. The contractor shall be required to provide copies of the following reports and include in the O&M Manual.
 - 2. Manufacturer Rigging System Inspection Report (Report As Generated By The QuickTouch Config)
 - 3. Manufacturer Signoff - Rigging System Inspection Report
 - 4. Manufacturer Signoff - Rigging System Commissioning Report
 - 5. Manufacturer Signoff - Rigging System Training Report
- J. Operations & Maintenance Manuals shall NOT include any alternate languages or language sections unless specifically requested by the owner (i.e. French, Dutch, German, Spanish, Japanese, etc.)
- K. Operations & Maintenance Manual: An operations and maintenance manual (or "Systems Manual") written in English. This manual should include, but is not limited to, the following (these items shall also be included in the system training and videotaping):
 - 1. A custom compiled simplified guide to standard rigging procedures, including, but not limited to, the following items:
 - a. Industry standard procedures for the handling, loading and unloading of weights, battens, arbors and other pipes
 - b. Make a clear effort to inform the owner (both during formal training and in the O&M Manuals) and to direct ALL operators to abide by the facility's "policy for working at height" and as is OSHA approved.
 - c. The proper procedures for taking curtains down, protecting them from dirt & damage during this process, storing them properly and reinstalling them.
 - d. How to properly load/offload fixtures from electric sets.
 - e. The purpose and operation of rope locks and their associated tensioning screws.
 - f. The intents of operating line flag.
 - g. Generally accepted stage practices regarding personnel on stage while sets are in operation, moving, being loaded, etc.
 - h. How operators can spot any imbalanced loading condition on a set that is locked, and the safe handling of such situations.
 - i. The math involved in calculating parameters surrounding the proper balancing of stage sets.
 - j. The operation and intent of legs & rotator operation.
 - k. A complete copy of manufacturer's furnished standard stage & counterweight rigging safety procedures.
 - l. The minimum number of persons required for safely loading/unloading sets (four – 2 at the locking rail and 2 on stage) along with proper adult supervision requirements during major set changes (four on stage).
 - m. The emergency procedures to follow during runaway set situations and other accident avoidance procedures
 - n. The importance of wearing leather gloves during all set movement and set change operations.
 - o. A set of blank rigging equipment inspection, maintenance and service log sheets (include as the first line item on each sheet the initial system installation, date, service performed, etc.
 - p. A sheet providing the name, address and phone number of the primary system installation contractor, manufacturer and supplier (if not already listed) of the system equipment, etc.

- q. A simple list of any required periodic maintenance procedures that need to be performed on the rigging system (motorized hoists, counterweights or projection screen winch).
*See the training section below for the intents of training and any additional requirements.
2. A sheet showing the ratings, safety factors and load limits of each set and all individual system components (including dead hung, motorized and counterweight sets either on stage or in the main auditorium area).
3. A reduced size copy of each safety sign and the included verbiage – large enough to be read but still small enough to fit neatly into binder.
4. A complete reduced size set of the final print drawings of the installation (“as built”), including field changes, routings, locations of sets, set numbering, installation details and other pertinent information.
5. A set of blank rigging equipment inspection, maintenance and service log sheets (include as the first line item on each sheet the initial system installation, date, service performed, etc. Each sheet shall include columns for the listing of date of service, person(s) performing service, service performed, additions or alterations to system or equipment, repairs performed, factory service tech service, etc. Log sheets shall be Microsoft Excel spreadsheet style sheets.
6. A sheet providing the name, address and phone number of the primary system installation contractor, manufacturer and supplier (if not already listed) of the system equipment, etc.
7. A sheet outlining the intents and usage of any supplementary auditorium pipe assemblies intended for the suspension of lighting instruments, including but not limited to tormentor, balcony, catwalk, gallery, cove or Shakespeare positions and the dangers involved in climbing or hanging from these assemblies (i.e. these structures should not be climbed – that is not their intent), proper access techniques, etc.
8. A sheet detailing a “show” operation overview – i.e. how an operator would set up a show, stage procedures on a dark stage, safety precautions and any required programming parameters.
9. A simple list of any required periodic maintenance procedures that need to be performed on the rigging system (motorized hoists, counterweights or projection screen winch).
10. Walkthrough of equipment locations with description of functions of each piece of equipment.
11. System operation procedures, an operational walkthrough, intent of fire curtain system, related reset winch, troubleshooting techniques, emergency contact numbers and system/curtain reset procedures.
*See the training section below for the intents of training and any additional requirements.
- L. The contractor must provide a letter to the owner upon completion of the installation and training work that all fabric/material utilized is flame retardant (or is FR per specifications) and that all system hardware and components have been installed per specifications and industry standard practices (note any approved digressions from contract documents in a short, simple paragraph style format). No digression from industry standard installation practices and/or ANSI standard requirements shall be allowed.
- M. The contractor must provide a copy of the “Certificate of Flame Resistance” to the owner for each type of curtain fabric used within the job. Each certificate should be complete and signed by the appropriate authority certifying its compliance with applicable fire codes – typically this is a sheet issued by the fabric manufacturer that states compliance with all appropriate NFPA regulations, etc. and is then filled out by the contractor as to the owner of the curtains, pattern and color of the fabric, the order and control numbers, date the order was processed, the contractor’s invoice number and the yards processed for the fabrication of the stage curtains (some may even bear the official seal of a particular state and/or authorizing agency). Contractor

sworn depositions or even duly witnessed and notarized sheets as to any particular fabric's flame-resistant characteristics is unacceptable as the contractor has no authority to make such statements.

- N. A sheet detailing any maintenance procedures required for the equipment installed that is custom compiled and written by the contractor as well as a list of the specific tools required, user servicing guidelines, etc. related to serviceable devices.
- O. The contractor shall provide the owner with complete instructions on maintaining the flame-resistant characteristics of any included fabrics, materials, etc. (e.g. the interval between flame retardant chemical applications) as well as the dangers involved in allowing third party vendors to apply flame retardant chemicals to IFR materials.
- P. All users of the rigging system shall be instructed to read and thoroughly understand the information contained in the systems manual. Knowledge of the system-specific load capacities, operating instructions and maintenance schedules are important to establishing safe operating practices and should be understood by all users of the rigging systems and related components.
- Q. A DVD (or set of DVDs', depending on requirements listed below) that details the training of users on the owner's installed systems. See owner instruction section below.
- R. As-Built Drawing Set requirements (required of all prime and sub-contractors):
 - 1. As-Built Drawings (AKA as fitted or as installed): This drawing package is a revised set of "red-lined" construction drawings submitted by each installing contractor upon completion of the project. These drawings must accurately record and reflect the equipment installed, all changes made during the construction process and must also show the exact dimensions, geometry and location of all elements of the work completed under the contract. As built drawings should be added to throughout the construction process as the project gets built.
 - 2. The as-built drawing package must include the following:
 - a. Clean, consistent look, layout and markup methodology across entire set
 - b. Conduit sizes
 - c. Wire types pulled (manufacturer, model, AWG, etc.)
 - d. All junction box locations, names, internal components, etc.
 - e. Conduit routing (actual installation paths with notes as to elevation, access, etc.)
 - f. Panel and circuit numbers for all power related devices
 - g. Shop drawing changes
 - h. Extra work not originally included in the contract
 - i. Field changes
 - j. Design changes
 - k. Modifications
 - l. Labels and dates (attesting to when changes were made and why)
 - m. Locations and dimensions (if as designed, state such; if not, indicated all deviations). This should include heights AFF, etc.
 - n. Legend or Key explaining all markups, color codes, numbering sequences, etc.
 - o. Port assignments and related nomenclature (for all DMX, Data, 0-10V, IP, switches, etc.)
 - p. Embedment depth, type & size for rigging related anchors
 - q. Accurate details for all installed devices
 - r. Equipment relocations (due to required or requested field directives, owner requests, obstructions, etc.)
 - 3. As built drawings must be written in legible, plain English without the use of shorthand, abbreviations, codes, etc. Descriptions shall be clear and concise.
 - 4. As built drawings can also be provided with electronic and technology driven interactions such as embedded photos, GPS data and active links to relevant material.
 - 5. Typical markups that would be expected in all as-built drawing sets:

- a. RED markups indicate where something has been REMOVED, RELOCATED or CHANGED from the original design.
 - b. GREEN markups indicate where something has been ADDED to the original design.
 - c. YELLOW markups indicate actual routings, locations, etc.
 - d. BLUE markups indicate special information that has been included regarding the installation of equipment, conduit & wiring.
6. An accurate and useful set of As-Built drawings includes preparation before the commencement of the project, during the installation process by all involved parties and after the final punch list items have been addressed and corrected.
 7. Only include drawings in the as-built set that are relevant to the installed systems. For example, the EC would not include detail drawing as-builts for systems or equipment that he had nothing to do with providing and/or installing (such as Brickhouse arbors or AV system touchscreen layouts).
 8. Do not include duplicate pages or pages without any markups. Every sheet included in the as-built set must include all relevant markups as listed above.
- S. O&M Manual pdf requirements: The contractor shall provide a pdf copy (with appropriate titles) for each piece of documentation listed above and bound together in a pdf portfolio/binder, labeled with the owner's name and with the submitting contractor's information. All electronic manuals shall contain only equipment and information that pertains to the project. Where custom procedural guides and troubleshooting manuals are required, these shall be produced by the contractor in a professional piece of software (Microsoft Office, Adobe Acrobat or cadd software or equal) and shall contain all required information in a neat and logical presentation. Where there are portions of the stock manuals that contain sections that do not pertain, the contractor shall use a program such as Adobe Acrobat Pro, BlueBeam or other similar pdf markup software applications and use the strikethrough function with a heavy red line to strike out any text or sections that do not apply. Where factory manuals are available the contractor shall provide these. Where factory manuals are not available, the contractor shall provide high resolution (150 dpi minimum and fully optimized in Acrobat or equal), full page, properly and consistently oriented pages in a consecutive ascending order. All pdf portfolio and binders produced and submitted shall be professionally put together and presented well. No pdf scan pages that are skewed, illegible, mis-ordered, angled, copied at a low dpi setting or that do not pertain to this project shall be allowed. All manuals shall be saved as standard Adobe Portable Document Format (PDF) files that are capable of being opened & viewed on any modern computer system with a standard pdf reader and shall be without password access protection or other security preventative measures engaged.

END OF SECTION