SPECIFICATIONS FOR:

ALTARA ELEMENTARY FACULTY AND CONFERENCE ROOM REMODEL

PROJECT ADDRESS:

Altara Elementary, 800 E 11000 S, Sandy, UT

OWNER: Canyons School District
9361 South 300 East
Sandy, Utah

ARCHITECT: KMA Architects
170 N Main Street
Spanish Fork, UT

PROJECT DIRECTORY
Canyons School District – Altara Elementary School Remodel

OWNER
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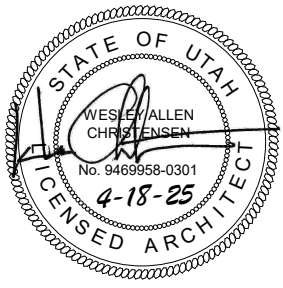

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Note to Contractors:

All contractors, subcontractors, and suppliers shall bid the following construction documents including all plans, specifications, and addenda in their entirety. Items pertaining to all trades can be found throughout these construction documents and shall be bid as such.

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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Name: Altara Elementary Faculty & Conference Room Remodel

B. Owner's Name: Canyons School District

C. Architect's Name: KMA Architects, Inc.

D. Scope of Work: The project consists of the remodel of some existing rooms with new millwork and wall finishes. It also includes updated lighting and patch and repair as needed.

E. Project Location: Altara Elementary School - 800 East 11000 South, Sandy, UT, 84094

1.03 CONTRACT DESCRIPTION

A. Contract Documents, dated April 2025, were prepared for the Project by KMA Architects, Inc., 170 N Main Street, Spanish Fork, 84660.

B. Contract Type: The Work will be constructed under a single prime contract.

C. Separate Contract: The Owner reserves the right to have separate contract for performance of certain construction operations at the building and site. Those operations will be conducted simultaneously with work under this Contract.

D. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly without interfering with or delaying work under this Contract.

1.04 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Owner intends to occupy a certain portion of the Project prior to the completion date for all phases of construction.

D. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

E. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

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

B. Construction Operations: Limited to areas within contract limits indicated.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

C. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.

D. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.06 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

B. Documentation of changes in Contract Sum and Contract Time.

C. Change order procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 50 00 - Contracting Forms and Supplements: Forms to be used.

B. Section 01 21 00 - Allowances: Payment procedures relating to allowances.

1.03 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule, and Contractor's Construction Schedule.
   2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Submit draft of AIA Document G703 Continuation Sheets.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
   7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
   8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
      a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.04 APPLICATIONS FOR PAYMENTS

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

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

C. Payment Application Forms: Use Form AIA G702 and Form AIA G703 Continuation Sheets as form for Applications for Payment.

D. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

E. Forms filled out by hand will not be accepted.

F. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

G. Execute certification by signature of authorized officer.

H. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

I. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

J. Submit one electronic and three hard-copies of each Application for Payment.

K. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 30 00.
   2. Construction progress schedule, revised and current as specified in Section 01 30 00.

L. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor, on AIA Document G710, "Architect's Supplemental Instructions."

B. Owner-Initiated Proposal Requests: For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with

supplementary or revised drawings and specifications, a change in Contract Time or Contract Sum for executing the change and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a estimated price quotation within time specified in proposal request.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

C. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

D. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.06 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what

could have been foreseen from information in the Contract Documents.

2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.07 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue Change Orders for signatures of Owner and Contractor on AIA Document G701.

1.08 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.09 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 29 00

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.
   1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

1.02 SECTION INCLUDES

A. Lump-sum allowances.

B. Contingency allowances, includes installation.

C. Payment and modification procedures relating to allowances.

1.03 RELATED REQUIREMENTS

A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.04 SELECTION AND PURCHASE

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

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

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

1.05 SUBMITTALS

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

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

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

1.06 COORDINATION

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

1.07 LUMP- SUM ALLOWANCES

A. Costs Included in Lump-sum Allowances: Cost to Contractor or subcontractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site..

B. Costs Not Included in Lump-sum Allowances: Contractor's costs for receiving and product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; labor for installation and finishing; overhead and profit, and similar costs related to products and materials shall be included as part of the Contract Sum and not part of the allowance.

1.08 CONTINGENCY ALLOWANCE

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

B. Contractor's costs for products, delivery, installation, labor, insurance, taxes, equipment rental, overhead, profit, and related costs for products and equipment will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance and are not part of the Contract Sum.

C. Funds will be drawn from the Contingency Allowance only by debit/credit Change Order.

D. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.09 UNUSED MATERIALS

A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted

1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit.

PART 2 - PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.03 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION

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SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Contractor's daily reports.

G. Field condition reports.

H. Progress photographs.

I. Coordination drawings.

J. Submittals Schedule.

K. Submittals for review, information, and project closeout.

L. Number of copies of submittals.

M. Requests for Interpretation (RFI) procedures.

N. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.

B. Section 01 60 00 - Product Requirements: General product requirements.

C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

1.04 PROJECT COORDINATOR

A. Project Coordinator: General Contractor.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for construction access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for Interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service.
   3. It is Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
   5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: Shall be selected by contractor and approved by Architect.

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Architect will determine when to terminate the service for the project and the Contractor is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Schedule meeting at the project site or another convenient location no later than fifteen (15) days after execution of the Agreement.

B. Contractor will schedule a meeting after Notice of Award.

C. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. Consultants.
   5. Contractor's Superintendent.
   6. Major Subcontractors.
   7. Suppliers

D. Agenda:
   1. Phasing.
   2. Execution of Owner-Contractor Agreement.
   3. Distribution of Contract Documents.
   4. Designation of personnel representing the parties to Contract, Owner and <1|A/E|>
   5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   6. Scheduling.
   7. Preparation of Record Documents.
   8. Use of the premises.
   9. Work restrictions.
   10. Responsibility for temporary facilities and controls.
   11. Construction waste management and recycling.
   12. Parking availability.
   13. Office, work, and storage areas.
   14. Equipment deliveries and priorities.
   15. First aid.
   16. Security.
   17. Progress cleaning.
   18. Working hours.

E. Minutes: Contractor and Architect will record and distribute meeting minutes.

3.03 PRE-INSTALLATION CONFERENCES

A. Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Roofing.
   2. Hardware/keying.
   3. Window installation.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings at the project site throughout progress of the work at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.

3. Architect.
4. Special consultants when required.
5. Contractor's superintendent.
6. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Status of proposal requests, pending changes and change orders.
14. Effect of proposed changes on progress schedule and coordination.
15. Documentation of information for payment requests.
16. Other business relating to work.

E. Record minutes and distribute copies within five days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.
1. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

3.05 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule.

3.06 DAILY CONSTRUCTION REPORTS

A. In addition to transmitting electronically a copy to Owner and Architect, submit two printed copies at monthly intervals.

B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. Major equipment at Project site.
5. Material deliveries.
6. Safety, environmental, or industrial relations incidents.
7. Meetings and significant decisions.
8. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
9. Meter readings and similar recordings.
10. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
11. Services connected and disconnected.
12. Testing and/or inspections performed.
13. List of verbal instruction given by Owner and/or Architect.
14. Signature of Contractor's authorized representative.

3.07 PROGRESS PHOTOGRAPHS

A. Submit new photographs at least once a month, within 3 days after being taken.

B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.

C. Photography Type: Digital; electronic files.

D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

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

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

G. Preconstruction Photographs: Before commencement of excavation, take digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Flag excavation areas before taking construction photographs.
   2. Take the appropriate number of photographs to show existing conditions adjacent to property before starting the Work.
   3. Take the appropriate number of photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

H. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   6. Final completion.

I. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
   1. Three days' notice will be given, where feasible.
   2. In emergency situations, take additional photographs within 24 hours of request.

J. Views:
   1. Provide aerial photographs from four cardinal views at each specified time, until structure is enclosed.
   2. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   3. Consult with Architect for instructions on views required.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
   5. Point of View Sketch: Provide sketch identifying point of view of each photograph.

K. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification.
   3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
   4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.08 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.09 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Architect.
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).

6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within fifteen calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.10 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule.
2. Coordinate with Contractor's construction schedule, schedule of values, and other required schedules and reports.
3. Format schedule to allow tracking of status of submittals throughout duration of construction.
4. Arrange in chronological order by dates required by construction schedule.
5. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, role and name of subcontractor, and scheduled date for Architect's final release or approval..
6. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.11 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
   5. Product Schedule or List:.
   6. Submittals Schedule.
   7. Application for Payment.
   8. Schedule of Values.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.

3.12 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Coordination drawings.
   8. Maintenance data.
   9. Other types indicated.

B. Number of Copies: Submit one digital copy of each submittal, unless otherwise indicated

C. Submit for Architect's knowledge as contract administrator or for Owner.

3.13 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.14 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.15 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Transmit using approved form.
      a. Use form generated by Electronic Document Submittal Service software.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Date; Architect; Contractor; subcontractor; supplier; manufacturer; pertinent drawing and detail number; location where product is to be installed; specification section number and title; and submittal number.
   5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, and date of Contractor's approval.
      b. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   6. Deliver each submittal using one of the following delivery methods on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Send submittals in electronic format via email to Architect.
      b. Upload submittals in electronic form to Electronic Document Submittal Service website.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. Provide space for Contractor and Architect review stamps.
   10. When revised for resubmission, identify all changes made since previous submission. Note date and content of previous submittal.
   11. Distribute reviewed submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms. Instruct parties to promptly report inability to comply with requirements.
   12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   13. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Do not submit (Material) Safety Data Sheets for materials or products.
   4. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   5. Mark each copy of each submittal to show which products and options are applicable.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
   4. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Notation of coordination requirements.
j. Notation of dimensions established by field measurement.
k. Relationship to adjoining construction clearly indicated.
l. Seal and signature of professional engineer if specified.
m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

D. Samples Procedures:
1. Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
2. Transmit related items together as single package.
3. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
4. Attach label on unexposed side of Samples that includes the following:
a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected. Architect shall request additional samples if needed.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
a. Number of Samples: Submit one set of Samples. Architect will retain Sample set. Additional sample sets can be requested by Architect.

3.16 SUBMITTAL REVIEW

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

B. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

C. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

D. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

E. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

F. Architect's actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.
      b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
         1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
      c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit".
         1) Resubmit revised item, with review notations acknowledged and incorporated.
      b. "Rejected".
         1) Submit item complying with requirements of Contract Documents.

G. Architect's actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

H. **NOTE: Submittals reviewed by Contractor and Architect, and marked with Action stamp, does not relieve contractor or supplier submitting of responsibility to comply with contract documents.**

END OF SECTION

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SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 10 00 - Summary: Work sequence, occupancy, and owner-furnished items.

1.03 SUBMITTALS

A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule.

B. Submit updated schedule with each Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

E. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

F. Indicate delivery dates for owner-furnished products.

G. Coordinate content with schedule of values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

H. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Final Completion.

F. As the Work progresses, indicate Actual Completion percentage for each activity.

G. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, testing and inspecting agencies, Architect, Owner, and other concerned parties.

B. Issue schedule one week before each regularly scheduled progress meeting. Issue updated schedule concurrently with the report of each such meeting.

C. Post copies in Project meeting rooms and temporary field offices.

D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

E. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Control of installation.

F. Mock-ups.

G. Tolerances.

H. Manufacturers' field services.

I. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 42 16 - Definitions.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2024.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

1.04 SUBMITTALS

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

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.

C. Test Reports: After each test/inspection, promptly submit one digital copy of report to Architect and to Contractor.
   1. Include:

a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Compliance with Contract Documents.
k. When requested by Architect, provide interpretation of results.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing and inspection.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
   4. Laboratory: Authorized to operate in Utah.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

3.03 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Notify Architect and Owner seven (7) working days in advance of dates and times when mock-ups will be constructed.

E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within five (5) working days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

H. Accepted mock-ups shall be a comparison standard for the remaining Work.

I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

J. Where possible salvage and recycle the demolished mock-up materials.

3.04 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.05 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

C. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.06 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.07 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 01 42 16
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

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

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

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

D. Furnish: To supply, deliver, unload, and inspect for damage.

E. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

F. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

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

H. Provide: To furnish and install.

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

J. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dewatering

B. Temporary utilities.

C. Temporary telecommunications services.

D. Temporary sanitary facilities.

E. Temporary Controls: Barriers, enclosures, and fencing.

F. Security requirements.

G. Vehicular access and parking.

H. Waste removal facilities and services.

I. Project identification sign.

J. Field offices.

1.02 RELATED REQUIREMENTS

1.03 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.04 DEWATERING

A. Comply with requirements of authorities having jurisdiction. Provide temporary means and methods for dewatering all temporary facilities and controls.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

B. Maintain temporary facilities as directed by Architect.

1.05 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. Existing facilities may be used.

C. New permanent facilities may be used.

1.06 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:
   1. Telephone Land Lines: One line for each field office; one handset per line.
   2. Internet Connections: Minimum of one; high speed internet connection or faster.
   3. Email: Account/address reserved for project use.

1.07 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.08 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and

demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

E. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

1.09 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

C. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

D. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized steel bases for supporting posts.

1.10 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.11 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.12 TEMPORARY FIRE PROTECTION

A. Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

B. Prohibit smoking.

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

1.13 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.14 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.15 WASTE REMOVAL

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.16 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

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

D. No other signs are allowed without Owner permission except those required by law.

1.17 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures. Provide incombustible construction for offices, shops, and sheds. Comply with NFPA 241.

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to owner.

C. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.

D. Clean and repair damage caused by installation or use of temporary work.

E. Restore existing facilities used during construction to original condition.

F. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Identification of Owner-supplied products.

B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.04 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.05 PRODUCT WARRANTIES

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

B. Warranty in first subparagraph below is manufacturer's standard and may have exclusions and limitations that do not suit Project. Check warranties and specify special warranties if manufacturers' warranties are not suitable.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
    a. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

2. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
    a. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
    b. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
    c. Refer to individual divisions for specific content requirements and particular requirements for submitting special warranties.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Where other criteria are met, Contractor shall give preference to products that:
    1. If used on interior, have lower emissions, as defined in Section 01 61 16.
    2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
    1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
    2. Arrange and pay for product delivery to site.
    3. On delivery, inspect products jointly with Contractor.
    4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
    5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
    1. Review Owner reviewed shop drawings, product data, and samples.

2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions, if any.

J. Do not store products directly on the ground.

K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

L. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

M. Prevent contact with material that may cause corrosion, discoloration, or staining.

N. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

O. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

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SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.

C. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.

D. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

E. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

F. Section 07 84 00 - Firestopping.

1.03 SUBMITTALS

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

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

6. Include in request:
    a. Identification of Project.
    b. Location and description of affected work.
    c. Necessity for cutting or alteration.
    d. Description of proposed work and products to be used.
    e. Effect on work of Owner or separate Contractor.
    f. Written permission of affected separate Contractor.
    g. Date and time work will be executed.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For surveying work, employ a land surveyor registered in Utah and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Utah. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in Utah.

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

J. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

K. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. 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.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.
   4. Controlling lines and levels required for mechanical and electrical trades.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.

1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
2. Remove items indicated on drawings.
3. Relocate items indicated on drawings.
4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
3. 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.
    a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    b. Provide temporary connections as required to maintain existing systems in service.
4. Verify that abandoned services serve only abandoned facilities.
5. 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; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Remove malfunctioning units, replace with new units, and retest.

C. Notify Architect and Owner prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage. Replace damaged and malfunctioning controls and equipment.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and other limited access spaces.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Project Manager on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Owner will occupy all of the building as specified in Section 01 10 00.

F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Accompany Project Manager on Contractor's preliminary final inspection.

I. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

J. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
   6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

G. The following sources may be useful in developing the Waste Management Plan:

H. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

I. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

E. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and

demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

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

B. Submit Waste Management Plan within 30 days of date established for commencement of the Work; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

C. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
      a. List each material proposed to be salvaged, reused, or recycled.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   6. Material Reused on Project: Include the following information for each:
      a. Identification of material and how it was used in the project.
      b. Amount, in tons or cubic yards (cubic meters).
      c. Include weight tickets as evidence of quantity.
   7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 60 00 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 10 00 for list of items to be salvaged from the existing building for relocation in project or for Owner.

B. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.

D. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

E. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
   3. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
   4. Locate enclosures out of the way of construction traffic.
   5. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   6. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
   7. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned within 15 days after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   2. Submit three sets of revised final documents in final form within 15 days of receipt of Architect's comments.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawingsand Shop Drawings: Legibly mark each item to record actual construction including:
1. Field changes of dimension and detail.
2. Details not on original Contract drawings.

3.02 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, flood, gas leak, water leak, power failure, water outage, equipment failure, and chemical release or spill.

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

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

3.03 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.04 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.05 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Manufacturer's name, product name, model number, and serial number.
3. Identify function, normal operating characteristics, and limiting conditions.
4. Include performance curves, with engineering data and tests.
5. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
   1. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Provide control diagrams by controls manufacturer as installed.

J. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

M. Include test and balancing reports.

N. Additional Requirements: As specified in individual product specification sections.

3.06 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Organize a digital copy in the same order and requirements as binder.

K. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.

a. Source data.
b. Product data, shop drawings, and other submittals.
c. Operation and maintenance data.
d. Field quality control data.
e. Photocopies of warranties and bonds.

3.07 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. List circumstances and conditions that would affect validity of warranties or bonds.

F. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.

G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

J. An organized digital copy of the warranties may be submitted along with hard copy binder.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

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

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use. Submit within seven days of end of each training module.
   1. Format: DVD Disc.

2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Schedule training with Owner, through Architect, with at least seven days' advance notice. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. For equipment that requires seasonal operation, provide similar instruction at start of each season.

F. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

G. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.

5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

H. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

I. Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

J. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

END OF SECTION

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SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 SUBMITTALS

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

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.
   2. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.

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

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-Demolition Conference: Conduct conference at Project site to comply with preinstallation conference requirements of Division 1 Section “Project Meetings.”

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 70 00.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. 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.
   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 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.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.

F. Protect existing structures and other elements that are not to be 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.

G. 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.

H. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury. Owner will remove hazardous materials under a separate contract.

I. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Comply with requirements of Section 01 74 19 - Waste Management.
   2. Dismantle existing construction and separate materials.
   3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

J. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that 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 other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

3.05 ASBESTOS

A. Asbestos Report, Inspection, Assessment, and Abatement by Owner.

B. If any asbestos is discovered by any contractor, the Owner and Architect are to be notified immediately.

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Miscellaneous framing and sheathing.

B. Concealed wood blocking, nailers, and supports.

C. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.

E. PS 1 - Structural Plywood; 2009.

F. PS 20 - American Softwood Lumber Standard; 2015.

1.03 SUBMITTALS

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

B. Product Data: Provide technical data on application instructions and fire retardant treatment information.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
   1. Miscellaneous lumber.

1.05 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

2.01 GENERAL REQUIREMENTS

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

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: Kiln-dry or MC15.

C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

PART 3 EXECUTION

3.01 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.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

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. Provide the following specific non-structural framing and blocking:
   1. Marker boards.
   2. TV display monitors.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

E. PS 1 - Structural Plywood; 2009.

F. WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork; 2015a.

1.03 SUBMITTALS

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

B. Product Data:
   1. Provide data on fire retardant treatment materials and application instructions.

C. Samples: Submit two samples of finish plywood illustrating wood grain and specified finish.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Riff-sawn, clear, kiln-dried oak selected for compatible grain and color.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 SHEET MATERIALS

A. Softwood Plywood: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.04 FASTENINGS

A. Fasteners: Of size and type to suit application indicated to provide secure attachment, conceal where possible.
   1. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
   2. Caulk all joints and edges where necessary for smooth transition at trim.

2.05 ACCESSORIES

A. Wood Filler: Solvent base, tinted to match surface finish color.

2.06 WOOD TREATMENT

A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

B. Water Repellent Preservative Treatment by Dipping Method: WDMA I.S. 4, with 0.25 percent retainage.

C. Provide identification on fire retardant treated material.

2.07 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 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 (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 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.
   1. Scale of Drawings: Show location of each item, dimensioned plans, and elevations, large scale details, attachment devices, and other components.

C. Product Data: Provide data for hardware accessories.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five 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.

B. Quality Certification:
   1. Provide designated labels on shop drawings as required by certification program.
   2. Provide designated labels on installed products as required by certification program.
   3. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   4. Replace, repair, or rework all work for which certification is refused.

1.06 MOCK-UP

A. If manufacturer is **not** on the approved manufacturer's list below (2.01), provide mock-up of typical base cabinet and countertop, including hardware and finishes for approval of Architect.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Granite Mill.

B. Johnson Brothers Mill.

C. Huetter Mill.

D. Artistic Mill.

E. Clients Design.

F. Mapleleaf Cabinets.

G. Substitutions: See Section 01 60 00 - Product Requirements.

H. Single Source Responsibility: Provide and install this work from single fabricator.

2.02 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   3. Finish - Semi-Exposed Surfaces: Decorative laminate.
   4. Finish - Concealed Surfaces: Manufacturer's option.
   5. Door and Drawer Front Edge Profiles: Square edge with thick applied band, exterior edges are to be heavy duty 3 mm PVC edge banding. Color to be selected by Architect.
   6. Casework Construction Type: Type A - Frameless.
   7. Wood Products: Comply with the following:
      a. Hardboard: AHA A 135.4.
      b. Medium-Density Fiberboard; ANSI A208.2, Grade **MD - Exterior Glue.**
      c. Softwood Plywood: DOC PS 1, **Medium Density Overlay**
   8. Cores: Sides, tops, bottoms, shelves, doors, drawer fronts, Plywood cores only with surface of thermally fused, polyester decorative surfacing - Velvet finish where semi-exposed, plastic laminate where exposed. **Particle board cores are not acceptable.**
      a. Multi-Core Panel Products
         1) States Industries "Armorcore"
         2) True North "Multi-Core"
   9. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
   10. Grained Face Layout for Cabinet and Door Fronts: Style and Rail, all Grades.
      a. Drawer fronts run grain either vertically or horizontally at the manufacturer's option.
      b. Doors: Vertical grain.
   11. Cabinet Design Series: As indicated on drawings.
   12. Cabinet Style: Reveal overlay.

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.04 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com/#sle.
   2. Panolam Industries International, Inc; Nevamar; Pionite: www.nevamar.com/#sle.
   3. Wilsonart LLC: www.wilsonart.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. Color selected by Architect

D. Provide specific types as indicated.
   1. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, (CL 20), through color, color as selected, finish as selected.

2.05 COUNTERTOPS

A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.

2.07 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

C. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

D. Drawer and Door Pulls: "U" shaped wire pull, aluminum with satin finish, 4 inch centers ("U" shaped wire pull, aluminum with satin finish, 100 mm centers).

E. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.
   1. Product: M20071L manufactured by National Lock.
   2. Or approved equal.
   3. Install in cabinets where indicated on drawings. All locks shall be installed in a hole shaped the same shape as the cylinder of the lock to eliminate rotation. Round lock cylinders installed in round holes will not be allowed. Each room to have its own cabinet keying (all cabinets in each room to be keyed alike). Millwork contractor to provide key schedule with all cabinet locks identified.

F. Catches: Magnetic, not to exceed 7 pound pull.

G. Drawer Slides:
   1. Type: KV1284 or equal, roller bearing, Full extension.
   2. Static Load Capacity: Heavy Duty grade, 100 lbs rated.
   3. Mounting: Bottom mounted.
   4. Stops: Positive type.
   5. Features: Provide self closing/stay closed type.

H. File Drawer Slides: (All file drawers and drawers over 30 inches in width)
   1. Type: Hettich/Grant 5632 or equal, roller bearing, Full extension.
   2. Static Load Capacity: Heavy Duty grade, 100 lbs rated.
   3. Mounting: Bottom mounted.
   4. Stops: Positive type.
   5. Features: Provide self closing/stay closed type.

I. Hinges
   1. Commercial Hinge: Dull chrome or black color 2-3/4" fixed pin, five knuckle, 270 degree swing, hospital type. RPC #B854, no known equal. Provide three hinges on all doors over 48" high and four hinges on all doors over 84" high.
   2. European style concealed self-closing type (use in administration and media cabinets).

2.08 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 specified edging. 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. Doors: Minimum 0.745" thick. Provide magnetic catch when hinges are not provided with a built-in closer. Provide two catches on doors over 48" high.

E. Drawers: Fabricate drawer fronts same as doors. Side shall be 1/2" and subfronts and back shall be 3/4" thick. Drawers shall be dowel construction, assembled true and square within a clamp and shall be provided with 8mm hardwood fluted dowels at a minimum of 1-1/4" o.c. at each joint. Provide all drawers with 1/4" hardboard bottoms housed into sides, subfront and back and glue entire perimeter with hotmelt adhesive. Provide 1/2" thick drawer bottoms for drawers over 30" wide. Also provide a 1/2" x 2 -1/2" reinforcing strip on underside of bottom, at center, on all drawers exceeding 30" wide. Drawers shall be mounted with positive "IN" and "OUT" stops to provide permanent alignment and quiet operation. Drawer fronts that impact cabinet body will not be allowed.

F. File Drawers: Fabricate same as drawers, only equip with full extension drawer slides, and provide support rails to support Owner provided pendaflex file folders. For drawers over 30" in width the drawer bottom panels need to be 1/2" thick.

G. Cabinets: Ends, tops, bottoms, dividers, partitions, fixed shelves, and other components not specified otherwise shall be minimum 0.745" thick.

H. Adjustable Cabinet Shelves: Provide 3/4" thick adjustable shelves except provide 1" thick shelves when shelf span exceeds 30-1/2". No shelves are to be provided over 48" long. All shelves shall be adjustable on minimum of 1-1/4".

I. Small Cubicle Shelves and Partitions: 1/4" hardboard of natural color smooth two sides, with front edges sanded.

J. Finished Backs: High-pressure decorative laminate exterior applied with cabinet liner interior. Minimum 0.745" thick.

K. Scribes and Fillers: Shall be 0.745" thick finished in decorative laminate on plywood core to match colors of adjacent cabinets.

L. Adjustable Wall Shelving: Shall be plywood, finished both surfaces with high pressure laminate, minimum 0.745" thick. Edgeband all four edges. Support wall shelves with brackets at spacing not to exceed 32" o.c., unless shown otherwise.

M. Adjustable Wall Shelving (Storage Areas): Shall be plywood, finished both surfaces with low pressure laminate, minimum 0.745" thick. Edgeband all four edges. Support wall shelves with brackets at spacing not to exceed 32" o.c., unless shown otherwise.

N. Prefinished Fixed Casework:
   1. Laminating: All laminating and fabrication shall be performed in a heated and humidity conditioned environment to prevent shrinkage, warpage, and delaminations.
   2. All parts shall be accurately machined and fit for square and true cases. Case joints shall be doweled with a minimum of six 10mm hardwood fluted dowels per 24" deep cabinet joint, and shall be glued and clamped. All backs shall be dadoed into cabinet ends and furnished with 2-1/2" plywood rails at the top and bottom the full width of cabinet, concealed behind back. Rails are to be provided at a maximum spacing of 42" o.c.
   3. Toe kicks shall be notched to form toe kick at 4" high. End panels to extend to the floor for maximum strength and to provide protection during shipping. The front kick board shall be of 3/4" thick plywood.
   4. All base units to have a 3/4" thick solid subtop, except for sink cabinets. Subtops in open cabinets shall be finished in semi-exposed material.
   5. All sink cabinets to be provided with removable backs.
   6. All edges on underside of wall hung cabinets shall be edge banded.

O. Countertops: Furnish all countertops in decorative high pressure laminate, 1" thick, with 4" high backsplashes where appropriate. Provide 1" overhand at edges, unless otherwise noted. Provide 1" radii corners at all countertop outside corners at cabinet ends. Round all countertop corner ends as directed by Architect.

P. Decorative Laminate Countertops - Butt Splash 3mm Edge Banded: All decorative laminate will be high pressure, equal to or exceed in NEMA Standards for horizontal work surfaces general purpose (.050" thick). Provide 1" particleboard substrate with a minimum weight of 45 lbs. per cubic foot, with .020" thick backing sheet applied to un-exposed sides of decks and splashes. Butt style backsplashes shall be field installed using water resistant acrylic latex adhesive. All exposed edges shall be edged with 3mm PVC edge banding applied under heat and pressure. All corners of edging to be radiused 1/8" and buffed smooth. Color shall be as selected by Architect from manufacturer's premium selection of colors.
   1. Unless otherwise indicated, all countertops shall be furnished 3/4" thick with 4" high backsplashes.
   2. Tops shall be furnished in longest possible lengths. Field joints are factory prepared with tight joint drawer bolts. Joints, where practical, shall occur no closer than 12" to any sink or knee space. Joints shall be field installed using acrylic latex sealant. All joints and cut-outs shall be sealed with a water sealant prior to installation.
   3. Countertops to be scribe fit to surrounding surfaces in neat and professional manner. All edges and corners shall be smoothly filed without presence of file marks.

Q. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
   1. Provide center matched panels at each elevation.

R. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches (400 mm) on center.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are 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.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.

F. Secure cabinets 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. Site glaze glass materials using the Interior Dry method specified in Section 08 80 00.

I. Installation of Countertops:
   1. Countertops shall be installed in as long of lengths possible. Unless impractical, no joints shall be closer than 12" to any sink or above unsupported kneespaces. Joints in plastic laminate countertops shall be factory prepared for joining using concealed clamping devices, located within 6" of front, at back edges and at intervals not exceeding 12". Joints shall be sealed and glued with polyseamseal caulking compound with clamping devices tightened to exert a constant, heavy clamping pressure and to provide flush hairline joints.

2. Countertops shall be adequately screwed to the cabinets or other supports at a minimum of 36" o.c. at front and at rear. Top mounted splashes shall be attached to countertops with polyseamseal caulking compound and #10 x1 3/4 sheet metal screws at 12" o.c. minimum.
3. Cut-outs in countertops for sinks and appliances shall be provided with radiused inside corners to resist cracking. Cut-outs shall be sealed against moisture penetration with "Thompson's Water Sealer" or equal.
4. RAD11 countertop corners where indicated on drawings.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware - To match existing. See plans for hardware group.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.

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; 2018a.

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

J. ITS (DIR) - Directory of Listed Products; current edition.

K. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

L. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

N. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

O. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

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

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

1.04 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 standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

1.05 QUALITY ASSURANCE

A. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

C. Inspect frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

D. Store frames at building site under cover. Place units on minimum 4-inches (100-mm) high wood blocking. Avoid use of non-vented plastic or canvas shelters. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Frames:
   1. Architectural Building Supply.
   2. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
   4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   5. Robert I. Merrill Company.
   6. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed 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.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. 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 door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Interior Door Frames, Non-Fire Rated: Face welded type.
   1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.

2.04 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.

2.05 ACCESSORIES

A. Glazing Stops: Minimum 0.04-inch (1.0-mm) steel or 0.040-inch (1.0-mm) thick aluminum.
   1. Provide non-removable stops on secure side of interior doors for glass, louvers, and other panels in doors.
   2. Provide screw applied removable glazing beads on inside of glass, louvers, and other panels in doors.

B. Silencers: Resilient rubber, {CH#47531}; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry tee anchors.

D. At existing concrete or masonry construction, provide 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb, set frames and secure to adjacent construction with bolts and masonry anchorage devices.

E. Install door hardware to match existing. See plans for door hardware group.

F. Touch up damaged factory finishes.

3.02 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 (1.6 mm) measured with straight edge, corner to corner.

3.03 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.04 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

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 08 11 13 - Hollow Metal Doors and Frames.

C. Section 08 71 00 - Door Hardware - Match existing. See drawings for hardware groups.

D. Section 09 91 23 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

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

E. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 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, 3 in by 5 in size illustrating wood grain, stain color, and sheen.

E. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the 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 in this section, with not less than three years of documented experience.

1.06 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.

1.07 WARRANTY

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

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Oshkosh Door.
   2. VT Industries Inc.
   3. Weyerhaeuser Company.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches (44 mm) 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.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), 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.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Red oak, HPVA Grade A, plain sliced (flat cut), with book match between leaves of veneer, center balance match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges(Hardwood Edge - NOT VENEER): Same species as face veneer.
   2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet (3 m) of each other when doors are closed.

2.05 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 for hardware reinforcement - 1 1/2 inch minimum hardwood at both sides of door.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 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-6, Catalyzed Polyurethane.
      b. Stain: As selected by Architect.
      c. Sheen: Semigloss.

B. Factory finish doors in accordance with approved sample.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Door Hardware: See drawings.

PART 3 EXECUTION

3.01 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.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.
   1. Adjust width of non-rated doors by cutting equally on both jamb edges.
   2. Trim maximum of 3/4 inch (19 mm) off bottom edges.
   3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

3.02 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.03 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 08 14 00

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SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Acoustic insulation.

D. Cementitious backing board.

E. Gypsum wallboard.

F. Joint treatment and accessories.

G. Textured finish system.

1.02 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2018.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019b.

H. 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; 2018.

I. 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; 2018.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

K. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2019.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

N. ASTM E413 - Classification for Rating Sound Insulation; 2016.

O. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.03 SUBMITTALS

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

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches (300 by 300 mm) in size, illustrating finish color and texture.

1.04 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 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 complying with ASTM E 119.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum; Firestop Type C: www.gpgypsum.com/#sle.
   4. National Gypsum Company; Fire-shield G: www.nationalgypsum.com/#sle.
   5. PABCO Gypsum: www.pabcogypsum.com/#sle.
   6. USG Corporation: www.usg.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

B. 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. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).

C. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind thinset tile, except in wet areas.
   2. Type: Type X, in locations indicated.
   3. Type X Thickness: 5/8 inch (16 mm).
   4. Edges: Tapered.
   5. Products:
      a. American Gypsum Company; M-Bloc Type X.
      b. Georgia-Pacific Gypsum; DensArmor Plus.
      c. National Gypsum Company; Gold Bond XP Gypsum Board.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: _____ inch (_____ mm).

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rigid plastic, 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, L-bead, and LC-bead at exposed panel edges.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
   2. Chemical hardening type compound.

E. Textured Finish Materials: Latex-based compound; plain.
   1. Products:

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

3.03 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.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

C. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as approved by Architect for visual effect.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materialsand as indicated.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. 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 (0.8 mm).

C. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

END OF SECTION

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SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2018.

C. 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; 2018.

1.03 SUBMITTALS

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

B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

1.04 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich; _____: www.clarkdietrich.com/#sle.
   2. SCAFCO Corporation; _____: www.scafco.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; 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 (L/240 at 240 Pa).
   1. Studs: C shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.

B. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.

C. Fasteners: ASTM C1002 self-piercing tapping screws.

D. Sheet Metal Backing: 0.036 inch (0.9 mm) thick, galvanized.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Comply with requirements of ASTM C754.

B. Extend partition framing to structure where indicated and to ceiling in other locations.

C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

D. Align and secure top and bottom runners at 24 inches (600 mm) on center.

E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

F. Align stud web openings horizontally.

G. Secure studs to tracks using crimping method. Do not weld.

H. Fabricate corners using a minimum of three studs.

I. Install double studs at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.

J. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

3.03 CEILING AND SOFFIT FRAMING

A. Comply with requirements of ASTM C754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns, and above-ceiling work.

D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inch (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.

H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches (600 mm) past each opening.

I. Laterally brace suspension system.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

E. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

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

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two full size samples illustrating material and finish of acoustical units.

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 Acoustical Units: Full size panels. Quantity equal to 2 percent of total installed.

1.04 QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by {\rs\#1} for the fire resistance indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. USG Corporation: www.usg.com/ceilings/#sle.
   4. Rockfon.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Rockfon, LLC: www.rockfon.com/#sle.
   4. USG Corporation: www.usg.com/ceilings/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.
   1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.

B. Acoustical Panels, Type 1: Painted mineral fiber, with the following characteristics:

1. Classification: ASTM E1264 Type III.
2. Size: 24 by 48 inch (610 by 1219 mm).
3. Thickness: 5/8 inches (16 mm).
4. Light Reflectance: LR 1 (Over 75%) percent, determined in accordance with ASTM E1264.
5. NRC Range: 0.50 to 0.60, determined in accordance with ASTM E1264.
6. Panel Edge: Square.
7. Color: White.
8. Suspension System: Exposed grid.
9. Products:
    a. Fine Fissured Pattern: CertainTeed "School Board"..
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

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. Aluminum Grid: Aluminum sheet, ASTM B209/B209M.

B. Exposed Suspension System: Hot-dipped galvanized steel grid and cap.
    1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
    2. Profile: Tee; 15/16 inch (24 mm) face width.
    3. Finish: Baked enamel.
    4. Color: White.

2.04 ACCESSORIES

A. Support Channels and Hangers: Primed steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
    1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
    2. At Concealed Grid: Provide exposed L-shaped molding.

D. Gypsum Board: Fire rated type; 5/8 inch (16 mm) thick, ends and edges square, paper faced.

E. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
    1. Products:
        a. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M 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. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
    1. Use longest practical lengths.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. 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.

G. 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.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

L. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch (25 mm) movement. Maintain visual closure.

M. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

3.02 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. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

G. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

3.03 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

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SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 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. 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.

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. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

C. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 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.

C. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on aluminum sheet, ____x____ inch (____x____ mm) in size.

D. 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: Furnish an additional 5 percent, but not less than 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified approved by manufacturer.

B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.05 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 10 feet (____ m) long by 10 feet (____ m) wide, illustrating paint color, texture, and finish.

C. Locate where directed by Architect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Paints:
   1. Base Manufacturer: Devoe..
   2. Fuller O'Brien.
   3. Benjamin Moore and Co.
   4. Pittsburgh Paints: www.ppgpaints.com/#sle.
   5. Kwal-Howells.
   6. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, and aluminum.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
   3. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
   4. Top Coat(s): Interior Latex; MPI #43, 44, 52, 53, 54, or 114.
   5. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
      b. Velvet: MPI gloss level 2; use this sheen at all locations.
      c. Eggshell: MPI gloss level 3; use this sheen at all locations.
      d. Satin: MPI gloss level 4; use this sheen for items subject to frequent touching by occupants, including door frames and railings.
      e. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
      f. Gloss: MPI gloss level 6; use this sheen at all locations.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior/Exterior Latex Block Filler; MPI #4.
   2. Interior Latex Primer Sealer; MPI #50.
   3. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
   4. Interior Rust-Inhibitive Water Based Primer; MPI #107.
   5. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
   6. Interior Water Based Primer for Galvanized Metal; MPI #134.
   7. Interior/Exterior Quick Dry Primer for Aluminum; MPI #95.

PART 3 EXECUTION

3.01 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 mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Masonry:

F. 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.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

3.02 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. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

END OF SECTION

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SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2016.

B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's data on markerboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Samples: Submit color charts for selection of color and texture of markerboard and trim.

E. Test Reports: Show compliance to specified surface burning characteristics requirements.

F. Maintenance Data: Include data on regular cleaning and stain removal.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site.

1.06 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.07 WARRANTY

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

B. Provide manufacturer's standard warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ADP Lemco, Inc: www.adplemco.com/#sle.

B. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.

C. MooreCo, Inc: www.moorecoinc.com/#sle.

D. Polyvision Corporation: www.polyvision.com/#sle.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Color: White.

2. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch (0.61 mm).
3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
4. Backing: Aluminum foil, laminated to core.
5. Size: 4'-0" by 6'-0".
6. Frame: Extruded aluminum , with concealed fasteners.
7. Frame Profile: As indicated on drawings.
8. Frame Finish: Anodized, natural.
9. Accessories: Provide chalk tray and map rail.

2.03 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Vinyl-Coated Fabric: ASTM F793 Category VI.

C. Foil Backing: Aluminum foil sheet, 0.005 inch thick (0.13 mm thick).

D. Adhesives: Type used by manufacturer.

2.04 ACCESSORIES

A. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.

B. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

3.02 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 26 0500

ELECTRICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full.

1.2 DESCRIPTION OF WORK:

A. The extent of electrical work is indicated on drawings and/or specified in Divisions 26, 27 and 28 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete electrical system. Work includes, but is not necessarily limited to, the following items.

	ITEM	SECTION
1.	Electrical General Provisions	26 0500
2.	Electrical Submittals O & M Manuals and Spare Parts	26 0502
3.	Electrical Connections for Equipment	26 0507
4.	Conductors and Cables	26 0519
5.	Grounding	26 0526
6.	Supporting Devices	26 0529
7.	Conduit Raceway	26 0532
8.	Electrical Boxes and Fittings	26 0533
9.	Electrical Identification	26 0553
10.	Lighting Control Equipment	26 0943
11.	Wiring Devices	26 2726
12.	Overcurrent Protective Devices	26 2815
13.	Demolition	26 4119
14.	Interior and Exterior Building Lighting	26 5100
15.	CSD – Network Cabling Global Specification	27 1500
16.	Intercommunication Systems	27 5123
17.	Fire Alarm and Detection System	28 3111

B. Use of standard industry symbols together with the special symbols, notes, and instructions indicated on the drawings describe the work, materials, apparatus and systems required as a portion of this work.

C. Visit the site during the bidding period to determine existing conditions affecting electrical and other work. All costs arising from site conditions and/or preparation shall be included in the base bid. No additional charges will be allowed due to inadequate site inspection.

1.3 DEFINITION OF TERMS:

A. The following terms used in Divisions 26, 27 and 28 documents are defined as follows:

1. "Provide": Means furnish, install and connect, unless otherwise indicated.
2. "Furnish": Means purchase and deliver to project site.
3. "Install": Means to physically install the items in-place.
4. "Connect": Means make final electrical connections for a complete operating piece of equipment.

1.4 RELATED SECTIONS:

A. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

B. General and Supplementary Conditions: Drawings and general provisions of contract and Division 1 of the Specifications, apply to all Division 26, 27 and 28 sections.

C. Earthwork:

1. Provide trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, buried cable, in-grade pull boxes, manholes, lighting pole foundations, etc. See Division 31, Sitework, and other portions of Divisions 26, 27 and 28, for material and installation requirements.

D. Miscellaneous Metal Work:

1. Provide fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor controls centers, etc. See Division 5, Metals for material and installation requirements.

E. Miscellaneous Lumber and Framing Work:

1. Provide wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment. See Division 6, Rough Carpentry for material and installation requirements.

F. Moisture Protection:

1. Provide membrane clamps, sheet metal flashing, counter flashing, caulking and sealants as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors and ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vapor tight. See Division 7, Thermal and Moisture Protection for material and installation requirements.

G. Access panels and doors:

1. Provide in walls, ceiling, and floors for access to electrical devices and equipment. See Division 8, Doors and Windows for material and installation requirements.

H. Painting:

1. Provide surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, poles, surface metal raceways, etc. See Division 9, Finishes for material and installation requirements.

1.5 WORK FURNISHED AND INSTALLED UNDER ANOTHER SECTION REQUIRING CONNECTIONS UNDER THIS SECTION:

A. Provide electrical service, make requisite connections and perform operational test. Items furnished and installed under other sections and connected under this section, include but are not limited to the following:

1. Electric motors.

2. Package mechanical equipment: fans, fan coil units, pumps, boilers, duplex compressors, etc.
3. Motorized dampers.
4. Fire and smoke dampers
5. Duct mounted smoke detectors.
6. Electric hardware.
7. Systems/Open Office Furniture.
8. Electric Chain Hoist.
9. Solatubes.

1.6 ITEMS FURNISHED UNDER ANOTHER DIVISION, BUT INSTALLED AND CONNECTED UNDER THIS DIVISION:

A. Items furnished under other Divisions, but turned over to Division 26 for installation and final connection include, but are not necessarily limited to, the following:

1. Wall mounted control stations for motorized roll-up doors/grills.
2. Wall mounted control stations for motorized projection screens.
3. Wall mounted control stations for electric chain hoist repair lift.

1.7 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:

A. Before bidding, Contractor shall familiarize himself with the drawings, specifications and project site. Submit requests for clarification to Architect/Engineer in writing prior to issuance of final addendum. After signing the contract, the Contractor shall meet the intent, purpose, and function of the Contract Documents. Any costs of materials, labor and equipment arising therefrom, to make each system complete and operable, is the responsibility of the Contractor.

1.8 REQUESTS FOR INFORMATION (RFIs):

A. Contractor shall review all Contract Documents thoroughly before submitting an RFI to avoid unnecessary questions and ensure the question has not already been addressed within the existing Contract Documents.

B. RFIs should be used to seek clarification on issues or areas of confusion that cannot be resolved through a review of the Contract Documents.

C. Each RFI shall contain the following:

1. Description of the Issue/Question: Clearly detail the issue or confusion, referencing the related Contract Document drawings and/or specifications.
2. Relevant Documents: Attach any necessary supporting documents that could aid in understanding the RFI.
3. Proposed Solution: Suggest a possible resolution to the problem or confusion.

D. Non-Compliant RFIs

1. Frivolous or incomplete RFIs will not be accepted. RFIs that do not follow the guidelines set forth in this section, or are deemed unnecessary, may be returned without response at the discretion of the Engineer.

1.9 QUALITY ASSURANCE:

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies refers to the latest edition of such publications adopted and published prior to submittal of the bid proposed, unless noted otherwise herein. Such codes or standards are considered a part of this specification as though fully repeated herein.

B. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the Drawings and Specifications. Perform work in accordance with applicable requirements of all governing codes, rules and regulations including the following minimum standards, whether statutory or not:

1. National Electric Code (NEC).
2. International Building Code (IBC).
3. International Fire Code (IFC).
4. International Mechanical Code (IMC).

C. Standards: Comply with the following standards where applicable for equipment and materials specified under this Division.

1.	UL	Underwriters' Laboratories
2.	ASTM	American Society for Testing Materials
3.	CBN	Certified Ballast Manufacturers
4.	IPCEA	Insulated Power Cable Engineers Association
5.	NEMA	National Electrical Manufacturer's Association
6.	ANSI	American National Standards Institute
7.	ETL	Electrical Testing Laboratories

D. All electrical apparatus furnished under this Section shall conform to (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.

E. Comply with requirements of State and Local Ordinances. If a conflict occurs between these requirements and the Contract Documents, the most stringent requirements shall govern. The Contractor accepts this responsibility upon submitting his bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the Contractor from complying with any requirements of the Contract Documents that may be in excess of the aforementioned requirements, and not contrary to same.

F. Obtain all permits, inspections, etc. required by authority having jurisdiction. Include all fees in bid. Furnish a certificate of approval to the Owner's Representative from the Inspection Authority at completion of the work.

G. Employ only qualified craftsmen with at least three years of experience. Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices. Provide a competent superintendent to direct the work at all times. Any person found incompetent shall be discharged from the project and replaced by satisfactory personnel.

H. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.

I. Required Pre-Electrical Construction Meeting with Electrical Engineer: Electrical contractor/representative will be required to attend a pre-electrical construction meeting (approximately 30-60 minutes) with engineering representative in the electrical engineers office prior to electrical construction commencement. This meeting will

address any questions on the part of the contractor and the expectations of the Engineer with regard to specifications, plans and site visits for both rough and finish electrical work.

1.10 CONSTRUCTION CHANGE ORDER PROPOSALS

A. In the event that a submission of a change order is issued by the contractor, the following information will be required to be submitted by the contractor, prior to any consideration by the owner/architect.
   a. Where project manager or project engineer work is required, the labor cost shall not exceed 2% of the electrical portion of the change order.
   b. All equipment, including conduit and wire, shall be itemized, identifying unit costs and quantities of equipment. Distributor quotes shall accompany all change order requests. The distributor quotes shall include costs for all equipment including conduit and wire. Lot pricing for equipment is not acceptable.
   c. The general contractor shall review and confirm that the quantity and costs of materials submitted appear reasonable for the scope proposed.
   d. Labor units shall not exceed base NECA #1 standards. No adjustment factors shall be approved.
   e. Any research and labeling time, shall be the responsibility of the electrical contractor and shall not be included in the change order request.
   f. Any costs associated with the purchase of tools or transportation shall be fully itemized for review by architect/owner.
   g. Overtime rates shall only be approved where additional manpower cannot achieve the same result.
   h. Change order form shall follow the following format:
      i. PCO number
      ii. Detailed description of work being performed
      iii. Location on project where work is performed
      iv. Chosen NECA column
      v. Identified material:
         1. QTY
         2. Unit cost
         3. Mark up
         4. Material total
      vi. Identified labor:
         1. QTY
         2. Unit cost
         3. Composite labor rate
         4. Labor total

1.11 RECORD DRAWINGS:

A. Maintain, on a daily basis, a complete set of “Record Drawings”, reflecting an accurate record of work in accordance with the following:

1. Show the complete routing and location of all feeders rated 100 amps and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.)
2. Show the complete routing and location of all telecommunications conduits, systems raceways, and empty raceways, 1-1/4" and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.).

3. Show all changes, deviations, addendum items, change orders, job instructions, etc., that change the work from that shown on the contract documents, including wall relocations, fixtures and device changes, branch circuiting changes, etc. Where locations of boxes, raceways, equipment, etc. are adjusted in the field to fit conditions, but such new locations may not be obvious by referring to the contract document, show new locations on the record drawings.

B. At the discretion of the Architect/Engineer, the drawings will be reviewed on a periodic basis and used as a pre-requisite for progress payments. This requirement shall not be construed as authorization for the Contractor to make changes in the layout, or work without written authorization for such changes. The “Record Drawings” for daily recording shall consist of a set of blue line prints of the Contract Drawings.

C. Upon completion of the work, purchase a complete set of electronic drawings. Transfer all “Record” information from the blue line prints to the drawings via the current CAD program that it was written. The Architect/Engineer shall review the drawings and the Contractor shall incorporate the resulting comments into the final record drawings. The Contractor shall make two complete copies of the drawings electronically and forward this to the Engineer.

D. Certify the “Record Drawings” for correctness by placing and signing the following certifications of the first sheet of the drawings:

"CERTIFIED CORRECT (3/8" high letters)

(Name of General Contractor)

By: _____ Date: _____

(Name of Electrical Contractor)

By: _____ Date: _____

1.12 GUARANTEE:

A. Ensure that electrical system installed under this contract is in proper working order and in compliance with drawings, specifications, and/or authorized changes. Without additional charge, replace any work or materials that develop defect, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.

1.13 OTHER:

A. Right to Hire. “Client” agrees that during the project and for a period of twenty four (24) months following substantial completion that it will not, directly or indirectly, employ or solicit to employ BNA Personnel.

PART 2 – PRODUCTS

2.1 GENERAL:

A. Products are specified by manufacturer name, description, and/or catalog number. Discrepancies between equipment specified and the intended function of equipment shall be brought to the attention of the Architect/Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents nor shall it change the contract cost. If the Contractor is unable to interpret any part of the

plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Architect/Engineer who will issue interpretation and/or additional instructions to Bidders before the project is bid.

2.2 MANUFACTURERS:

A. Provide products of manufacturers specified. Manufacturers catalog numbers and descriptions establish the quality of product required. Substitutions will be considered if a duplicate written application (2-copies) is at the office of the Architect/Engineer eight (8) working days prior to the day of the bidding. The application shall include the following: 1) A statement certifying that the equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible dimensions, and meets the functional intent of the contract documents; 2) The specified and submittal catalog numbers of the equipment under consideration; 3) A pictorial and specification brochure.

B. Any conflict arising from the use of substituted equipment shall be the responsibility of the Contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents.

C. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.

D. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued.

E. Provide only equipment specified in the Contract Documents or approved by addendum.

2.3 SPARE PARTS:

A. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Transmit all spare parts to Owner's Representative prior to substantial completion.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Layout electrical work in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary for proper installation; perform with care. Use skilled mechanics of the trades involved. Repair damage to building and equipment at no additional cost to the contract. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting structural members shall not be permitted.

B. Since the drawings of floor, wall, and ceiling installation are made at small scale; outlets, devices, equipment, etc., are indicated only in their approximate location unless dimensioned. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned, and coordinate such locations with work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings, but refer to the architectural and mechanical shop drawings and project drawings for dimensions as applicable.

C. Perform for other trades, the electrical wiring and connection for all devices, equipment or apparatus. Consult Architectural, Mechanical, and other applicable drawings, and all applicable shop drawings to avoid switches, outlets, and other equipment from being hidden behind doors, cabinets, counters, heating equipment, etc., or from being located in chalkboards, tackboards, glass panels, etc. Relocate buried electrical devices and/or connections as directed at no additional cost.

D. Coordinate the location of outlets, devices, connections, and equipment with the supplier

of the systems furniture prior to rough-in.

E. Where conduit, outlets or apparatus are to be encased in concrete, it must be located and secured by a journeyman or foreman present at the point of installation. Check locations of the electrical items before and after concrete and/or masonry installation and relocate displaced items.

F. Provide block-outs, sleeves, demolition work, etc., required for installation of work specified in this division.

3.2 CLEAN:

A. Clean up all equipment, conduit, fittings, packing cartons and other debris that is a direct result of the installation of the work of this Division.

B. Clean fixtures, interiors and exteriors of all equipment, and raceways. Replace all filters in electrical equipment upon request for Substantial Completion.

3.3 POWER OUTAGES:

A. All power outages required for execution of this work shall occur during non-standard working hours and at the convenience of the Owner. Include all costs for overtime work in bid.

B. Submit written request at least 7 days in advance of scheduled outage and proceed with outage only after receiving authorization from the Owner's Representative.

C. Keep all outages to an absolute minimum.

3.4 STORAGE AND PROTECTION OF MATERIALS:

A. Provide storage space for storage of materials and apparatus and assume complete responsibility for all losses due to any cause whatsoever. In no case shall storage interfere with traffic conditions in any public thoroughfare or constitute a hazard to persons in the vicinity. Protect completed work, work underway, and apparatus against loss or damage.

3.5 EXCAVATING FOR ELECTRICAL WORK:

A. General: Locate and protect existing utilities and other underground work in manner that will ensure that no damage or service interruption will result from excavating and backfilling. Perform excavation in a manner that protects walls, footings, and other structural members from being disturbed or damaged in any way. Burial depths must comply with NEC Section 300-5 (or State of Utah requirement, whichever is more stringent), unless noted otherwise on drawings.

B. Protect persons from injury at excavations, by barricades, warnings and illumination.

C. Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.

D. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install electrical work on frozen excavation bases or sub-bases.

E. Do not excavate for electrical work until the work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimum. See other sections of specification for additional requirements for excavating.

F. Store excavated material (temporarily) near excavation, in a manner that will not interfere with or damage excavation or other work. Do not store under trees (within drip line).

G. Retain excavated material that

3.6 BACKFILL MATERIALS:

A. For buried conduit or cable (other than below slab-on-grade, or concrete encased) - 2" thickness of well graded sand on all side of conduit or cable.

B. For trench backfill to within 6" of final grade - soil material suitable for compacting to required densities.

C. For top 6" of excavation - Top soil.

D. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM D 1557), using power-driven hand-operated compaction equipment.

1. Lawn/Landscaped Areas: 85 percent for cohesive soils, 95 percent for cohesionless soils.
2. Paved Areas, Other than Roadways (90 percent for cohesive soils, 95 percent for cohesionless soils).

E. Subsidence: Where subsidence is measurable or observable at electrical work excavations during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of the surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.7 ROOF PENETRATIONS:

A. Where raceways penetrate roofing or similar structural area, provide appropriate roof jack coordinate with the roofing contractor and the Architect in order to match the vent with the roof construction. The jack shall be sized to fit tightly to raceway for weather-tight seal, and with flange extending a minimum of 9" under roofing in all sides or as required by the roof type of construction. Completely seal opening between inside diameter of roof flashing and outside diameter of penetrating raceways. Coordinate all work with work required under roofing section of specifications.

3.8 FIRE PENETRATION SEALS:

A. Seal all penetrations for work of this section through fire rated floors, walls and ceilings to prevent the spread of smoke, fire, toxic gas or water through the penetration either before, during or after fire. The fire rating of the penetration seal shall be at least that of the floor, wall or ceiling that it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the National Electrical Code. Where applicable, provide OZ Type CFSF/I and CAFSF/I fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs, and similar structures. Where applicable, provide 3M CID cast-in device for floor slabs. Where applicable, provide 3M fire barrier sealing penetration system, and/or IPC Flame Safe Fire Stop System, and/or Chase Foam fire stop system, including wall wrap, partitions, caps, and other accessories as required. All materials to comply with UL 1479 (ASTM E-814). Comply with manufacturer's instructions and recommendations for installation of sealing fittings and barrier sealing systems.

3.9 PROJECT FINALIZATION AND START-UP:

A. Upon completion of equipment and system installation, assemble all equipment Factory Representatives and Subcontractors for system start-up.

B. Each Representative and Subcontractor shall assist in start-up and check out their respective system and remain at the site until the total system operation is accepted by

the Owner's representative.

C. The Factory Representative and/or System Subcontractor shall give personal instruction on operating and maintenance of their equipment to the Owner's maintenance and/or operation personnel. To certify acceptance of operation and instruction by the Owner's Representative, the contractor shall prepare a written statement as follows:

1. This is to certify that the Factory Representative and System Subcontractor for each of the systems listed below have performed start-up and final check out of their respective systems.
2. The Owner's Representative has received complete and thorough instruction in the operation and maintenance of each system.

SYSTEM	FACTORY REPRESENTATIVE
(List systems included)	(List name and address of Factory Representative)

Owner's Representative	Contractor

D. Send copy of acceptance to Architect/Engineer.

3.10 FINAL REVIEW:

A. At the time of final review, the project foreman shall accompany the reviewing party, and remove coverplates, panel covers and other access panels as requested, to allow review of the entire electrical system.

END OF SECTION 26 0500

SECTION 26 0502

ELECTRICAL SUBMITTALS AND O & M MANUALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to all Division 26, 27 and 28 sections.

B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full. Contractor must review the entire set of plans and specifications. Reviewing only the electrical set is not acceptable.

C. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 SUBMITTAL REQUIREMENTS:

A. GENERAL:

1. After the Contract is awarded but prior to ordering, manufacture, or installation of any equipment, prepare complete Submittals including shop drawings, product data, brochures, etc. for materials and equipment as required by each section of the specification.
2. Review of Submittals shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from the Contract Document's requirements. It shall be clearly understood that the noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Document's shall govern and are not waived, or superseded in any way by the review of the Shop Drawings and Brochures.
3. Submittals are reviewed, not approved. Comments made within submittals do not alter the contract documents in any way. The contractor is still responsible, regardless of comments (if any) made within submittals, for complying with drawings and specifications.
4. Notify engineer in writing if any of the comments noted in the submittals alter the contract cost. A comment within the submittal process which increases/decreases cost of product is not an authorization to the contractor under any circumstances to proceed.
5. Notify engineer of any modifications between contract documents and submittals. It is the responsibility of the contractor to ensure compliance.
6. ELECTRONIC SUBMITTAL REQUIREMENTS:
    a. Provide submittals in Portable Document Format (PDF).
    b. Documents must be electronically bookmarked and keyword searchable using Adobe Acrobat (http://www.adobe.com/acrobat) or Bluebeam Revu (http://www.bluebeam.com) for each relevant section. For example,

include electronic bookmarks separating “Light Fixtures” from “Panelboards”.

c. Electronically highlight all options for light fixtures, electrical equipment, etc. Manual highlighting and scanning of the documents is NOT acceptable and will NOT be reviewed.

d. Provide only completed cutsheets for all fixture and equipment types. Blank cutsheets submitted with a schedule are NOT acceptable and will NOT be reviewed.

e. At the time of submission, the electrical contractor shall provide a complete and comprehensive submission of all required specification sections/shop drawings at the same time. Exceptions may be given, with prior approval, for time-sensitive equipment.

f. A maximum of one submittal per specification section is allowed. It is NOT acceptable to provide a product by product submittal. Single product by product submittals will NOT be reviewed.

B. SCHEDULING

1. GENERAL

a. A minimum period of two weeks, exclusive of transmittal time, will be required each time Submittals are submitted or resubmitted for review. This time period shall be considered by the Contractor when scheduling submittal data.

b. If the shop drawings are rejected twice, the contractor shall reimburse the engineer the sum of $1,200.00 for the third review and any additional reviews required prior to commencement of the third review.

C. QUALITY ASSURANCE

1. PRE-SUBMITTAL PREPARATION

a. Prior to submission of the Shop Drawings and Project Data, review and certify that they are in compliance with the Contract Documents. Verify all dimensional information to ensure proper clearance for installation of equipment.

b. Shop drawings requiring the use of electronic documents (floor plans, Lighting plans, fire alarm plans, etc.) shall be requested via a request for information (RFI) through the general contractor. Electronic documents will be provided to the Architect for distribution. No direct vendor requests will be accepted.

c. Contractor is completely responsible for the content of the submittal

2. SUBMITTAL REQUIREMENTS

a. Certifications shall be written or in the form of rubber stamp impressions as follows:

i. I hereby certify that this Shop Drawing and/or Brochure has been checked prior to submittal and that it complies in all respects with the requirements of the Contract Drawings and Specifications for this Project.

(Name of Electrical Subcontractor)

Name_____.

Position_____Date_____.

b. Brochures to be submitted shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs that describe several different items in addition to those items to be used, unless all irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified and submitted separately.

c. Shop Drawings shall be done in an easily legible scale and shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the equipment or apparatus, and its location. Drawings shall be prepared by an Engineer/Draftsmen skilled in this type of work. Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.

d. Observe the following rules when submitting the Shop Drawings and Brochures.

i. Each Shop Drawing shall indicate in the lower right hand corner, and each Brochure shall indicate on the front cover the following: Title of the sheet or brochure, name and location of the building; names of the Architect and Electrical Engineer, Contractor, Subcontractors, Manufacturer, Supplier/Vendor, etc., date of submittal, and the date of correction and revision. Unless the above information is included the submittal will be returned for resubmittal.

1. Submittal Identification shall include the following:

a. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted.

b. Original submittal numbers shall have the following format: “XXX-Y;” where “XXX” is the originally assigned submittal number and “Y” is a sequential letter assigned for resubmittals (for example, A, B, or C being the first, second, and third resubmittals, respectively). Submittal 25B, for example, is the second resubmittal of Submittal 25.

e. SPECIFICATION section and paragraph to which submittal applies.

D. POST-SUBMITTAL

1. Check all materials and equipment after arrival on the job site and verify compliance with the Contract Documents.

1.3 PROVIDE SUBMITTALS AS REQUESTED FOR EACH OF THE SECTIONS LISTED BELOW:

A. 26 0533 Electrical Boxes and Fittings

1. Submit manufacturer’s data including specifications, installation instruction and general recommendations for each type of floor box used on project.

B. 26 0553 Electrical Identification

1. Submit manufacturer’s data on each type of electrical identification products

    a. Submit one sample of each component of the electrical identification system as follows: Wire/cable tape marker, Tags, Engraved, plastic laminate labels, Arc-flash hazard labels

C. 26 0943 Lighting Control Equipment

1. Submit manufacturer’s data on lighting control equipment including, but not limited to published catalog data sheets, rough-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.

2. Meet with the electrical engineer at their office prior to preparation of shop drawings to discuss and verify specific programming and zoning requirements of system(s).

3. Meet with the lighting representative/manufacturer of the approved and accepted lighting control equipment to verify and understand specific installation requirements associated with that system.

4. Submit detailed drawings and documentation of lighting control components and interconnection including, but not necessarily limited to:

    a. Electronic controllers

    b. Control stations

    c. Photo sensors

    d. Occupancy sensors

    e. Network wiring details

    f. Input and output wiring details

    g. Lighting control panel load schedules

    h. Provide a complete sequencing and programming schedules for all devices, zones and scenes.

    i. Wallstations layouts

    j. Accurately scaled equipment layouts, wire/cable routing and connections to control wiring and electrical power feeders.

D. 26 2726 Wiring Devices

1. Submit manufacturer's data on electrical wiring devices.

E. 26 5100 Interior and Exterior Building Lighting

1. Submit manufacturer's data on interior and exterior building lighting fixtures.

2. Submit dimensioned drawings of lighting fixtures. Submit fixture shop drawings in PDF format with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture catalog number and accessories clearly indicated on each sheet.

3. When applicable submit standard color samples with the shop drawings. If standard colors are not acceptable, a color sample will be provided to the fixture manufacturer. Return of the shop drawings will be delayed until color samples are provided.

4. Submit ballast and driver manufacturer cut sheets.

F. 27 1500 Canyons School District – Network Cabling Global Specification

1. See district specifications for exact submittal requirements.
2. Provide proof of RCDD certification and connectivity manufacturer certification.
3. Provide submittals for all racks/cabinets; patch panels, devices, cabling, firestopping solutions, tray, non-continuous cable support devices, grounding equipment, and miscellaneous equipment to be used on project. Where multiple part numbers are listed on a datasheet/cutsheet, highlight or circle applicable part.
4. Provide color samples of all available standard color faceplates to architect.
5. Provide proposed labeling scheme for approval by owner/engineer.
6. Provide catalog cutsheets of all test equipment that will be used.

G. 27 5123 - Intercommunication Systems– Update System and Programming as required

1. Submit manufacturer's data on intercom system devcies including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
2. Provide shop drop drawings updating existing system.

H. 28 3111 Fire Alarm and Detection System – Update System and Programming as required:

1. Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
2. Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel. Provide dimensioned drawing of Fire Alarm Control Panel and Building Graphic. Shop drawings shall be prepared by an individual with a minimum NICET Level IV (Fire Protection Engineering/Fire Alarm Systems) certification. The individuals name and certification number shall be indicated on submittal design drawings.
3. Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system will be installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72.
4. Submit a complete set of documents to the Office of the State Fire Marshal containing the following information:
    a. A complete set of shop drawings indicating:
        i. Location of all alarm-initiating and alarm-signaling devices.
        ii. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.
    b. Wiring diagrams for:
        i. Alarm control panels.
        ii. Auxiliary function relays and solenoids.
        iii. Remote signaling equipment.

iv. Standby battery calculations, including voltage drop calculation.

c. A complete equipment list identifying:

i. Type

ii. Model

iii. Manufacturer

iv. Manufacturer catalog data sheets

v. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)

d. A complete zone list identifying all:

i. Alarm-initiating and alarm-signaling devices.

ii. Remote signaling and auxiliary function zones.

iii. Specific devices associated with each zone.

e. Sample “System Record Document”.

f. Fire Alarm Key Plan Drawing showing the location of all device addresses and/or zones.

1.4 OPERATION & MAINTENANCE MANUALS

A. Provide operating instruction and maintenance data books for all equipment and materials furnished under this Division.

B. Submit four copies of operating and maintenance data books for review at least four weeks before final review of the project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item. The binder (sized to the material) shall be a 2" slide lock unit (Wilson-Jones WLJ36544B). The cover shall be engraved with the job title in 1/2" high letters and the name and address of the Contractor in 1/4" high letters. Provide the same information in 1/8" letters on the spine.

C. Include complete cleaning and servicing data compiled in clearly and easily understandable form. Show serial numbers of each piece of equipment, complete lists of replacement parts, motor ratings, etc. Each unit shall have its own individual sheet. (Example: If two items of equipment A and D appear on the same sheet, an individual sheet shall be provided for each unit specified).

D. Include the following information where applicable.

1. Identifying name and mark number.
2. Certified outline Drawings and Shop Drawings.
3. Parts lists.
4. Performance curves and data.
5. Wiring diagrams.
6. Light fixture schedule with the lamps and ballast data used on the project for all fixtures
7. Manufacturer's recommended operating and maintenance instructions.
8. Vendor's name and address for each item.

E. The engineer will review the manuals and when approved, will forward the manuals on to the architect. If the manuals are rejected twice, the contractor shall reimburse the engineer the sum of $1,200.00 for each review afterwards.

F. Provide high quality video and audio recording for all training sessions. All trainings shall be recorded by utilizing a pro-grade digital camera system. Utilize camera tripod and record audio directly at the presenter. Smartphone recordings are not allowed.

G. Provide Operation and Maintenance Manual information for each section listed below in addition to the general requirements listed above.

1. 26 0943 Lighting Control Equipment

   a. Record Drawings

      i. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.

      ii. Provide a DIGITAL COPY to the owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the schedules themselves. The DIGITAL COPY shall contain a minimum of following:

         1. CAD drawing files of 'as-built' lighting control components and point to point connections.
         2. General configuration programming.
         3. Job specific configuration programming to include schedule.
         4. Tutorial file on complete programming of lighting control system.

2. 26 5100 Interior and Exterior Building Lighting

   a. The supply two complete manuals consisting of, as a minimum, general system arrangement, lighting cutsheets, schematic of System components and options, factory test reports, trouble-shooting data, parts lists, preventative maintenance information, and warranty contact information.

3. 27 1500 Canyons School District – Network Cabling Global Specification

   a. Adhere to district specific requirements outlines within specifications.

   b. Test Results as outlined in Section 27 1500

   c. Manual shall include all service, installation, programming and warranty, including test results for each cable.

   d. Provide laminated plans (minimum size 11 x 17) of all telecommunications record drawings (including riser diagrams) in each and every EF, ER and TR.

   e. Record Drawings

      i. The Owner shall provide electronic (DWG) format of telephone/data system drawings that as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.

ii. Provide a complete set of “as built” drawings in paper and electronic (DWG and PDF) formats showing cabinets, racks, patch panels, wiring, specific interconnections between all equipment and internal wiring of equipment within 30 working days of completion. Drawings are to include all labeling information used in denoting equipment used in the installation. Labeling, icons, and drawing conventions used shall be consistent throughout all documentation provided.

4. 27 5123 Intercommunications System

a. Provide updated programming and as-built drawings.

5. 28 3111 Fire Alarm and Detection System

a. Manual Requirements

i. Operating and maintenance manuals shall be submitted prior to testing of the system. Manuals shall include all service, installation, and programming information.

b. Record Drawings

i. A complete updated set of CAD "as-built" drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system. Vendor shall not request drawings from the Engineer. Vendor shall request current architectural drawings from the Architect and include all cost with bid.

ii. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel and all remote operating panels. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various devices and wiring by the use of different colors (minimum of five colors).

iii. Provide a DIGITAL COPY to the Owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the fire alarm program themselves. The DIGITAL COPY shall contain a minimum of the following:

1. CAD drawing files of building fire alarm map.
2. CAD drawing files of as-built fire alarm components and point to point connections.
3. General configuration programming.
4. Job specific configuration programming.

c. Final Submittal to the Office of the Fire Marshal

i. Record of Completion: Provide a completed System Record of Completion (NFPA 72-Figure 4.5.2.1) in accordance with Section 4.5.3.

ii. Operation Instructions and A-Built Drawings: Provide one set of instructions on operation of the Fire Alarm System and one set of As-Built drawings. Demonstrate compliance of installation of the System Record Documents at or near the fire alarm control unit.

iii. Fire Alarm Key Plan Drawing: Demonstrate compliance of installation of the fire alarm key plan drawing at the FACP.

iv. TUTORIAL FILE ON COMPLETE PROGRAMMING OF FIRE ALARM SYSTEM

END OF SECTION 26 0502

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SECTION 26 0507

ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-23 section making reference to electrical connections.

1.2 DESCRIPTION OF WORK:

A. Extent of electrical connection for equipment includes final electrical connection of all equipment having electrical requirements. Make final connections for all owner furnished equipment. See other applicable portions of specification for building temperature control wiring requirements.

B. Refer to Division-23 sections for motor starters and controls furnished integrally with equipment; not work of this section.

C. Refer to Division-23 section for control system wiring; not work of this section.

D. Refer to sections of other Divisions for specific individual equipment power requirements.

1.3 QUALITY ASSURANCE:

A. NEC COMPLIANCE: Comply with applicable portions of NEC as to type products used and installation of electrical power connections.

B. UL LABELS: Provide electrical connection products and materials that have been UL-listed and labeled.

PART 2 - PRODUCTS

2.1 GENERAL:

A. For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, raceways, conductors, cords, cord caps, wiring devices, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices, terminations, and connections as required. Crimp on or slip-on type splicing materials (insulation displacement type) designed to be used without wire stripping are not acceptable. See Section 26 0532, Conduit Raceways; Section 26 2726 Wiring Devices: and Section 26 0519 Conductors and Cables for additional requirements. Provide final connections for equipment consistent with the following:

1. Permanently installed fixed equipment - flexible seal-tite conduit from branch circuit terminal equipment, or raceway; to equipment, control cabinet, terminal junction box or wiring terminals. Totally enclose all wiring in raceway.

2. Movable and/or portable equipment - wiring device, cord cap, and multi-conductor cord suitable for the equipment and in accordance with NEC requirements (Article 400).

3. Other methods as required by the National Electrical Code and/or as required by special equipment or field conditions.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS:

A. Make electrical connections in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.

B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams.

C. Coordinate installation of electrical connections for equipment with equipment installation work.

D. Verify all electrical loads (voltage, phase, horse power, full load amperes, number and point of connections, minimum circuit ampacity, etc.) for equipment furnished under other Divisions of this specification, by reviewing respective shop drawings furnished under each division. Meet with each subcontractor furnishing equipment requiring electrical service and review equipment electrical characteristics. Report any variances from electrical characteristics noted on the electrical drawings to Architect before proceeding with rough-work. In summary, it is not in the Electrical Engineers scope to review the shop drawings from other trades/divisions.

E. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.

F. Refer to basic materials and methods Section 26 0553 Electrical Identification, Conductors, for identification of electrical power supply conductor terminations.

END OF SECTION 26 0507

SECTION 26 0519

CONDUCTORS AND CABLES (600V AND BELOW)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to conductors and cables specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of electrical conductor and electrical cable work is indicated by drawings and schedules.

B. Types of conductors and cables in this section include the following:

1. Copper Conductors (600V)
2. Aluminum Conductor (600V)
3. 0-10V Class 1 Circuits

C. Applications for conductors and cables required for project include:

1. Power Distribution
2. Feeders
3. Branch Circuits
4. 0-10V Class 1 Circuits

1.3 RECORDS SUBMITTAL:

A. Submit record in triplicate of megohmmeter readings to Architect/Engineer. Please see paragraphs 3.2A AFTER INSTALLATION TEST FOR CABLE 600 VOLTS AND BELOW for testing requirements.

1.4 QUALITY ASSURANCE:

A. Comply with NEC as applicable to construction and installation of electrical conductors and cable. Comply with UL standards and provide electrical conductors and cables that have been UL-listed and labeled.

B. Comply with applicable portions of NEMA/Insulated Cable Engineers Association standards pertaining to materials, construction and testing of conductors and cable.

C. Comply with applicable portions of ANSI/ASTM and IEEE standards pertaining to construction of conductors and cable.

1.5 SUBMITTALS:

A. Refer to Section 26 0502 for electrical submittal requirements.

PART 2 - PRODUCTS

2.1 COPPER AND ALUMINUM CONDUCTORS (600V):

A. Provide factory-fabricated conductors of sizes, ratings, materials, and types indicated for each service. Where not indicated provide proper selection to comply with project's installation requirements and NEC standards. Provide conductors in accordance with the following:

1. Service Entrance Conductors – Copper/Aluminum conductor; see drawings for insulation type.
2. Distribution and Panelboard Feeders; and Other Conductors, #2 AWG and Larger – Copper/Aluminum conductor; see drawings for insulation type.
3. Branch Circuit Conductors and All Conductors #3 AWG and Smaller - Copper conductor, with THHN/THWN insulation. Size all conductors in accordance with NEC; minimum size to be #12 AWG.
4. Aluminum Conductors. Where aluminum conductors are specified for use, provide compact stranded Aluminum Association 8000- series alloy conductor material.
    a. Stabiloy - Alcan Cable
    b. Triple E - Southwire

B. Provide connectors and terminations for aluminum-alloy conductors of hydraulic compression type only, listed under UL 486-B, and marked "AL 7CU" for 75o rated circuits, and "AL9CU" for 90o rated circuits.

C. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.

D. Provide neutral and ground wire as specified elsewhere in documents.

E. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.

2.2 FIRE-RESISTIVE CABLE:

A. Mineral Insulated Copper (MI) Copper Sheathed Cable:

1. General:
    a. Provide 1/c type system 1850 sheathed power cable, conforming to current standards of UL system No. 1850.
    b. Cable shall be classified as 2-hour fire resisting cable and shall comply with NEC articles 695 and 700 as an “Electrical Circuit Protective System” with a minimum 2-hour fire rating.
    c. Construct cable with copper conductor with highly compressed magnesium oxide insulation and seamless soft-drawn copper sheath.
    d. Provide termination kits as recommended by cable manufacturer.
2. Manufacturer:
    a. Subject to compliance with requirements, provide products of one of the

following:

i. Pentair – Pyrotenex System 1850

2.3 COPPER LOW VOLTAGE CONDUCTORS (0-10V CIRCUITS):

A. 0-10V Class 1 Circuits:

1. General:

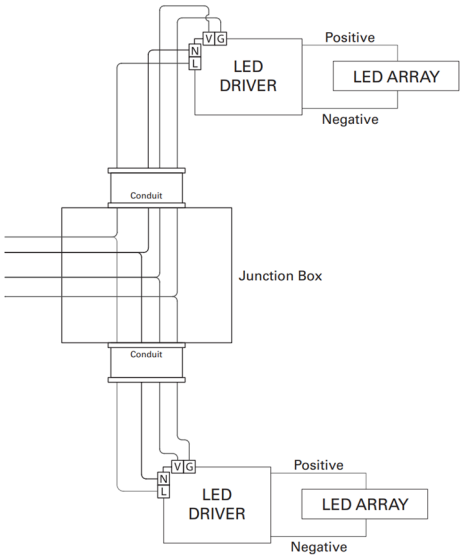
a. Provide Class 1 circuits for all 0-10V dimming installations. Class 1 circuits shall be permitted to be installed with other circuits as specified in NEC 725.48 (A) and (B):

i. Class 1 circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway without regard to whether the individual circuits are alternating or direct current, provided all conductors are insulated for the maximum voltage of any conductors in the cable, cable tray, enclosure or raceway.

ii. Class 1 circuits shall be permitted to be installed with power supply conductors as specified:

1. Class 1 and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only when functionally associated.

iii. Utilize purple and grey copper conductors, with THHN/THWN insulation.



PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install electric conductors and cables as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in accordance with recognized industry practices.

B. Coordinate installation work with electrical raceway and equipment installation work, as necessary for proper interface.

C. Cables may be pulled by direct attachment to conductors or by use of basket weave

pulling grip applied over cables. Attachment to pulling device shall be made through approved swivel connection. Nonmetallic jacketed cables of small size may be pulled directly by conductors by forming them into a loop that pull wires can be attached; remove insulation from conductors before forming the loop. Larger sizes of cable may be pulled by using basket weave pulling grip, provided the pulling force does not exceed limits recommended by manufacturer; if pulling more than one cable, bind them together with friction tape before applying the grip. For long pulls requiring heavy pulling force, use pulling eyes attached to conductors.

D. Do not exceed manufacturer's recommendations for maximum allowable pulling tension, side wall pressure, and minimum allowable bending radius. In all cases, pulling tension applied to the conductors shall be limited to 0.008 lbs. per circular mil of conductor cross-section area.

E. Pull in cable from the end having the sharpest bend; i.e. bend shall be closest to reel. Keep pulling tension to minimum by liberal use of lubricant, and turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one in pullhole during this operation.

F. For training of cables, minimum bend radius to inner surface of cable shall be 12 times cable diameter.

G. Where cable is pulled under tension over sheaves, conduit bends, or other curved surfaces, make minimum bend radius 50% greater than specified above for training.

H. Use only wire and cable pulling compound recommended by the specific cable manufacturer, and that is listed by UL.

I. Seal all cable ends unless splicing is to be done immediately. Conduit bodies shall not contain splices.

J. Support all cables in pullholes, concrete trenches, and similar locations by cable racks and secure to rack insulators with nylon cord or self-locking nylon cable ties. Place each cable on separate insulator. In manholes, pullholes, concrete trenches, and similar locations, wrap strips of fire-proofing tape (approx. 1/16 inch thick by 3 inches wide) tightly around each cable spirally in half-lapped wrapping or in two butt-joined wrappings with the second wrapping covering the joints in the first. Apply tape with the coated side toward the cable, and extend tape one inch into the ducts. To prevent unraveling, random wrap the fireproofing tape the entire length of the fireproofing with pressure sensitive glass cloth tape. Provide fireproofing tape of a flexible, conformable fabric having one side coated with flame retardant, flexible, polymeric coating and/or a chlorinated elastomer not less than 0.050 inch thick weighing not less than 2.5 pounds per square yard. Provide tape that is noncorrosive to cable sheath, self-extinguishing, and that will not support combustion. Construct tape of materials that do not deteriorate when subjected to oil, water, gases, salt water, sewage and fungus.

K. Follow manufacturer's instructions for splicing and cable terminations.

3.2 AFTER INSTALLATION TEST FOR CABLE 600 VOLTS AND BELOW:

A. Prior to energization, test cable and wire for continuity of circuitry, and for short circuits, Megger all circuits of 100 amp and greater rating. Correct malfunctions. Record all test data and provide written test report.

B. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements.

3.3 IDENTIFICATION OF FEEDERS: Refer to Section 26 0553 for requirements.

END OF SECTION 26 0519

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SECTION 26 0526

GROUNDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Provide grounding as specified herein, and as indicated on drawings.

B. Provide grounding and bonding of all electrical and communication apparatus, machinery, appliances, building components, and items required by the NEC to provide a permanent, continuous, low impedance, grounding system.

C. Unless otherwise indicated, ground the complete electrical installation including the system neutral, metallic conduits and raceways, boxes, fittings, devices, cabinets, and equipment in accordance with all code requirements.

D. Ground each separately derived system, as described in NEC Section 250-30, unless otherwise indicated.

E. Types of grounding in this section include the following:

1. Enclosures
2. Systems
3. Equipment
4. Other items indicated on drawings

F. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

1.3 QUALITY ASSURANCE:

A. Comply with NEC as applicable to electrical grounding and ground fault protection systems. Comply with applicable ANSI and IEEE requirements. Provide products that have been UL listed and labeled.

B. Resistance from the service entrance ground bus, through the grounding electrode to earth, shall not exceed 5 ohms.

1.4 SUBMITTALS:

A. Not Required.

PART 2 – PRODUCTS

2.1 MATERIALS AND COMPONENTS:

A. GENERAL: Except as otherwise indicated, provide each electrical grounding system as specified herein, and as shown on drawings, including but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and

plate electrodes, bonding jumper braid, and other items and accessories needed for complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

B. ELECTRICAL GROUNDING CONDUCTORS: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC. Provide with green insulation.

PART 3 - EXECUTION

3.1 INSTALLATION OF GROUNDING SYSTEMS:

A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding devices comply with requirements.

B. Install clamp-on connectors only on thoroughly cleaned and metal contact surfaces, to ensure electrical conductivity and circuit integrity.

C. Provide grounding for the entire raceway, enclosure, equipment and device system in accordance with NEC. All non-metallic raceways shall include copper grounding conductor sized in accordance with NEC. Include copper grounding conductor in all raceway installed in suspended slabs.

D. Provide service entrance grounding by means of ground rods (quantity of two, driven exterior to building), by means of bonding to water main, and by means of bonding to building structural steel. In addition, provide a grounding electrode for not less than 30 lineal feet in concrete footing or foundation that is in direct contract with earth. Size electrode in accordance with NEC, but in no case, smaller than No. 4 AWG bare copper. Support electrode so as to be below finished grade near the bottom of the trench, and approximately three inches from the bottom or sides of the concrete. Locate a point of connection for inspection.

E. Provide grounding conductors for dimming systems in accordance with manufacturer's requirement.

END OF SECTION 26 0526

SECTION 26 0529

SUPPORTING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to supports, anchors, sleeves, and seals, specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of supports, anchors, and sleeves is indicated by drawings and schedules and/or specified in other Division-26 sections. See Section 260532, Raceways, for additional requirements.

B. Work of this section includes supports, anchors, sleeves and seals required for a complete raceway support system, including but not limited to: clevis hangers, riser clamps, C-clamps, beam clamps, one and two hole conduit straps, offset conduit clamps, expansion anchors, toggle bolts, threaded rods, U-channel strut systems, threaded rods and all associated accessories.

1.3 QUALITY ASSURANCE:

A. Comply with NEC as applicable to construction and installation of electrical supporting devices. Comply with applicable requirements of ANSI/NEMA Std. Pub No. FB 1, "Fittings and Supports for Conduit and Cable Assemblies". Provide electrical components that are UL-listed and labeled.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES:

A. GENERAL:

1. Provide supporting devices; complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. See drawings for additional requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES:

A. Install hangers, anchors, sleeves, and seals as required, in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

C. Install hangers, supports, clamps and attachments to support piping properly from building structures. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. For pre-and post tensioned construction, use pre-set inserts for support of all electrical work. Do not use toggle bolts, moly bolts, wood plugs or screws in sheetrock or plaster as support for any equipment or raceway.

D. Independent support wires are not allowed as indicated as per NEC 300.11(B).

E. RACEWAYS:

1. Support raceways that are rigidly attached to structure at intervals not to exceed 8 feet on center, minimum of two straps per 10 foot length of raceway, and within 12" of each junction box, coupling, outlet or fitting. Support raceway at each 90° degree bend. Support raceway (as it is installed) in accordance with the following:

NUMBER OF RUNS	3/4" TO 1-1/4" 0	1-1/2" & LARGER 0
1	Full straps, clamps or hangers.	Hanger
2	Full straps, clamps or hangers.	Mounting Channel
3 or more	Mounting Channel	Mounting Channel

2. Support suspended raceways on trapeze hanger systems; or individually by means of threaded rod and straps, clamps, or hangers suitable for the application. Do not use "tie wire" as a portion of any raceway support system; do not support raceway from ceiling support wires.

F. FLOOR MOUNTED EQUIPMENT:

1. Provide rigid attachment of all floor mounted equipment to the floor slab or structural system. Provide 5/8" bolts or expansion anchors at each 90 degree corner and at intervals not to exceed 48" on center along entire perimeter of the equipment. Provide rigid attachment for all floor mounted switchboards, panelboards, power and control equipment, motor control centers, dimmer cabinets, transformers (provide neoprene vibrations isolators at anchor points), oil switches, battery packs and racks, and similar equipment furnished under Division 26, 27 and 28.

END OF SECTION 26 0529

SECTION 26 0532

CONDUIT RACEWAY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to electrical raceways and specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of raceways is indicated by drawings and schedules.

B. Division-26 is responsible to provide conduit and rough-in for all thermostat controls located within walls. Coordinate with the Controls Contractor and verify exact location of all thermostats. Obtain and review submittals of Temperature Control Equipment from Controls Contractor and Divisions 21-23.

C. Types of raceways in this section include the following:

1. Electrical Metallic Tubing
2. Flexible Metal Conduit
3. Intermediate Metal Conduit
4. Liquid-tight Flexible Metal Conduit
5. Rigid Metal Conduit
6. Rigid Non-metallic Conduit

1.3 QUALITY ASSURANCE:

A. MANUFACTURERS: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.

B. STANDARDS: Comply with applicable portions of NEMA standards pertaining to raceways. Comply with applicable portions of UL safety standards pertaining to electrical raceway systems; and provide products and components that have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.

1.4 SUBMITTALS:

A. Not Required.

PART 2 – PRODUCTS

2.1 METAL CONDUIT AND TUBING:

A. GENERAL:

1. Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of 3/4".

B. RIGID METAL CONDUIT (RMC): FS WW-C-0581 and ANSI C80.1.

C. INTERMEDIATE STEEL CONDUIT (IMC): FS WW-C-581.

D. PVC EXTERNALLY COATED RIGID STEEL CONDUIT: ANSI C80.1 and NEMA Std. Pub. No. RN 1.

E. ALUMINUM CONDUIT: Not acceptable.

F. ELECTRICAL NON-METALLIC TUBING (ENT) SYSTEM: Not acceptable.

G. MC CABLE: Only acceptable as indicated below.

1. MC Cable is acceptable for all branch circuits installed in gypsum wallboard walls from the home run device box to the last device box on the branch circuit and all boxes in between, from the home run device box to the branch panel, the circuit shall be installed in an approved raceway. **All MC Cable shall be provided with anti-short fittings.**

2. MC Cable is acceptable for all light fixture whips not longer than six feet in length. Located in removable grid ceilings. MC Cable is unacceptable to be installed from light fixture to light fixture. **All MC Cable shall be provided with anti-short fittings.**

    a. The use of MC-PCS cable is acceptable for light fixture whips utilizing 0-10v control schemes, not longer than 72” in length, located above removable grid ceilings. All MC cable shall be provided with anti-short fittings.

        i. Acceptable Manufacturers

            1. AFC – MC Luminary Cable
            2. Encore – MC-LED Lighting Cable
            3. Southwire – MC-PCS Duo

3. Before any rough-in of MC cable, the contractor shall conduct a on-site meeting with owner and engineer to review standards and overall rough-in requirements. Contractor shall conform to all owner and engineer requirements.

4. Contractor mock-up one classroom for review of electrical installation prior to continuing installation of MC cabling.

H. RIGID AND INTERMEDIATE STEEL CONDUIT FITTINGS:

1. Provide fully threaded malleable steel couplings; raintight and concrete tight where required by application. Provide double locknuts and metal bushings at all conduit terminations. Install OZ Type B bushings on conduits 1-1/4" and larger.

I. ELECTRICAL METALLIC TUBING (EMT): FS WW-C-563 and ANSI C80.3.

J. EMT FITTINGS:

1. Provide insulated throat nylon bushings with non-indenter type malleable steel fittings at all conduit terminations. Install OZ Type B bushings on conduits 1" larger. Cast or indenter type fittings are not acceptable.

K. FLEXIBLE METAL CONDUIT: FS WW-C-566, of the following type;

1. Zinc-coated steel.

L. FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 1, and Style A.

M. LIQUID TIGHT FLEXIBLE METAL CONDUIT:

1. Provide liquid-tight, flexible metal conduit; constructed of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).

N. LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 3, Style G.

O. EXPANSION FITTINGS: OZ Type AX, or equivalent to suit application.

2.2 NON-METALLIC CONDUIT AND DUCTS:

A. GENERAL:

1. Provide non-metallic conduit, ducts and fittings of types, sizes and weights as indicated; with minimum trade size of 3/4".

B. PVC AND ABS PLASTIC UTILITIES DUCT FITTINGS:

C. ANSI/NEMA TC 9, match to duct type and material.

D. HDPE CONDUIT: Not acceptable.

2.3 CONDUIT; TUBING; AND DUCT ACCESSORIES:

A. Provide conduit, tubing and duct accessories of types and sizes, and materials, complying with manufacturer's published product information, that mate and match conduit and tubing. Provide manufactured spacers in all duct bank runs.

2.4 SEALING BUSHINGS:

A. Provide OZ Type FSK, WSK, or CSMI as required by application. Provide OZ type CSB internal sealing bushings.

2.5 CABLE SUPPORTS:

A. Provide OZ cable supports for vertical risers, type as required by application.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL RACEWAYS:

A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and in accordance with the following:

1. BRANCH CIRCUITS, SIGNAL AND CONTROL CIRCUITS, AND INDIVIDUAL EQUIPMENT CIRCUITS RATED LESS THAN 100 AMPS:

a. Install in electric metallic tubing (EMT). Below concrete slab-on-grade or in earth fill, install in non-metallic plastic duct. In areas exposed to weather, moisture, or physical damage, install in RMC or IMC. In suspended slabs, install in EMT (NOT APPROVED).

B. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.

C. Install raceway in accordance with the following:

1. Provide a minimum of 12" clearance measured from outside of insulation from flues, steam and hot water piping, etc. Avoid installing raceways in immediate vicinity of boilers and similar heat emitting equipment. Conceal raceways in finished walls, ceilings and floor (other than slab-on-grade), except in

mechanical, electrical and/or communication rooms, conceal all conduit and connections to motors, equipment, and surface mounted cabinets unless exposed work is indicated on the drawings. Run concealed conduits in as direct a line as possible with gradual bends. Where conduit is exposed in mechanical spaces, etc., install parallel with or at right angles to building or room structural lines. Do not install lighting raceway until piping and duct work locations have been determined in order to avoid fixtures being obstructed by overhead equipment.

2. PVC conduit may be utilized within CMU and Block type walls. At the point exiting or offsetting from wall transition to EMT and metal electrical box as required.
3. The required raceway size, for any given installation, shall remain the same throughout the entire length of the run. At no point shall any conduit be reduced in size.
4. Where cutting raceway is necessary, remove all inside and outside burrs; make cuts smooth and square with raceway. Paint all field threads (or portions of raceway where corrosion protection has been damaged) with primer and enamel finish coat to match adjacent raceway surface.
5. Provide a minimum of 1 ½" from nearest surface of the roof decking to raceway.
6. In open gymnasiums, auditoriums, etc; all conduit shall be installed in straight lines parallel to, or at right angles to, the structure or adjacent building elements. Separations between conduits and fastenings of conduits shall be neat and consistent. Conduit shall be installed as tight to the bottom of structural elements when parallel to joists as code will allow. Overall installation shall be accomplished in an aesthetic and workmanlike manner. No conduits shall be allowed to run perpendicular to the bottom chord and at the bottom of the joists.
7. Provide conduit from device to device in open and/or exposed ceilings. Ceilings with clouds are considered open/exposed ceiling. No exposed cables shall be seen from below.
8. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.
9. Provide neutral and ground wire as specified elsewhere in documents.
10. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.

D. Comply with NEC for requirements for installation of pull boxes in long runs.

E. Cap open ends of conduits and protect other raceways as required against accumulation of dirt and debris. Pull a mandrel and swab through all conduit before installing conductors. Install a 200 lb. nylon pull cord in each empty conduit run.

F. Replace all crushed, wrinkled or deformed raceway before installing conductors.

G. Do not use flame type devices as a heat application to bend PVC conduit. Use a heating device that supplies uniform heat over the entire area without scorching the conduit.

H. Provide rigid metal conduit (RMC) for all bends greater than 22 degrees in buried conduit. Provide protective coating for RMC bend as specified herein.

I. Where raceways penetrate building, area ways, manholes or vault walls and floors below

grade, install rigid metal conduit (RMC) for a minimum distance of 10 feet on the exterior side of the floor or wall measured from interior face. Provide OZ, Type FSK, WSK or CSMI sealing bushings (with external membrane clamps as applicable) for all conduit penetrations entering walls or slabs below grade. Provide segmented type CSB internal sealing bushings in all raceways penetrating building walls and slabs below grade, and in all above grade raceway penetrations susceptible to moisture migration into building through raceway.

J. Install liquid-tight flexible conduit for connection of motors, transformers, and other electrical equipment where subject to movement and vibration.

K. Install spare 3/4" conduits (capped) from each branch panelboard into the ceiling and floor space. Run five into the ceiling space and five into the floor space. Where the floor is not accessible run six conduits into the ceiling space. Run conduits the required distance necessary to reach accessible ceiling space.

L. Provide OZ expansion fittings on all conduits crossing building expansion joints, both in slab and suspended.

M. Provide OZ cable supports in all vertical risers in accordance with NEC 300-19; type as required by application.

N. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.

O. Raceway installation below grade:

1. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
2. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.

P. Raceway installation below slab-on-grade, or below grade:

1. For slab-on-grade construction, install runs of rigid plastic conduit (PVC) below slab. All raceway shall be located a at top of sub-grade and a minimum of 6” below bottom of slab. Stake down conduits as required to keep conduits from floating or moving. Coordinate strictly with other trades at grade level structural members for correct installation. Install RMC (with protective coating) for raceways passing vertically through slab-on-grade. Slope raceways as required to drain away from electrical enclosures and to avoid collection of moisture in raceway low points.
2. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
3. Mark all buried conduits that do not require concrete encasement by placing yellow plastic marker tape (minimum 6" wide) along entire length of run 12" below final grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16", install a single line marker.
4. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.
5. Do not locate utility feeds under any structure. Verify all utility power paths with RMP prior to any rough-in. Utility burial depths must comply with RMP requirements or AHJ, but in no case be less than 48" minimum, unless noted otherwise on drawings, diagrams etc.

Q. Raceway installation in suspended slabs:

1. No conduit can be installed in suspended slabs.

R. Raceway installation in hazardous locations:

1. Install RMC in all hazardous locations as defined by NEC. Provide suitable fittings, seal-offs, boxes, etc. to comply with requirements.

2. Engage at least five full threads on all fittings. Provide inspection fittings with explosion proof drains to prevent water accumulation in conduit runs. Install seal-offs for arcing or high temperature equipment, at housing with splices or taps and where conduits enter or leave the hazardous area. Provide seal-offs of the appropriate type for vertical or horizontal installation. Ground all metallic parts.

S. Electrical Identification: Refer to Section 260553 for requirements.

END OF SECTION 26 0532

SECTION 26 0533

ELECTRICAL BOXES AND FITTINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to electrical wiring boxes and fittings specified herein. See Section 260532, Raceways, for additional requirements.

1.2 DESCRIPTION OF WORK:

A. The extent of electrical box and electrical fitting work is indicated by drawings and schedules.

B. Types of electrical boxes and fittings in this section include the following:

1. Outlet Boxes
2. Junction Boxes
3. Pull Boxes
4. Floor Boxes
5. Conduit Bodies
6. Bushings
7. Locknuts
8. Knockout Closures
9. Miscellaneous Boxes and Fittings

1.3 QUALITY ASSURANCE:

A. Comply with NEC as applicable to construction and installation of electrical boxes and fittings. Comply with ANSI C 134,1 (NEMA Standards Pub No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports. Provide electrical boxes and fittings that have been UL-listed and labeled.

1.4 SUBMITTALS:

A. Submit manufacturer’s data including specifications, installation instruction and general recommendations for each type of floor box used on project.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS:

A. INTERIOR OUTLET BOXES:

1. Provide one piece, galvanized flat rolled sheet steel interior outlet wiring boxes with accessory rings, of types, shapes and sizes, including box depths, to suit each respective location and installation, construct with stamped knockouts in

back and sides, and with threaded screw holes with corrosion-resistant screws for securing box and covers and wiring devices; minimum size 4"x4"x2-1/8".

2. Provide an ‘FS’ box, with no knockouts when surface mounted in a finished, non-utility space. Surface mounting is only acceptable when approved by the Architect.

B. INTERIOR OUTLET BOX ACCESSORIES:

1. Provide outlet box accessories as required for each installation, including mounting brackets, hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, that are compatible with outlet boxes being used and fulfilling requirements of individual wiring applications.

C. WEATHERPROOF OUTLET BOXES:

1. Provide corrosion-resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes (including depth) required, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, with face plate gaskets and corrosion-resistant fasteners.

D. JUNCTION AND PULL BOXES:

1. Provide code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

E. CONDUIT BODIES:

1. Provide galvanized cast-metal conduit bodies, of types, shapes and sizes to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.

F. BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS:

1. Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable steel conduit bushings and offset connectors, of types and sizes to suit respective uses and installation.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

A. GENERAL:

1. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

2. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.

3. Provide coverplates for all boxes. See Section 262726, Wiring Devices.

4. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.

5. Provide knockout closures to cap unused knockout holes where blanks have been removed.

6. Install boxes and conduit bodies to ensure ready accessibility of electrical wiring. Do not install boxes above ducts or behind equipment. Install recessed boxes with face of box or ring flush with adjacent surface. Seal between switch,

receptacle and other outlet box openings and adjacent surfaces with plaster, grout, or similar suitable material.

7. Fasten boxes rigidly to substrates or structural surfaces, or solidly embed electrical boxes in concrete or masonry. Use bar hangers for stud construction. Use of nails for securing boxes is prohibited. Set boxes on opposite sides of common wall with minimum 10" of conduit between them. Set boxes on opposite sides of fire resistant walls with minimum of 24” separation.
8. Provide a minimum of 1 ½” from the nearest surface of the roof decking to the installed boxes.
9. Provide electrical connections for installed boxes.

END OF SECTION 26 0533

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SECTION 26 0553

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Requirements of the following Division 26 Sections apply to this section:

1. “Basic Electrical Requirements”.
2. “Basic Electrical Materials and Methods”.

1.2 SUMMARY

A. This section includes identification of electrical materials, equipment and installations. It includes requirements for electrical identification components including but not limited to the following:

1. Buried electrical line warnings.
2. Identification labels for raceways, cables and conductors.
3. Operational instruction signs.
4. Warning and caution signs.
5. Equipment labels and signs.
6. Arc-flash hazard labels

B. Related Sections: The following sections contain requirements that relate to this section:

C. Division 9 Section “Painting” for related identification requirements.

D. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

1.3 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 “National Electrical Code”

1.4 SUBMITTALS: Refer to Section 26 0503 for requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. American Labelmark Co.
2. Calpico, Inc.
3. Cole-Flex Corp.
4. Emed Co., Inc.
5. George-Ingraham Corp.
6. Ideal Industries, Inc.

7. Kraftbilt
8. LEM Products, Inc.
9. Markal Corp
10. National Band and Tag Co.
11. Panduit Corp.
12. Radar Engineers Div., EPIC Corp.
13. Seton Name Plate Co.
14. Standard Signs, Inc.
15. W.H Brady, Co.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. Colored Conduit Systems for raceway identification:
   1. Factory-painted conduit and/or factory-painted couplings and fittings

B. Colored paint for raceway identification:
   1. Use Kwal Paint colors as specified in Part 3 – Execution.

C. Color Adhesive Marking Tape for Raceways, Wires and Cables:
   1. Self-adhesive vinyl tape not less than 3 mills thick by 1” to 2” in width.

D. Underground Line Detectable Marking Tape:
   1. Permanent, bright colored, continuous-printed, acid- and alkali-resistant plastic tape specifically compounded for direct-burial service. Not less than 6” wide by 4 mills thick.
   2. With metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.
   3. Printed legend indicative of general type of underground line below.

E. Wire/Cable Designation Tape Markers:
   1. Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with pre-printed numbers and letters.

F. Brass or Aluminum Tags:
   1. Metal tags with stamped legend, punched for fastener.
   2. Dimensions: 2” X 2” 19 gage.

G. Engraved, Plastic Laminated Labels, Signs and Instruction Plates:
   1. Engraving stock plastic laminate, 1/16” minimum thickness for signs up to 20 sq. in. or 8” in length; 1/8 “ thick for larger sizes. Engraved legend in 1/4” high white letters on black face and punched for mechanical fasteners.

H. Arc-flash Hazard Labels:
   1. ANSI Z535.4 Safety Label.
   2. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.
   3. Dimensions: 5” x 3.5”
   4. Information contained: Arc-flash boundary; Voltage; Flash Hazard Category; Incident Energy (arc rating); checkboxes for the required Personal Protective Equipment (PPE) and the date that the calculations were performed.

I. Equipment Labels:

1. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.
2. Dimensions: minimum 5” x 2”
3. Conductor-Identification-Means Labels:
    a. Information contained: the method utilized for identifying ungrounded conductors within switchboards, distribution panels and branch circuit panels.
4. Available-Fault-Current Labels:
    a. Information contained: maximum available fault current at the respective piece of equipment, and date of calculation of fault current.
5. Source-of-Supply Labels:
    a. Information contained: indicate the device or equipment where the power supply originates.

J. Baked Enamel Warning and Caution Signs for Interior Use:
1. Preprinted aluminum signs, punched for fasteners, with colors legend and size appropriate to location.

K. Fasteners for Plastic-Laminated and Metal Signs:
1. Self-tapping stainless steel screws or # 10/32 stainless steel machine screws with nuts, flat and lock washers.

L. Cable Ties:
1. Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18” minimum width, 50-lb. Minimum tensile strength, and suitable for a temperature range from minus 40° F. to 185° F. Provide ties for specified colors when used for color coding.

M. Colored Support Wires:
1. When electrical equipment/wiring is supported by wires within the ceiling cavity, these wires shall be independent of the ceiling support assembly and shall be distinguishable by painting entire length in bright yellow.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Lettering and Graphics:
1. Coordinate names, abbreviations, colors and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering and colors as approved in submittals and as required by code.

B. Install identification devices in accordance with manufacturer’s written instructions and requirements of NEC.

C. Sequence of Work:
1. Where identification is to be applied to surfaces that require a finish, install identification after completion of finish work.

D. Conduit Identification:
1. Identify Raceways of Certain Systems with Color Coding. Acceptable means of color identification are as follows:
    a. Factory-painted conduit.

b. Band exposed or accessible raceways of the following systems for identification. Bands shall be pre-tensioned, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side. Install bands at changes in direction, at penetrations of walls and floors, and at 40-root maximum intervals in straight runs. Apply the following colors:

i. Fire Alarm System: Red

ii. Sound/IC: Yellow

iii. Data: Blue

iv. MATV: Black

v. Security: Orange

vi. Legally Required Emergency Systems: Red with Black Stripe (Per NEC 700.10(A))

2. Identify Junction, Pull and Connection Boxes.

a. Code-required caution sign for boxes shall be pressured-sensitive, self-adhesive label indication system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers on outside of cover with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

3. Label and paint the covers of the systems junction boxes as follows:

SYSTEM	COLOR (ALL COLORS ARE KWAL PAINT)	
Fire Alarm	Red Alert	AC118R
Sound/IC	Competition Yellow	7225A
Security	Fiesta Orange	AC107Y
Data	Neon Blue	7076A
MATV	Flat Black	
Legally Required EM System	Red/Black Stripe	

E. Underground Electrical Line Identification.

1. During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground line detectable marking tape, located directly above line at 6 to 8 inches below finished grade. Where multiple lines are installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

2. Install detectable marking tape for all underground wiring, both direct-buried and in raceway.

3. Provide red marker dye applied to concrete encased ductbank.

F. Conductor Color Coding.

1. Provide color coding for secondary service, feeder and branch circuit conductors throughout the project secondary electrical system as follows:

CONDUCTOR	208Y / 120V System	480Y / 277V System

Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Shared/Single Neutral	White	Gray
Neutral A (dedicated)	White w/Black Stripe	Gray w/Black Stripe
Neutral B (dedicated)	White w/Red Stripe	Gray w/Orange Stipe
Neutral C (dedicated)	White w/Blue Stripe	Gray w/Yellow Stipe
Equipment Ground	Green	Green
Isolated Ground	Green w/Yellow Strip	Green w/Yellow Stripe

2. Switch legs, travelers and other wiring for branch circuits shall be of colors other than those listed above.
3. Use conductors with color factory applied the entire length of the conductors except as follows:
    a. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
    b. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
    c. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

G. Power Circuit Identification.

1. Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb monofilament line or one-piece self-locking nylon cable ties.
2. Tag or label conductors as follows:
    a. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicting source and circuit numbers.
    b. Multiple Circuits: Where multiple branch circuits or control wiring or communications/ signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs,

and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

H. Apply warning, caution and instruction signs and stencils as follows:

1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items. Warning and caution signs shall be furnished and installed on, but not be limited to the following equipment and locations:

a. Entrances to rooms and other guarded locations that contain exposed live parts 600 volts or less; signs shall forbid unqualified personnel to enter.

b. Switch and Overcurrent device enclosures with splices, taps and feed-through conductors. Provide warning label on the enclosures that identifies the nearest disconnecting means for any feed-through conductors.

c. Entrances to buildings, vaults, rooms or enclosures containing exposed live parts or exposed conductors operating at over 600 volts: DANGER-HIGH VOLTAGE-KEEP OUT.

d. Metal-enclosed switchgear, unit substations, transformers, enclosures, pull boxes, connection boxes and similar equipment operating at over 600 volts shall have appropriate caution signs and warning labels.

e. Indoor and Outdoor substations operating over 600 volts. Provide warning signs, instructional signs and single-line diagrams in accordance with NEC 225.70.

I. Emergency Operating Signs: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

J. Install equipment/system circuit/device identification as follows:

1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/4"-high lettering on 1-inch-high label (1 1/2-inch-high where two lines are required) white lettering in black field. White lettering in red field for Emergency Power Systems. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.

a. Each service disconnect, to identify it as a service disconnect.

b. Panelboards (exterior and interior), electrical cabinets, and enclosures. For subpanels, identify feeder circuit served from.

c. Switches in fusible panelboards shall be labeled. Main switches shall be identified.

d. Access doors and panels for concealed electrical items.

e. Electrical switchgear and switchboards.

f. Motor control centers.

g. Motor starters, including circuit origination, HP, heater size, FLA, and mechanical equipment designation.

h. Disconnect switches.

i. Pushbutton stations.

j. Power transfer equipment.

k. Contactors.

l. Dimmers.

m. Control devices.

n. Transformers.

o. Power generating units, to include transfer switches.

p. Telephone switching equipment.

q. Clock/program master equipment.

r. Call system master station.

s. TV/audio monitoring master station.

t. Fire alarm master station or control panel.

u. Busduct – Label all cable tap boxes, bus plug-in units, etc. with plastic laminate labels designating load served.

v. Variable frequency drives.

w. Lighting Control Equipment.

x. Uninterruptable Power Supply.

K. Post Conductor-Identification-Means labels at locations of switchboards, distribution panels and branch circuit panels. The labels shall identify the color-coding used on ungrounded conductors for each voltage system used on the premises.

L. Apply Available-Fault-Current labels at the service entrance equipment.

M. Apply Source-of-Supply labels on the exterior covers of equipment (except in single- or two-family dwellings) as follows:

1. Each switchboard supplied by a feeder.

2. Each branch circuit panelboard supplied by a feeder.

3. Each disconnect switch serving elevators, escalators, moving walks, chairlifts, platform lifts and dumbwaiters.

4. Each dry type transformer (or primary-side disconnect switch at transformer). If the primary-side disconnect is remote from the transformer, both the remote disconnect and the transformer shall be labeled, and the transformer label shall also indicate the location of the disconnect.

5. Each feeder disconnect, branch circuit disconnect, panelboard or switchboard in a remote building or structure.

6. Each on-site emergency power source, with sign placed at service entrance equipment to comply with NEC 700.

N. The label shall identify the device or equipment where the power supply originates, and the system voltage, phase or line and system at all termination, connection and splice points. For example: Feeder Power Supply for Panel “XX” Originates at Panel “XX” (or Switchboard “XX”, Transformer “XX”, Switch “XX”, etc.); 120/208 volts, 3-phase, Phase Color Identification (or 120/240, 277/480, etc.).

O. Install Arc-flash hazard labels on the following equipment:

1. Each piece of service entrance equipment.
2. Each power distribution switchboard or panel.
3. Each individually mounted circuit breaker.
4. Each branch circuit panelboard.
5. Each motor control center.
6. Each individually mounted motor starter.
7. Each meter socket enclosure.

P. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere.

Q. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

R. Engrave all receptacle plates other than those serving 120 volt, single phase devices. State voltage and amperage characteristics: Example; “208V 30A”.

S. Mark each device box (for each type of wiring device) with a permanent ink felt tip marker, indicating the circuit that the device is connected to: Example; “CKT A-1”

T. Label circuit breaker feeding fire alarm panel “Fire Alarm Circuit”. Using plastic laminate label, white lettering on a red background.

END OF SECTION 26 0553

SECTION 26 0943

LIGHTING CONTROL EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent of lighting control equipment work is indicated by drawings and schedules, and is hereby defined to include, but not by way of limitation, lighting control panels, control stations and other user interface devices, wiring and ancillary equipment.

B. Types of lighting control equipment specified in this section, includes the following:

1. Low voltage relay control panels
2. Occupancy sensors
3. Daylight sensors
4. Wallstations/Switches
5. Lighting Load Controllers (Room Controllers)
6. Emergency Lighting Control Units/Generator Transfer Devices

C. Requirements are indicated elsewhere in these specifications for work including but not limited to raceways, electrical boxes and fittings required for installation of lighting control equipment, not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. To ensure a uniform installation and single responsibility, all switching and dimming equipment described herein shall be supplied by a single manufacturer.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with lighting control equipment installation work similar to that required for project.

C. NEC Compliance: The control system shall comply with all applicable National Electrical Codes regarding electrical wiring standards.

D. NEMA Compliance: The control system shall comply with all applicable portions of the NEMA Standard regarding the types of electrical equipment enclosure.

E. Codes and Standards: Provide units that meet the requirements of IEEE Std. 2000.1.1999.

F. Independent Testing Laboratory: Provide units that have been tested and listed under UL 916 energy management equipment.

G. Component Pre-testing: All control equipment shall undergo strict inspection standards. The equipment shall be previously tested and burned-in at the factory prior to installation.

1.4 SUBMITTALS:

A. Refer to Section 26 0502 for electrical submittal requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide lighting control equipment of one of the following;

1. Acuity nLight Controls
2. Greengate lighting
3. Hubbell lighting

B. Manufacturer's representative for division 26 and bidding controls shall be accountable for the comprehensive lighting controls package's finalization in alignment with the design intent depicted in the drawings and complying with IECC 2021 requirements. The lighting representative is required to develop detailed shop drawings demonstrating the lighting control system's topology and the essential connections necessary for its proper functioning. Lighting control devices shown are to provide general intent only. Manufacturers representative to provide all additional devices and modify device locations as required to meet IEC 2021 requirements

2.2 SYSTEM DESCRIPTION:

A. The lighting control system shall provide seamless control and monitoring of all lighting included in the scope of work regardless of whether it is relay switched or dimmed.

B. The lighting control system shall consist of low voltage relay control panels with programmable switch inputs, the panel shall be microprocessor controlled with a touchscreen interface display. The touchscreen shall provide relay status information viewable through a protected windowed enclosure. All local programming shall be permissible through the self-prompting touchscreen.

C. Programmable intelligence shall include:

1. Time of day control (64 time-of-day/holiday schedules)
2. 32 holiday dates
3. Timed inputs (adjustable from 1 to 99 minutes)
4. Timed override (from touchscreen, adjustable from 1 to 999 minutes, then resumes normal schedule)
5. Pre-set controls
6. Auto daylight savings adjust
7. Low voltage Dimming/Central Dimming Controls:
    a. 0-10V dimming capability
    b. Daylighting control via 0-10V dimming relays and programming
    c. DMX or other dimming protocols as indicated on plans

8. Astronomical clock with offsets
9. Local control (from touchscreen and local switch)
10. Digital wallstations/switches
11. Flash warning of impending off for occupants
12. Network override

D. The controller shall permit lighting to be overridden on for after-hours use or cleaning. The controller shall provide priority and masking choices to allow for customizing the functions of switch inputs, thereby enabling wallstations/switches to function differently at different times of day. These overrides shall be digital, network or hard-wired inputs.

E. The lighting control system shall be fully programmable through PC programming software. Programming shall be permitted through a direct RS-232 connection, modem or TCP/IP.

1. Shall include with user-friendly software suitable for operation on computer workstations which serve as central control stations for the selection and operation of lighting scenes.

2. All software shall be programed by the vendor and delivered ready to use. This program shall include preparation of all graphics, and displays required as a part of this project.

F. The control system shall provide networking between lighting control panels. The network shall support up to a maximum of 254 control panels. Panels shall permit data sharing for global controls. All inputs shall be transferable over the network to create any switching pattern.

G. The lighting control system shall log all control events. Log reports shall be available through the integral touchscreen or enterprise software.

H. All lighting programing shall meet the requirements of the IECC 2018 or current energy code applied to the project.

2.3 EQUIPMENT:

A. Room Controllers:

1. The room controller shall provide the following functionality;
   a. Provide interface with room occupancy sensor to provide lighting and receptacle control and be programmable as either manual on/automatic off. Provide interface with room wallstations to provide multi-level switching and/or variable dimming. Provide interface with daylight sensors to provide daylighting controls of lighting fixture via multi-level (step dimming) and/or variable dimming.
2. The room controller shall be a fully functional lighting control system to match the room lighting and control requirements. The controller shall provide the following features:
   a. Separate compartments for line voltage, emergency voltage and low voltage connections.
   b. Breakouts for direct conduit connections.
   c. Dual voltage (120/277 VAC)

d. Low voltage connections using standard RJ-45 connectors.

e. Zero cross circuitry for each load.

f. Relay and 0-10V dimming zone configuration to match room requirements.

g. The ability to be independently program or be re-programmed on site and without the need to replace or send the device to the manufacturer for re-programming.

3. Emergency Lighting: When the room controller is provided with emergency relay, the controller shall be UL 924 Listed and monitor the normal power circuit. The UL 924 relay will track the normal power operation. Upon loss of normal power the emergency lighting will be forced on to full bright (if dimming) until normal power is restored. The following features shall be included:

   a. 120/277 VAC

   b. Push-to-test

4. Daylight sensors shall work with the room controller to provide automatic daylight dimming capabilities for loads connected to the room controller. The daylight sensor shall include the following features:

   a. An additional photodiode that measures only the visible spectrum.

   b. The sensor shall have three light level ranges;

      i. Low (3-300 LUX), high (30-3000 LUX) and direct sun (300-30,000 LUX).

   c. The sensor shall provide the capability of controlling multiple (up to three) daylight zones for dimming daylight harvesting.

   d. The sensor shall include an internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.

5. Ceiling Mounted Occupancy Sensors: Sensors shall utilize dual-technology (ultrasonic and infrared technologies) and have the following additional features:

   a. Sensor shall be class 2, low voltage; capable of mounting in the ceiling for maximum coverage.

   b. Sensor shall have automatic self-adjustment algorithm that adjusts timer and sensitivity settings to maximize performance and minimize energy usage.

   c. Sensor shall have 360 degree field of view.

   d. Sensor shall incorporate non-volatile memory such that all settings and parameters are saved in protected memory.

   e. Sensor shall have time delays from 10 to 30 minutes.

   f. Sensor shall provide a visual means of indication that motion is being detected via an LED.

   g. Sensors shall have readily accessible, user adjustable settings for time delay and sensitivity.

   h. Provide internal additional isolated relay with NO, NC and common outputs for use with HVAC control, data logging and other control options.

6. Wallstations: Provide low voltage push-button type switches up to 8 button configurations to match requirements of lighting control within the room. Provide factory engraved labeling for individual push buttons. Provide in a color to match wiring devices and coverplates to match devices and plates in Wiring Devices

(Section 26 2726). Wallstation shall connect to the room controller via the room controller local network. Wallstations that require user interface to allow for raise/lower control of dimming, loads shall include a slider function or similar. All wallstations shall have the ability to be independently program or be re-programmed on site and without the need to replace or send the device to the manufacturer for re-programming.

B. Emergency Power Control (CEPC)/ Emergency Lighting Control Units (ELCU)/Generator Transfer Devices (Required when not built into Room Controller, Relay Panel, etc):

1. The Emergency Power Control (CEPC)/Lighting Control Unit (ELCU) shall provide all required functionality to allow any standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building. The unit shall be installed flush to the ceiling so that test switch & LED's are in plain view of room occupants as required by some local electrical codes.

2. The device shall automatically illuminate connected emergency loads upon utility power interruption, regardless of room switch position. (NEC 700.24)

3. Local room switch or lighting control shall turn both regular & emergency luminaires on at the same time (no dedicated emergency room switch required).

4. The emergency lighting control unit shall allow control of emergency lighting fixtures in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.

5. The unit shall be compatible with 2-wire, 3-wire, 0-10V, & DALI dimming systems & ballasts.

6. The device shall be self-contained, measure 1.70" x 2.97" x 1.64," and provide integral one half inch pip nipple mount with snap in locking feature for mounting into a standard junction box KO.

7. The device shall have normally closed dry contacts capable of switching 20 amp emergency ballast loads @ 120-277 VAC, 60 Hz, or 10 amp tungsten loads @ 120 VAC, 60 Hz.

8. The device shall have universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.

9. The device shall have an integral momentary test switch. Pressing and holding this switch shall instantly force the unit into emergency mode and turn on emergency lighting. Releasing the test switch shall immediately return the unit to normal operation.

10. The unit shall provide dedicated leads and 24 VDC source for connection to remote test switch, fire alarm system, or other external system capable of providing a normally closed dry contact closure. Breaking contact between the terminals shall force and hold the emergency lighting on until the terminals are

again closed. An integral LED indicator shall indicate the unit's current remote activation status.

11. The device shall provide separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency).

12. The device's normal power input lead shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.

13. The unit shall automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.

14. The unit shall utilize zero crossing circuitry to protect relay contacts from the damaging effects of inrush current generated by switching electronic ballast loads.

15. The unit shall have UL 94-V0 or UL 94-5VA flame rating & be approved for installation above the suspended ceiling.

16. To ensure quality and reliability, the unit shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

17. The device shall not generate any objectionable electrical or mechanical noise.

18. The unit shall be UL and cUL listed and labeled for connection to both normal and emergency lighting power sources.

PART 3 - EXECUTION:

3.1 INSTALLATION OF LIGHTING CONTROL EQUIPMENT:

A. Install lighting control system components and ancillary equipment as indicated, in accordance with equipment manufacturers written instructions, and with recognized industry practices, to ensure that lighting control equipment complies with requirements.

B. Comply with Requirements of NEC, and applicable portions of NECA's 'Standard of Installation' pertaining to general electrical installation practices.

C. Coordinate with other electrical work, including raceways, electrical boxes and fittings, as necessary to interface installation of lighting control equipment work with other work.

D. Electrical Identification: Refer to Section 26 0553 for requirements.

3.2 FIELD QUALITY CONTROL:

A. Upon completion of installation and after circuitry has been energized, demonstrate capability and compliance of system with requirements.

B. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

3.3 PRODUCT SUPPORT AND SERVICES:

A. System Start-Up: Provide a factory authorized technician to verify the installation, test the system, and train the owner on proper operation and maintenance of the system. Before requesting start-up services, the installing contractor shall verify that:

1. The control system has been fully installed in accordance with manufacturer's installation instructions.
2. Low voltage wiring for overrides and sensors is completed.
3. Accurate 'as-built' load schedules have been prepared for each lighting control panel.
4. Proper notification of the impending start-up has been provided to the owner's representative.
5. Programming of all wallstations/switches, relays, groups of relays and interfaces with building automation shall be completed by factory authorized technician, prior to final and training.

B. Factory support: Factory telephone support shall be available at no cost to the owner during the warranty period. Factory assistance shall consist of assistance in solving programming or other application issues pertaining to the control equipment. The factory shall provide a toll free number for technical support.

3.4 PROGRAMMING:

A. Program of all lighting control systems as directed by the electrical engineer and/or owner. Meet with the electrical engineer at their office prior to preparation of shop drawings to discuss specific programming and zoning requirements of system(s). Each networked or standalone system shall be programmed to revert back to its normal "ON" position one hour after selecting a scene or raising or lowering a lighting zone.

B. All lighting programing shall meet the requirements of the IECC 2021 or current energy code applied to the project.

C. Integrate lighting controls into classroom or room AV touch Screen and Shade Controller. Provide interface as required. Coordinate with AV integrator to integrate with Touch Panel and GUI within the room. Lighting shall provide multiple presets and slider control options.

1. Sensors can be used to trigger automated settings for shades and projector screens based on room occupancy, ambient light level, etc.

2. Program lighting and shades, per owner's requirements, to operate in accordance with the defined lighting presets within the space.

3.5 COMMISSIONING:

A. A lighting control system requires at least one site visit for proper commissioning. If multiple site visits are required, the first ensures that the contractor is trained to install the system correctly. On the second, the factory trained engineer will start up the system, ensure that it is operating according to specification, and perform initial programming. The third visit is for the purposes of refining the programming, and training the owner/end

user on the system.

B. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:

1. Certified by the equipment manufacturer on the system installed.

2. Site visit activities:

a. Verify connection of power feeds and load circuits.

b. Verify connection of controls.

c. Verify system operation control by control, circuit by circuit.

d. Obtain sign-off on system functions.

e. Demonstrate system capabilities, operation and maintenance and educate Owner's representative on the foregoing.

3. At least three site visits to accomplish the following tasks:

a. Prior to wiring:

i. Review and provide installer with instructions to correct any errors in the following areas:

1. Low voltage wiring requirements

2. Separation of high and low voltage wiring runs

3. Wire labeling

4. Load schedule information

5. Switching cabinet locations and installation

6. Physical locations and network addresses of controls

7. Ethernet connectivity

8. Computer-to-network connections

9. Load circuit wiring

10. Connections to other systems and equipment

11. Placement and adjustment of Occupancy Sensors

12. Placement and adjustment of Photocells

b. After system installation:

i. Check and approve or provide correction instructions on the following:

1. Connections of power feeds and load circuits
2. Connections and locations of controls
3. Connections of low voltage inputs
4. Connections of the data network

ii. Turn on system control processor and upload any pre-programmed system configuration

iii. Verify cabinet address(es)

iv. Upload pre-programmed system configuration and information to switching and/or dimming cabinets

v. Check load currents and remove bypass jumpers

vi. Verify that each system control is operating to specification

vii. Verify that each system circuit is operational according to specification

viii. Verify that manufacturers' interfacing equipment is operating to specification

ix. Verify that any computers and software supplied by the manufacturer are performing to specifications

x. Verify that any remote WAN (Wide Area Network) connections are operating properly

xi. Have an owner's representative sign off on the above-listed system functions

c. Before project completion and hand-off:

i. Demonstrate system capabilities and functions to owner's representative

ii. Train owner's representative on the proper operation, adjustment, and maintenance of the system.

C. Notification: Upon completion of the installation, the contractor shall notify the manufacturer that the system is ready for formal checkout. Notification shall be given in writing a minimum of 21 days prior to the time factory-trained personnel are required on site. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to manufacturer prior to scheduling commissioning activity. Manufacturer shall have the option to waive formal turn-on.

D. Turn-On: Upon completion of all line, load and interconnection wiring, and after all

fixtures are installed and lamped, Manufacturer's Certified Technician shall completely check the installation prior to energizing the system. Each installed relay system shall be tested for proper ON/OFF operations, and proper LED illumination. Each installed control cabinet shall be tested verifying that each controlled load adjusts to the selected setting and that all switch LED's illuminate properly.

E. Provide written commissioning report including space/room names and numbers indicating list of all lighting equipment and devices tested and verifying proper operation of the system. Report shall include corrections, programming information/file, warranties, and owner's representative sign off on the above-listed system functions

F. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

3.6 RETRO-COMMISSIONING:

A. During the one year warranty period, provide retro-commissioning services at three month, six month, nine month, and one year marks. Provide at least 4 hours of commissioning service for each of the four retro-commissioning periods. This will include meeting with the Owner to receive feedback on the system and making changes to the system including programming, task tuning.

3.7 MAINTENANCE:

A. Enable the end user to order new equipment for system expansion, replacements, and spare parts.

B. Make new replacement parts available for a minimum of ten years from the date of manufacture.

C. Manufacturing shall provide telephone technical support by factory personnel 24 hours a day, 7 days a week. Project cost overruns and delays can occur without this service. Answering services can add to frustration and delay the resolution of any problems or issues. Manufacturers who do not offer factory-direct technical support on a 24/7 basis should not be acceptable on this project.

D. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.

E. Offer renewable annual service contracts, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system commissioning.

3.8 WARRANTY:

A. Manufacturer shall provide a one (1) year limited warranty on lighting control system. A ten (10) year limited warranty shall be provided on the lighting control relays.

3.9 AS-BUILT DRAWINGS:

A. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.

B. Provide a CD or USB storage (media) device to the owner containing the information specified below. The media shall include all information required to allow the Owner to

change the schedules themselves. The media shall contain a minimum of following:

1. CAD drawing files of ‘as-built’ lighting control components and point to point connections.
2. General configuration programming.
3. Job specific configuration programming to include schedule.
4. Tutorial file on complete programming of lighting control system.

END OF SECTION 26 0943

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SECTION 26 2726

WIRING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK:

A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems that are intended to carry but not utilize electric energy.

B. Types of electrical wiring devices in this section include the following:

1. Receptacles
2. Switches
3. Cord caps
4. Cord connectors

1.3 QUALITY ASSURANCE:

A. Comply with NEC and NEMA standards as applicable to construction and installation of electrical wiring devices. Provide electrical wiring devices that have been UL listed and labeled.

1.4 SUBMITTALS:

A. Refer to Section 260502 for electrical submittal requirements.

PART 2 - PRODUCTS

2.1 FABRICATED WIRING DEVICES:

A. GENERAL:

1. Provide factory-fabricated wiring devices, in types, and electrical ratings for applications indicated and complying with NEMA Stds. Pub No. WD 1.

B. Provide wiring devices (of proper voltage rating) as follows:

	RECEPTACLE	SWITCHES			
MFGR		1-POLE	3-WAY	4-WAY	W-PILOT
Hubbell	BR20XTR	HBL 1221	HBL 1223	HBL 1224	HBL 1221-PL
Bryant		1221	1223	1224	1221-PL

Pass Seymour	TR63X	20AC1	20AC3	20AC4	20AC1-RPL
Leviton	TWR20-X	1221	1223	1224	
Cooper	TR5362	1221	1273	1224	1221-PL

C. Provide devices in colors selected by Architect. Provide red devices on all emergency circuits.

D. SURGE PROTECTIVE (SPD) RECEPTACLES:

1. Provide SPD receptacles having 4 series parallel 130V MOV's capable of a minimum of 140 joules suppression. Provide units with visual (and audible) surge status indicators to monitor condition of surge circuit; visual indicator to be "on" when power present and suppression circuit is fully functional. (Audible indicator shall sound a "beep" alarm approximately every 30 seconds if suppression circuit has been damaged.) Provide NEMA 5-20R, 20 amp, 125V receptacle of one of the following manufacturers:

	MANUFACTURER	
SPECIFICATION GRADE	HUBBELL	PASS SEYMOUR
Duplex Recept-Visual only	5350	5352 XXXSP
Duplex Recept-Visual/Audible	5352	5362 XXXSP
Single Recept-Visual only	5351	N/A
Duplex Recept-Isol Gnd, Visual/Audible	IG5352S	IG5362 XXXSP
Single Recept-Isol Gnd, Visual only	IG5351S	N/A
HOSPITAL GRADE	HUBBELL	PASS SEYMOUR
Duplex Recept-Visual/Audible	8300HS	8300 XXXSP
Single Recept-Visual only	8310HS	N/A
Duplex Recept-Isol Gnd, Visual/Audible	IG8300HS	IG8300 XXXSP
Single Recept-Isol Gnd, Visual only	IG8310HS	N/A

2. Provide (1) SPD receptacle in all Flat Panel Display Wall Boxes (‘DP’ symbol)

3. Color of devices selected by Architect. Provide red devices on all emergency circuits.

E. GROUND-FAULT INTERRUPTER:

1. Provide general-duty, duplex receptacle, ground-fault circuit interrupters; feed-thru types, capable of protecting connected downstream receptacles on single circuit; grounding type UL-rated Class A, Group A, 20-amperes rating; 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; color as selected by Architect. Provide Hospital grade where required elsewhere by specification or drawings. Provide units of one of the following:

a. P&S/Sierra

b. Hubbell

c. Leviton

d. Square D

F. USB RECEPTACLE

1. Provide duplex receptacle with two (2) USB 3.0 amps, 5VDC, 2.0 Type A charging ports.

2. Provide products of one of the following:

a. Bryant – USB20-X
b. Cooper – TR7736-X
c. Hubbell – USB20X2-X
d. Legrand – TR5362USB-X
e. Leviton – T5832-X

G. TAMPER RESISTANT RECEPTACLES:

1. **Provide tamper resistant receptacles throughout the entire project**.
2. Provide products of one of the following:

a. Leviton-TWR20-X
b. Hubbell – BR20XTR
c. Pass Seymour – TR63X
d. Cooper – TR5362

H. WEATHER-RESISTANT RECEPTACLES

1. Provide weather-resistant receptacles in outdoor locations such as under roofed open porches, canopies, marquees, etc.
2. Provide products of one of the following:

a. Pass & Seymour 2095TRWRXXX.
b. Hubbell GFTR20XX

I. CORD CAPS AND CONNECTORS:

1. Provide 3, 4 and 5-wire grounding, cap plugs, and connectors of ampere and voltage rating required, for final equipment, and as indicated otherwise on drawings.
2. Provide products of one of the following:

a. Cooper
b. General Electric
c. Hubbell
d. Leviton
e. P&S

2.2 WIRING DEVICE ACCESSORIES:

A. WALL PLATES:

1. Provide stainless steel cover plates in all finished areas. Provide galvanized steel plates in unfinished areas. Provide blank coverplates for all empty outlet boxes.

B. WEATHER-PROTECTING DEVICE ENCLOSURES:

1. Where required for compliance with NEC 406-8 (receptacles installed outdoors for use other than with portable tools or equipment), provide weather-tight device covers that provide complete protection with the cord and cap inserted into the wiring device. Provide units that mount on either single or double gang devices.

2. Provide products of one of the following extra-duty low-profile expandable in-use weatherproof covers for exterior mounted installations:

a. Intermatic:

i.	WP7000W	Single-Gang/White Cover
ii.	WP7000G	Single-Gang/Gray Cover
iii.	WP7000BR	Single-Gang/Brown Cover
iv.	WP7200W	Double-Gang/White Cover
v.	WP7200G	Double-Gang/Gray Cover
vi.	WP7200BR	Double-Gang/Brown Cover

b. TayMac:

i.	ML500W	Single-Gang/White Cover
ii.	ML500G	Single-Gang/Gray Cover
iii.	ML500Z	Double-Gang/Brown Cover
iv.	ML2500G	Single-Gang/Gray Cover

c. Color chosen by architect.

3. Provide products of one of the following for roof mounted installations:

a. Intermatic WP1020 or WP1030

b. P&S WIUC10C or WIUC20c

PART 3 – EXECUTION

3.1 GENERAL

A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation" and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work. Install devices in boxes such that front of device is flush and square with coverplate. Drawings are small scale and, unless dimensioned, indicate approximate locations only of outlets, devices, equipment, etc. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate with other work. Verify all dimensioned items on job site. Consult architectural cabinet, millwork, and equipment shop drawings before

beginning rough-in of electrical work. Adjust locations of all electrical outlets as required to accommodate work in area, and to avoid conflicts with wainscoat, back splash, tackboards, and other items.

C. Where stranded conductors have been utilized, provide solid pigtails to terminate at device.

D. Provide receptacles in surface raceway at 12” on center unless indicated otherwise.

E. Install wiring devices only in electrical boxes that are clean; free from excess building materials, dirt, and debris.

F. Install blank plates on all boxes without devices.

G. Delay installation of wiring devices until wiring work and painting is completed. Provide separate neutral conductor from panel to each GFI receptacle.

H. Install GFI receptacles for all receptacles installed in the following locations:

1. Restrooms, locker rooms, kitchens, within 6 feet of any sink, or when serving vending machines and electric drinking fountains.

2. Indoor wet locations, non-dwelling garages, elevator rooms and pits.

3. Outdoors, and on rooftops.

4. Dwelling unit garages, crawlspaces and unfinished basements, accessory buildings, boathouses, and receptacles for boat hoists.

5. Label all receptacles (non-GFI), protected downstream of a GFI receptacle or protected by GFI circuit breaker, with an indication that it is protected.

I. Where light switches or wall box dimmers are specified, provide a separate neutral for each phase of the branch circuits that switches or dimmers are connected.

J. Electrical Identification: Refer to Section 260553 for requirements.

3.2 PROTECTION OF WALL PLATES AND RECEPTACLES:

A. At time of substantial completion, replace those items, that have been damaged, including those stained, burned and scored.

3.3 GROUNDING:

A. Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

3.4 TESTING:

A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 26 2726

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SECTION 26 2815

OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK:

A. Extent of overcurrent protective device work is indicated by drawings and schedules and specified herein. Overcurrent protective devices specified herein are for installation as individual components in separate enclosures; and for installation as integral components of switchboard and panelboards. See Section 262413, Switchgear and Switchboards, and Section 262416, Panelboards.

B. Contractor shall verify type and cost of all overcurrent protective devices required within existing gear and panelboards. Contractor shall include the necessary cost to provide devices within their bid.

C. Types of overcurrent protective devices in this section include the following for operation at 600 Volts and below:

1. Molded case thermal circuit breakers

D. Refer to other Division-26 sections for cable/wire and connector work required in conjunction with overcurrent protective devices.

1.3 QUALITY ASSURANCE

A. Comply with NEC requirements and NEMA and ANSI standards as applicable to construction and installation of overcurrent devices.

1.4 SUBMITTALS: Refer to Section 26 0503 for requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, provide products of one of the following (main and branch device manufacturer must be same as panelboard and/or switchboard manufacturer):

B. PROVIDE CIRCUIT BREAKERS WITHIN NEW AND EXISTING GEAR:

1. Siemens Energy & Automation, Inc.
2. Square D Company
3. Cutler Hammer Products, Eaton Corp.
4. GE/ABB (Existing Brand/System On-site)

C. MOLDED CASE THERMAL TRIP CIRCUIT BREAKERS:

1. Provide factory-assembled, molded case circuit breaker for power distribution panelboards and switchboards; and for individual mounting, as indicated. Provide breakers of amperage, voltage, and RMS interrupting rating shown, with permanent thermal trip and adjustable instantaneous magnetic trip in each pole. Series rated systems are not acceptable. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 degrees C. Provide with mechanical screw type removable connector lugs, AL/CU rated, of proper size to accommodate conductors specified.

2. Circuit breakers 15 amps through 599 amps shall be molded case thermal trip circuit breakers.

PART 3 – EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES:

A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with work as necessary to interface installations of overcurrent protective devices with other work.

C. Install fuses in overcurrent protective devices. For motor circuits, fuse sizes shown on drawings are for general guidance only. Size fuses in accordance with fuse manufacturer's recommendation for given motor nameplate ampere rating. Test operation. If nuisance tripping occurs, increase fuse size and disconnect device (if necessary) as required to provide nuisance free tripping. Adjust fuse size properly for ambient temperature, frequent starting and stopping of motor loads, and for loads with long start times. Include all costs in bid.

D. Electrical Identification: Refer to Section 260553 for requirements.

3.2 FIELD QUALITY CONTROL

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 2815

SECTION 26 4119

DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Special Provisions, Division 1 and Division-2 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to demolition.

1.2 DESCRIPTION OF WORK:

A. Extent of major items of demolition work is indicated by drawings. Other demolition work shall be performed as required to maintain system operation.

B. The intent of the drawings is to indicate major items affected and not to show every device, outlet, fixture, etc. affected by demolition work.

C. The drawings do not necessarily reflect as-built conditions. The contractor shall visit the jobsite prior to bidding to determine the overall scope of demolition work.

D. Refer to sections of other Divisions for applicable requirements affecting demolition work.

E. Refer to Section 260500 for requirements with regard to power outages affecting the operation of existing electrical systems.

1.3 QUALITY ASSURANCE:

A. NEC COMPLIANCE:

1. Comply with applicable portions of NEC as to methods used for demolition work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL:

A. Demolition work shall be laid out in advance to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary, perform with care, use skilled mechanics of the trades involved. Repair damage to building and equipment. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting of structural members shall not be permitted.

3.2 PATCHING AND REPAIR

A. The Contractor is responsible for all demolition, patching and repair of all finished interior surfaces pertaining to the installation of this particular phase of work. All surfaces shall be finished (painted, etc.) to match the adjacent materials, finishes and colors.

B. Hard surfaces: Whenever demolition or excavation is required for the installation of the electrical system, it shall be the responsibility of this contractor to make repairs and/or replacements of hard finish surfaces such as concrete, asphalt, roofing, etc.

C. The method of patching and repair shall follow good construction practices and all finished surfaces shall match materials and finish wherein the demolition occurred.

3.3 EXISTING EQUIPMENT

A. The following is a part of this project and all costs pertaining thereto shall be included in the base bid.

B. The new electrical equipment and apparatus shall be coordinated and connected into the existing system as required. Auxiliary systems shall comply, unless otherwise specified.

C. The existing electrical devices, conduit and/or equipment that for any reason obstructs construction shall be relocated. Provide conduit, wiring, junction boxes, etc. as required to extend existing circuits and systems to relocated devices or equipment.

D. The new fixtures indicated for existing outlets shall be installed in accordance with the fixture specifications.

E. When installing equipment in the existing building, it shall be concealed.

F. All existing electrical equipment and systems in portions of the building not being remodeled shall be kept operational, in service and in working condition throughout the entire construction period. Restore any circuits and systems interrupted. Provide temporary panels, temporary wiring and conduit, etc. as required.

G. Maintain circuit integrity and continuity of all existing circuits and systems that interfere with or are interrupted by remodel work unless those circuits are to be abandoned completely. Maintain all circuits and systems in operation during construction. Provide temporary panels, temporary wiring and conduit, etc. as required.

H. Existing raceways may be used where possible in place, except as noted. All circuits, conduit and wire that are not used in the remodeled area shall be removed back to the panelboard, where it shall be labeled a spare with circuit number indicated. Re-used raceway shall meet all requirements for new installations.

I. The existing light fixtures that are not used in the remodeled area shall be carefully removed, and turned over to the owner or properly disposed of. Those fixtures indicated for re-use shall be thoroughly cleaned, repaired as required, re-lamped and installed as indicated.

J. Move and adjust existing lighting as required for demolition and construction.

K. Obtain permission from the Architect and Owner's representative before penetrating any ceiling, floor, and wall surfaces.

L. Any and all equipment having electrical connections that require disconnecting and reconnection at the same or another location throughout the course of construction shall be included as part of this contract.

END OF SECTION 26 4119

SECTION 26 5100

INTERIOR AND EXTERIOR BUILDING LIGHTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Types of lighting fixtures in this section are indicated by schedule and include the following:

1. LED (Light Emitting Diode)

1.3 QUALITY ASSURANCE:

A. Comply with NEC, NEMA and ANSI 132,1 as applicable to installation and construction of lighting fixtures. Provide lighting fixtures that have been UL-listed and labeled.

B. Components and fixtures shall be listed and approved for the intended use by a National Recognized Testing Laboratory (NRTL) including: UL, ETL, and CSA or equivalent

C. All led products shall comply with the latest version of Illuminating Engineer Society (IES) publications LM-79 and LM-80.

1.4 SUBMITTALS:

A. Refer to Section 260502 for electrical submittal requirements.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, provide products of one of the following (for each type of fixture):

1. LED:

a. Cree

b. Nichia

c. Samsung

d. Philips Lumiled

e. Osram

f. Xicato

2.2 INTERIOR AND EXTERIOR LIGHTING FIXTURES:

A. GENERAL:

1. Provide lighting fixtures, of sizes, types and ratings indicated complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts,

LED drivers, starters, and wiring. Label each fixture with manufacturer's name and catalog number. Provide all enclosed fixtures with positive latch mechanisms; spring tension clips not acceptable. Provide all exterior fixtures with damp or wet location label as required by application.

B. SUPPORT REQUIREMENTS:

1. Provide all pendant and stem hung fixtures with flexible ball joint hangers at all points of support. Equip hooks used to hang fixtures with safety latches. Provide all detachable fixture parts, luminous ceiling accessories, louvers, diffusers, lenses, and reflectors with locking catches, screws, safety chain, or safety cable.

C. LIGHT EMITTING DIODE (LED) LUMINAIRES:

1. LED luminaires that can be serviced in place shall have a disconnecting means internal to the luminaries to disconnect simultaneously from the source of supply all conductors of the driver, including the grounded conductor. Disconnects shall not be required under the following exceptions:

a. Luminaries located in hazardous locations.

b. Luminaries used for egress lighting.

c. Cord-and-plug luminaries.

d. In industrial establishments with restricted public access where conditions of maintenance and supervision ensure that only qualified persons service the installation.

e. Where more than one luminaire is installed in a space and where disconnecting the supply conductors to the luminaire will not leave the space in total darkness.

f. Provide LED luminaires which are tested in accordance with IES LM-79, diodes tested in accordance with IES LM-80, and provide a minimum R9 rating of ≥ 50 (unless specified differently), a CRI rating of ≥ than 80 and L70 (6K) = 50,000 hours (IES TM-21). Provide with 0-10V dimming drivers as standard.

g. The fixture manufacturer(s) shall warrant the luminaires, in their entirety, to be free from defects in material or workmanship for at least 5 years from date of manufacture. Provide warranty in accordance with other sections of this specification and include a certificate of warranty from the fixture manufacturer with extended warranty information and proper forms and procedure description.

D. DIFFUSERS:

1. Where plastic diffusers are specified, provide 100 percent virgin acrylic compound; minimum thickness, .125 inches.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standards of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Coordinate with other work as appropriate to properly interface installation of lighting fixtures with other work. Consult architectural reflected ceiling plan for exact location of all

lighting fixtures.

C. Provide all necessary supports, brackets, and miscellaneous equipment for mounting of fixtures. Support all ceiling mounted fixtures from the building structure; independent of the ceiling system, unless noted. Support each recessed fixture (fluorescent incandescent, and/or HID) from the building structure with #12 ga. steel wire attached to each corner (in addition to supports normally provided for attachment to the ceiling system). Provide backing supports above (or behind) sheetrock, plaster and similar ceiling and wall materials. Support surface mounted ceiling fixtures from channel. Support ceiling mounted outlet boxes independent of the raceway system, and capable of supporting 200 pounds. Feed each recessed fixture directly from an outlet box with flex conduit as required; do not loop from fixture to fixture. See plans for additional details.

D. FIXTURE WHIPS:

1. Provide each lay-in light fixture with at least 36" (Not to exceed 72") of 3/8" steel flexible conduit.

2. With-in spaces utilizing 0-10v control schemes ie: Room Controllers, the fixture whip shall be comprised of a MC-PCS Cable (see Section 26 0532 Conduit raceways) with at least 36” and not to exceed 72” in length located above removable grid ceilings.

E. Coordinate lighting in mechanical room with duct and equipment locations to avoid obstruction of illumination.

F. Provide gypsum board protection as required, (acceptable to fire official having jurisdiction) to ensure fire rating of each ceiling that the fixtures are installed in.

G. COORDINATION MEETINGS:

1. Meet at least twice with the architect and ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each light fixture mounting condition with ceiling type. During second meeting, coordinate fixture layout in each area.

a. Coordinate mounting height of pendant and wall mounted fixtures.

b. Coordinate conduit layout in all open ceiling spaces e.g. Gym, Commons, Auditorium, etc. with architect prior to rough-in.

2. Meet at least twice with the AV/Intercom systems Installer. Hold first meeting before submittal of shop drawings to coordinate each AV equipment, speaker mounting condition with ceiling type. During second meeting, coordinate AV equipment, speaker layout in each area.

3. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all fixtures and duct work in all areas.

H. ADJUST AND CLEAN:

1. Clean lighting fixtures of dirt and debris upon completion of installation.

2. Protect installed fixtures from damage during remainder of construction period. Repair all nicks and scratches to appearance of original finish.

3.2 FIELD QUALITY CONTROL:

A. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements.

B. Where possible, correct malfunctioning units at site, then retest to demonstrate

compliance; otherwise remove and replace with new units, and proceed with retesting.

C. At the time of Substantial Completion, replace lamps in interior lighting fixtures that are observed to be noticeably dimmed after the Contractor's use and testing, as judged by Architect/Engineer.

D. GROUNDING:

1. Provide equipment grounding connections for each lighting fixture.

END OF SECTION 26 5100

CANYONS School District

Canyons School District

Network Cabling Global Specification

Information Technologies

Final Draft
Wednesday August 31, 2018

Scot McCombs
Director of IT

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CANYONS School District

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Appendix A – Materials List 41

I. GENERAL

A. Purpose

1. The purpose of this document is to provide a standard defining the structured communications cabling systems to be installed within Canyons School District facilities. It is geared toward leveraging our legacy cabling infrastructure while upgrading to more recent technologies in new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards and industry best practices.

2. Within this document, the facilities owner is Canyons School District, and shall be referred to as such, or as “Canyons School District” or simply as “Information Technologies”. Bidding low-voltage installers shall be referred to as “Contractor”.

3. This specification defines quality standards and practices common to all Canyons School District Information Technologies enterprise network cabling upgrades and greenfield (new) projects.

4. In addition to this global cabling standard, individual projects will also have associated documentation such as Requests for Proposals (RFP), facility drawings, project schedules and requirements pertaining to that particular job. Such collateral will be referred to in this document as “Project Specific Documentation” or simply “Construction Documents”. Any conflict between this general specification and any project specific documentation shall be brought to the attention of Canyons School District Information Technologies and must be resolved in writing by Canyons Schools.

5. It is the responsibility of the installing contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of Canyons School District Information Technologies any design directions that may be improved. All such changes shall be approved in writing from Information Technologies.

6. Note that while many portions of this global specification are addressed to "The Contractor", these requirements apply equally to anyone doing the network cabling and infrastructure work within Canyons School District, whether those persons are outside contractors or persons directly employed by Information Technologies.

B. Scope of Work - Typical

1. Contractor shall be solely responsible for all parts, labor, testing, documentation and all other associated processes and physical apparatus necessary to turn over the completed system fully warranted and operational for acceptance by Canyons School District Information Technologies

2. This specification includes structured cabling design considerations, product specifications and installation guidelines for low-voltage network systems and associated infrastructure including, but not limited to:

a. Cabling Sub-system 1 – Horizontal Copper

b. Cabling Sub-system 2 - Intra-building Fiber Backbone Cabling

c. Telecommunications Pathways

d. Communications Racks

e. Communications Grounding Systems

f. Cabling Labeling and Administration

3. In addition to systems specifications, this document also addresses applicable codes and standards, contractor qualifications and requirements, system warranties and system testing and acceptance.

4. Products to be used in Canyons School District Information Technologies telecommunications infrastructure are listed in “Appendix A” at the end of this document. All approved ‘equivalents’ must match performance specifications.

C. Applicable Regulatory References

1. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. In cases where listed standards and codes have been updated, Contractor shall adhere to the most recent revisions, including all relevant changes or addenda at the time of installation.

2. ANSI/TIA:

a. ANSI/TIA-526-7-A (July 2015) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

b. TIA-526.2-A (July 2015) Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable - Adoption of IEC 61280-1-1 ed. 2 Part 1-1: Test Procedures for General Communication Subsystems – Transmitter Output Optical Power Measurement for Single-Mode Optical Fibre Cable

c. ANSI/TIA-4994 (March 2015) Standard for Sustainable Information Communications Technology

d. ANSI/TIA-526-14-C (April 2015) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

e. ANSI/TIA-568.0-D (September 2015) Generic Telecommunications Cabling for Customer Premises (supersedes TIA-568-C.0 and TIA-568-C-1)

f. ANSI/TIA-568-C.2 (August 2009) Balance Twisted Pair Communications and Components Standards

g. TIA-568-C.2-1 (July 2016) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 1: Specifications for 100 Next Generation Cabling

h. TIA-568-C.2-2 (November 2014) Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Addendum 2: Additional Considerations for Category 6A Patch Cord Testing

i. TIA-568-C.3 (June 2008) Optical Fiber Cabling Components Standard (will be superseded by ANSI/TIA-568.3-D after default ballot)

j. TIA-568-C.3-1 (October 2011) Optical Fiber Cabling Component Standard- Addendum 1, Addition of OM4 Cabled Optical Fiber and array connectors (will be superseded by ANSI/TIA-568.3-D after default ballot)

k. ANSI/TIA-568-C.4 (July 2011) Broadband Coaxial Cabling Components Standard

l. ANSI/TIA-568.1-D (September 2015) Commercial Building Telecommunications Infrastructure Standard (supersedes ANSI/TIA-C.1)

m. ANSI/TIA-569-D (April 2015) Telecommunications Pathways and Spaces

n. ANSI/TIA-598-D (July 2014) Optical Fiber Cable Color Coding

o. ANSI/TIA-570-C (August 2012) Residential Telecommunications Infrastructure Standard

p. ANSI/TIA-606-C (June 2017) Administration Standard for Telecommunications Infrastructure

q. ANSI/TIA-607-C (November 2015) Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

r. ANSI/TIA-758-B (March 2012) Customer-Owned Outside Plant Telecommunication Infrastructure Standard

s. ANSI/TIA-862-B (February 2016) Structured Cabling Infrastructure Standard for Intelligent Building Systems

t. ANSI/TIA-942-B (July 2017) Telecommunications Infrastructure Standard for Data Centers (will be superseded by ANSI/TIA-942-B after balloting)

u. ANSI/TIA-1005-A (May 2012) Telecommunications Infrastructure Standard For Industrial Premises

v. ANSI/TIA-1005-A-1 (January 2015) Telecommunications Infrastructure Standard For Industrial Premises, Addendum 1- M12-8 X-Coding Connector - Addendum to TIA-1005-A

w. ANSI/TIA-1183 (August 2012) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems

x. ANSI/TIA-1183-1 (January 2016) Measurement Methods and Test Fixtures for Balun-Less Measurements of Balanced Components and Systems, Extending Frequency Capabilities to 2 GHz - Addendum to TIA-1183

y. ANSI/TIA-1152 (September 2009) Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

z. ANSI/TIA-1179 (July 2010) Healthcare Facility Telecommunications Infrastructure Standard

aa. ANSI/TIA-4966 (May 2014) Telecommunications Infrastructure Standard for Educational Facilities

bb. TIA-455-104-B (February 2016) FOTP 104- Fiber Optic Cable Cyclic Flexing Test (supersedes TIA-455-104-A)

cc. TIA/EIA-455-25-D (February 2016) FOTP-25 Impact Testing of Optical Fiber Cables

dd. TIA-604-18 (November 2015) FOCIS 18 Fiber Optic Connector Intermateability Standard – Type MPO-16

ee. TIA-604-5-E (November 2015) FOCIS 5 Fiber Optic Connector Intermateability Standard- Type MPO

ff. TIA-5017 (March 2016) Telecommunications Physical Network Security Standard

gg. TIA-TSB-155-A (Reaffirmed 10-6-2014) Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T

hh. TSB-184-A (March 2017) Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling

ii. TSB-4979 (August 2013) Practical Considerations for Implementation of Multimode Launch Conditions in the Field

jj. TSB-190 (June 2011) Guidelines on Shared Pathways and Shared Sheaths

kk. TIA-TSB-162-A (November 2013) Telecommunications Cabling Guidelines for Wireless Access Points

ll. TSB-5018 (July 2016) Structured Cabling Infrastructure Guidelines to support Distributed Antenna Systems

mm. TIA-492AAAD (October 2009) Detail specification for 850-nm laser-optimized, 50-um core diameter/125-um cladding diameter class Ia graded-index multimode optical fibers

nn. TIA-455-243 (March 2010) FOTP-243 Polarization-mode Dispersion Measurement for Installed Single-mode Optical Fibers by Wavelength-scanning OTDR and States-of-Polarization Analysis

oo. TSB-172-A (February 2013) Higher Data Rate Multimode Fiber Transmission Techniques

3. ISO/IEC

a. ISO/IEC 11801 Edition 2.2: Information Technology – Generic Cabling For Customer Premises

b. ISO/IEC 24702 Edition 1.0: Information Technology – Generic Cabling – Industrial Premises

c. ISO/IEC 24764 Edition 1.0: Information Technology – Generic Cabling Systems For Data Centres

d. ISO/IEC 14763-2 Edition 1.0: Implementation and Operation of Customer Premises Cabling – Part 2: Planning and Installation

e. ISO/IEC 14763-3 Edition 1.1: Implementation and Operation of Customer Premises Cabling – Part 3: Testing of Optical Fiber Cabling

4. National Electric Codes

a. National Electrical Safety Code (NESC) (IEEE C2-2012)

b. ANSI/NFPA 70-2011, National Electrical Code© (NEC©)

c. ANSI/IEEE C2-207, National Electrical Safety Code®

d. National Electrical Code (NEC) (NFPA 70)

5. OSHA Standards and Regulations – all applicable

6. Local Codes and Standards – all applicable

7. BICSI – Building Industry Consultative Services International

    a. Telecommunications Distribution Methods Manual, 13th Edition

    b. ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices

    c. Information Transport Systems Installation Methods Manual (ITSIMM), 6th Edition

    d. ANSI/BICSI 002-2011, Data Center Design and Implementation Best Practices

    e. Network Systems and Commissioning (NSC) reference, 1st Edition

    f. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling

    g. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

    h. AV Design Reference Manual, 1st Edition

    i. Network Design Reference Manual, 7th Edition

    j. Outside Plant Design Reference Manual, 5th Edition

    k. Wireless Design Reference Manual, 3rd Edition

    l. Electronic Safety and Security Design Reference Manual, 3rd Edition

    m. Commercial Installation On-the-Job Training Booklet

    n. Telecommunications Project Management (TPM) reference, 1st Edition

8. Anywhere cabling standards conflict with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either.

9. Anywhere standards, codes, specifications or project documents conflict, Contractor shall default to the standards of the country where the installation is taking place, or default to the more stringent of either. Where such resolutions are not clear, it is the responsibility of the Contractor to bring this to the attention of the local Canyons School District project manager to receive clarification in writing.

10. Knowledge and execution of applicable standards and codes is the sole responsibility of the Contractor.

11. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor’s expense.

D. Substitution Policy

1. This is a performance-based specification based on the experience of Canyons School District Information Technologies in providing exceptional solutions for all of our facilities and departments. As such, substitution of specified systems is discouraged, but allowed if Contractor strictly follows the Canyons Substitution Policy outlined below. The right to determine suitability, compatibility, or acceptability of product/service offerings belongs exclusively to Canyons School District.

2. Contractors offering product substitutions or equivalents are responsible for showing equal or superior mechanical and transmission performance specifications to those products listed herein.

3. The process for substituting products other than those specified is as follows:

    a. Any Contractor wishing to offer structured cabling or associated infrastructure products other than those specified should submit a request for product substitution in writing at least ten (10) business days prior to the closing of the bid for which the substitution is requested.

    b. Written requests for substitution should be accompanied by three samples of the substitution product along with associated drawings, specification sheets and engineering documents for evaluation by Canyons School District.

    c. Any copper or fiber cabling products that carry signal shall be accompanied by third party laboratory performance test reports from an NRTL (Nationally Recognized Testing Laboratory) proving equivalency in transmission performance.

4. Equal product acceptance is exclusively at Canyons School District discretion.

5. Contractor shall assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

E. Contractor Qualifications

1. General

    a. Contractor must have at least 5 years documented experience installing and testing structured cabling systems of similar type and size.

    b. Contractor shall have offices and service personnel based with a fifty-mile radius of Canyons School District and be capable of same-day response to service calls.

    c. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.

    d. Contractor shall have the responsibility to obtain any of the necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.

    e. Contactor shall be a current Panduit ONE℠ Partner, Silver or above, Leviton/Berk-Tek Certified Installer, Siemon/Mohawk Certified Installer, or accepted substitute manufacturer (See Substitution Policy). A copy of the corporate manufacturer certification must be included with quote.

f. At least 30 percent of the technicians on the job must have a current Panduit Certified Copper Technicians certificate, Leviton/Berk-Tek Certified Copper Technicians certificate, Siemon/Mohawk Certified Installer certificate, or accepted substitute manufacturer, to install copper distribution systems.

g. At least 30 percent of the technicians installing any Fiber Distribution Systems must have a current Panduit Certified Fiber Technicians certificate, Leviton/Berk-Tek Certified Fiber Technicians certificate or accepted substitute manufacturer certificate, to install fiber distribution systems

h. The Telecommunications contractor must provide a project manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:

- Initiate and coordinate tasks with the Canyons School District Information Technologies Project Manager and others as specified by the project schedule.
- Provide day to day direction and-site supervision of Contractor personnel.
- Ensure conformance with all contract and warranty provisions.
- Participate in weekly site project meetings.
- This individual will remain project manager for the duration of the project. The contractor may change Project Manager only with the written approval of Canyons School District Information Technologies.

i. Contractor Project Manager must be manufacturer certified in the copper and fiber information distribution systems to be installed.

2. References

a. Communications Contractor shall provide with bid, a list of three reference accounts where similar Data, Voice, Fiber Optic Cable, and related equipment installation work was performed within the last year (twelve month period).

3. Termination of Services

a. Canyons School District Information Technologies reserves the right to terminate the Communication Contractor's services if at any time the Information Technologies Engineer determines the Communication Contractor is not fulfilling their responsibilities as defined within this document.

b. Contractor's appearance and work ethics shall be of a professional manner, dress shall be commensurate with work being performed.

c. Dress displaying lewd or controversial innuendos will strictly be prohibited.

d. Conduct on Canyons School District Information Technologies property will be professional in nature.

e. Any person in the Contractor's employ working on a Canyons School District Information Technologies project considered by Canyons School District Information Technologies to be incompetent or disorderly, or for any other reason unsatisfactory or undesirable to the Information Technologies, such person shall be removed from work on the Canyons School District Information Technologies project.

f. Upon termination, the Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.

4. Other Contractor Responsibilities

   a. Confirmation of Pathway and Cable Manager Sizing:

      - Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to represent no more than 30% fill according to manufacturer's fill charts based on projected cable densities when racking systems and cabling pathways are fully populated.
      - Pathways overfilled upon installation will not be accepted and shall be remedied at Contractor expense.

   b. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job. All work areas will be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.

   c. Contractor must remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors must consider this when placing bids.

   d. Contractor shall abide by the regulations set by local Canyons School District's Security Policy pertaining to access and conduct while on Canyons School District property.

   e. Contractor shall all obey all posted speed limits and parking regulations at the Canyons School District facilities where the work is being performed.

F. Warranty

1. General

   a. Contractor shall provide a minimum 3 year warranty on all copper and fiber permanent cabling links. A 25-year extended warranty is desired and will be considered as preferred. Costs to increase the warranty beyond 3 years should be included with ineligible costs, if part of an e-rate project.

   b. Upon acceptance of Warranty the contractor will mail a notification letter to the installer and a notification letter and warranty certificate to Canyons School District Information Technologies.

2. Contractor Warranty Obligations

   a. Installation firm (Contractor) must be a current Panduit ONE℠ Partner, Silver or above, Leviton/Berk-Tek Certified Installer, Siemon/Mohawk Certified Installer, or Canyons School approved equal manufacturer in good standing and shall include a copy of the company installation certification with the bid.

   b. Contractor shall name a supervisor to serve on site as a liaison responsible to inspect and assure all terminations are compliant to factory methods taught in Panduit Technician Certification Training, Leviton/Berk-Tek Technician Certification Training, Siemon/Mohawk MAC or Canyons School approved equal, and according to all Standards cited in the Regulatory References section of this document.

   c. Contractor liaison (project supervisor) shall have a current, up-to-date Panduit Certified Technician (PCT) certificate, Leviton/Berk-Tek Certified Technician certificate, Siemon/Mohawk, or Canyons School approved equal in both copper and fiber. Copies of the copper and fiber certificates of the Panduit,

Leviton/Berk-Tek, or Canyons School approved equal liaison shall be submitted with the bid. These requirements are the same for accepted equivalent manufacturers. See “Substitution Policy” for mandatory procedure when offering substitutions.

d. Fiber optic cabling system additions and upgrade to existing facilities (Brownfield) shall match the fiber type (OM/OS designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same system.

e. All intra-building new fiber optic installations shall utilize an appropriate construction of OM3 or OM4 multi-mode fiber as specified herein.

f. All UTP cable pulled and terminated shall be Category 6a cable and connectivity whether new or legacy systems. The exception to this is the 25 pair Category 5E cable installed for building controls as specified in this document.

g. All UTP terminations within the Canyons School District Information Technologies greenfield (new) projects shall be terminated using the T568B pin-out (wire map). Legacy additions shall match the copper pin-out of the facility to which cabling is being added-to or upgraded.

h. Contractor shall install all racking and support structures according to cited Standards in such fashion as to maintain both cited industry standards as well as manufacturer recommendations for uniform support, protection, and segregation of different cable types,

i. Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods as well as adhering to industry accepted practices of good workmanship.

j. Contractor is responsible for understanding and submitting to Panduit or Leviton/Berk-Tek all documents required prior to project start to apply for the Panduit Certification PLUS or Pan/Gen system warranty, Leviton/Berk-Tek Limited Lifetime Warranty, or Siemon Premium Warranty. These include but are not limited to the project information form and SCS warranty agreement. These requirements are the same for accepted equivalent manufacturers. See “Substitution Policy” for mandatory procedure when offering substitutions.

k. Contractor is responsible for understanding and submitting to Panduit, Leviton/Berk-Tek, Siemon/Belden, or other, all documents required at project end. These include, but are not limited to: completed warranty forms, passing test reports and drawings of floor plans showing locations of links tested. These requirements are the same for accepted equivalent manufacturers. See “Substitution Policy” for mandatory procedure when offering substitutions.

l. Test results shall be delivered in the tester native format (not Excel) and represent the full test report, summaries shall not be accepted. Contact your Panduit, Leviton/Berk-Tek, Siemon/Belden, or Canyons School approved equal’s representative for a current list of approved testers, test leads and latest operating systems.

m. The Communications Contractor will correct any problems and malfunctions that are warranty-related issues without additional charge to Canyons School District Information Technologies for the entire warranty period.

n. The warranty period shall commence following the final acceptance of the project by Canyons School District Information Technologies and written confirmation of Warranty from Panduit, Leviton/Berk-Tek, or Siemon/Belden. These requirements are the same for accepted equivalent manufacturers. See

"Substitution Policy" for mandatory procedure when offering substitutions.

END OF SUB-SECTION SECTION I

II. Installation and Maintenance Guidelines

A. Maintenance of Patch Fields

1. Any persons, whether with a Contractor or Canyons School District, adding or moving copper or fiber optic patch (equipment) cords shall do so in a neat, workmanlike fashion in keeping with the original system cable management design concept and according to all industry best practices as outlined in cabling standards and applicable BICSI publications referenced in this document.

2. Persons performing such moves, adds or changes (MACs) shall further adhere to the following:

    a. Use existing cabling management pathways and take care to place cable like with like, maintaining original segregation strategies for separating fiber and copper cables as well as any separation necessary between different types of copper cables.

    b. Cables shall be dressed neatly within patch management pathways with care taken to maintain minimum bend radius of not less than 1 times the cord outer diameter for copper and not less than a 1" bend radius for fiber jumpers as per ANSI/TIA 568-C.0.

    c. All patch cords used shall be of same copper Category or fiber OM/OS designation as the media used in the permanent cabling links.

    d. Patching in all cases shall be done using factory terminated cords manufactured for that purpose. Hand terminated patch cords will not be accepted.

    e. All patch cords or jumpers must be completely contained within supplied cable management paths. Cables draped across the front of cabinets or racks will not be accepted and shall be remedied at Contractor's expense.

    f. Any persons installing or moving fiber optic patch cords for any reason will clean the connector with lint-free wipes and 99% or higher isopropyl alcohol before replacing the connector in a patch or equipment port.

    g. Any technicians, whether with Canyons School District or Contractors performing moves, adds or changes within patch field will label additions to the system according to the labeling conventions in place at that facility.

    h. Any persons with Canyons School District or installing Contractor performing moves, adds or changes within patch field will record the move according to record system in place at that facility.

B. Cable Pulling and Termination

1. General

    a. Contractor is responsible for installing systems according to all applicable codes and the standards cited in this document.

    b. Contractor shall use grommets to protect the cable when passing through metal studs or any openings that can possibly cause damage to the cable.

c. Do not deform the jacket of the cable. The jacket shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections.

d. Install proper cable supports, spaced less than 5 feet apart, and within manufacturer's requirements for fill ratio and load ratings.

e. Leave a pull string to the end of each conduit run. Replace pull string if it was used for a cable pull.

f. Note service loops may not touch the ceiling assembly and if so must be remedied at the Contractor expense.

g. Label every cable within 12 in. of the ends with self-laminating wire wrap cable appropriate to that cable size. Use a unique number for each cable segment as required by the project documentation and the labeling section of this document.

h. Dress the cables neatly with hook and loop cable ties in telecommunications rooms. Plastic ties are approved in pathways where cable bundles will not be reentered.

i. Contractor is responsible for using plenum-rated cable ties in plenum spaces.

j. Contractors installing cabling systems in Canyons School District facilities shall install plenum rated cable in all instances. Non-plenum cable is not allowed and shall be removed at Contractor's expense.

a. Copper

a. When making additions to legacy systems, Contractor shall match the cabling configuration (pinout) of the existing systems. Legacy systems at Canyons School District Information Technologies are in most cases T568B.

b. Within all new (greenfield) installations within Canyons School District facilities, contactor shall use copper pinout T568B.

c. All four pair Category 6a cable runs shall be kept to a maximum permanent link length of 83 meters when using a total 10 meters of 28 awg/small diameter patch cords.

d. Copper links that are 90 meters in permanent link, shall not exceed 6 meters (total) of patch cords when using 28 awg/small diameter patch cords.

e. Use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.

f. No pathway, including conduits shall have greater than a 30% fill per manufacturer fill charts. Contractor is responsible for bringing to the attention of Canyons School District Information Technologies project manager any insufficiently sized conduit or cable pathways in project documentation.

g. Keep Category 6a cables as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as required in cited TIA Standards.

h. All copper horizontal cabling shall have slack service loops no less than 12" at the work area (equipment outlet) and not less than 3 feet in the telecommunications room. Provide a 25' service loop for all cables for cameras.

i. Slack at the work area may be stored in the ceiling and in the telecommunications room may be wall

mounted or contained in pathways or racking systems if done in a neat, workmanlike fashion.

j. Service loops shall be stored in such fashion as to not violate bend radius, slack touching the drop ceiling is not allowed and must be remedied at Contractor expense.

k. Maintain the twists of the pairs all the way to the point of termination, or no more than 0.5" (one half inch) untwisted.

l. All UTP patching shall be accomplished using Category 6a rated modular patch panels as indicated elsewhere in this document.

m. All removed copper cable is to be disposed of in a Canyons School District Information Technologies recycling bin designated for “copper”, or removed from the property to be disposed of by Contractor if this is the instructions in the project documentation.

b. Fiber

a. When making additions to legacy systems, Contractor shall match the fiber type and fiber connectors used within that system.

b. Within all new (greenfield) fiber installations within Canyons School District Information Technologies, contactor shall use Panduit OptiCam, Leviton FastCam, Siemon/Beldenor or Canyons School approved equal LC connectors as specified in the fiber section of this document.

c. When installing fiber cable, Contractor shall maintain a minimum bend radius, both under pulling load and installed, per requirements outlined within TIA standards, or manufacturer’s recommendations, whichever is the most stringent.

d. Fiber terminations shall be done according to recommendations of TIA, manufacturer’s requirements and accepted industry best practices.

e. All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered or loose-tube strands will not be tolerated and shall be remedied at Contractor’s expense.

f. Contractor shall use fusion splices when terminating loose-tube fiber.

g. Contractor shall perform test setup and testing according to guidelines in the “Testing and Acceptance” section of this document.

h. All fiber backbone links will extend from each IDF directly to the MDF (Home Run) except where agreed to by exception with Canyons School District Director of IT.

END OF SUB-SECTION SECTION II

III. Cabling Systems and Associated Infrastructure

A. Cabling Subsystem I – Horizontal Cabling System

1. Slack (Service Loops) in Horizontal UTP Cable

    a. Contractor shall provide a minimum 12” slack or service loop at the equipment outlet (work area) on each terminated copper horizontal permanent link. Work area slack shall be contained within boxes behind the faceplate only if this may be done easily without violating cable bend radius.

    b. Where there is not sufficient space in the work area box, Contractor may pull work area slack into the ceiling space and properly store service loop with appropriately rated hook and loop cable ties. Cable slack shall in no instances touch the ceiling grid or associated drop ceiling components or fixtures.

    c. Contractor shall provide a minimum of 10 feet slack or service loop in the horizontal telecommunications room on each terminated copper horizontal permanent link, to be stored on the wall backboard using appropriate mounting fixtures built to that purpose (i.e. D-rings).

    d. Contractor should consult project-specific documentation or their Canyons Schools project liaison for other mounting methods where wall mount is not an option.

2. Metal Conduit

    a. Cable in horizontal runs in classrooms shall be routed and contained in metal conduit.

    b. No conduits shall have greater than a 30% fill per manufacturer fill charts. Contractor shall size conduit large enough to accommodate 50% growth. (i.e., conduit for 4 cables shall be sized to accommodate 6 cables) Contractor is responsible for bringing to the attention of Canyons School District Information Technologies project manager any insufficiently sized conduit or cable pathways in project documentation.

3. Electrical Boxes

    a. Contractor shall size work area boxes to accommodate no less than 12” cable slack on each terminated Category 6a UTP cable run.

    b. Contractor shall use double-gang boxes behind single-gang faceplates if necessary for storing 12” cable slack (service loop) without violating minimum bend radius of 4X cable outer diameter.

    c. In work areas where slack storage in cable box violates cable bend radius, Contractor should pull slack into ceiling and affix with plenum rated hook and loop (re-enterable) cable ties. If drop ceiling is present. Cable shall under no circumstances be laid upon drop ceiling.

4. Copper Jacks – Category 6A

    a. Category 6a, eight-position copper jacks shall be Panduit Mini-Com® TX6A™ 10Gig UTP, Leviton/Berk-Tek, or Canyons School approved equal Jack Modules.

b. Category 6a jacks at the work area shall be color black unless otherwise indicated in project-specific documentation.

c. Category 6a jacks shall further meet the following requirements:

- Exceed ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA standards
- Meet requirements of IEEE 802.3af and IEEE 802.3at for PoE applications
- Be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
- Color-coded, keyed jack modules mechanically and visually distinguish connections to prevent unintentional mating with unlike keyed or non-keyed modular plugs accommodating more discrete networks.
- Include MaTriX split foil tape to suppress the effects of alien crosstalk, allowing 10 Gb/s transmission even in high density 48-port, 1RU patch panels.
- Utilize patent-pending enhanced Giga-TX ™Technology for jack terminations which optimizes performance by maintaining cable pair geometry and eliminating conductor untwist.
- Meets ANSI/TIA-1096-A contacts plated with 50 microinches of gold for superior performance.
- Rated for 2500 cycles with IEEE 802.3af / 802.3at and proposed 802.3bt type 3 and type 4
- Require no punch down tool required; termination tool (EGJT) ensures conductors are fully terminated by utilizing a smooth forward motion without impact on critical internal components for maximum reliability.
- Have available a high-volume “gun-style” optional termination tool (TGJT) that reduces termination time by 25% and is ideal for high volume installations.
- Have guaranteed ability to be re-terminated a minimum of twenty times without measurable degradation of performance.
- Employ a blue termination cap to designate Category 6A performance at a glance and provides positive strain relief; help control cable bend radius and securely retain terminated cable.
- Have range to terminate 4-pair, 22 – 26 AWG, 100 ohm, solid or stranded twisted pair cable.
- Utilize a universal termination cap is color-coded for T568A and T568B wiring schemes for flexibility across installations.
- Accept 6 and 8-position modular plugs without damage to conductor pins.
- Identified options that include optional labels and icons.
- Be compatible with Mini-Com ® Modular Patch Panels, Faceplates, and Surface Mount Boxes.
- Have available optional RJ45 blockout device that blocks out unauthorized access to jack modules and potentially harmful foreign objects, saving time and money associated with data security breaches, network downtime, repair, and hardware replacement
- Have an optional dust cap keeps out dust and debris while not in use

d. See Appendix A for part numbers.

5. Flush Mount Equipment Outlets (Faceplates)

a. When adding horizontal cabling to existing facilities Brownfield within Canyons School District, Contractor shall match the existing cable plant in regards to color of existing raceway and faceplates.

b. Unless otherwise instructed on project-specific documentation, all Canyons greenfield (new) projects shall use Panduit Mini-Com® Classic Series sloped faceplates, Leviton faceplates with label cover, of international white (IW) color, or a Canyons School District approved equal.

c. Plastic sloped faceplates shall be in 4 or 6-hole single-gang configuration, or double-gang 8 hole configurations as needed for the number of cables at that workstation.

d. Plastic faceplates for greenfield applications shall further have the following properties:

- Accept Mini-Com® or Leviton Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
- Include label/label covers for easy port identification.
- Replacement label/label covers available.
- Optional icons available.

e. Some greenfield projects for Canyons School District will require Panduit Mini-Com® or Leviton stainless steel faceplates with label fields, in single-gang 4-hole or double-gang 8-hole configurations, (or Canyons approved equivalent). See project-specific documentation or consult the Canyons project liaison if clarification on faceplate type is needed.

f. Stainless faceplates, where used, shall meet the following criteria:

- Accept Mini-Com®, Leviton Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
- Include label/label covers for easy port identification.
- Replacement label/label covers available.
- Impact-resistant 304 stainless steel suitable for light industrial environments.

g. Contractor shall use blank inserts to reserve space on any unused positions (holes) in plastic or stainless plates.

h. See Appendix A for part numbers.

6. Horizontal Copper Cable

a. Inside 4 pair horizontal cable for Canyons School District facilities shall be CAT6a high-performance, jacketed, plenum rated General Cable, or Canyon School approved equivalent. Jacket colors shall be as follows: green to security cameras, gray to non-networked infrastructure [e.g., lighting controls, motion/fire sensors], blue to all network data drops, and yellow to A/V controllers and devices.

b. In addition, inside 4 pair Category 6a UTP copper cable must meet the following mechanical and performance criteria:

- UL Listed CMP-LP, UL Limited Power (LP) Certified
- Meet TIA TSB-184-A/ IEEE P802.3bt “LP” rating for Limited Power cable requirements
- Exceeds requirements of ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA channel standards.
- Exceeds requirements of ANSI/TIA-568-C.2 and IEC 61156-5 Category 6A component standards.
- Meets requirements of IEEE 802.3af and IEEE 802.3at for PoE applications.
- Meets requirements of ANSI/TIA 862
- Meets requirements of ICEA S-116-732
- Third party tested to comply with ANSI/TIA-568-C.2.
- Cable diameter: Plenum 0.250 in nominal.
- Installation temperature range: (0°C to 60°C).
- Operating temperature range: (-20°C to 90°C).
- Include Encapsulated Isolation Wrap to suppress the effect of alien crosstalk allowing 10 Gb/s transmission, while minimizing cable diameter.
- Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap.

c. Outside run 4 pair horizontal cable for Canyons School District facilities shall be high-performance, black jacketed, General Cable CAT6a OSP cable constructed for wet or outside-plant applications, or Canyon School approved equivalent.

d. In addition, outside run 4 pair Category 6a UTP copper cable must meet the following mechanical and performance criteria:

- Outdoor horizontal cable drops shall use 23 AWG category 6A 4-pair UTP outdoor cable.
- Cable jacketing shall be black.
- Cable shall be intended for outdoor installation in buried conduit or as aerial cable.
- Installation temperature range (-30 to +60C)
- Operation temperature range (-45 to +80C)
- The cable core shall be Gel-filled construction to prevent moisture migration in underground and wet applications.
- OSP type cables shall have a nominal diameter less than or equal to .365”

e. See Appendix A at the end of this document for cable part numbers.

7. Distributor I (Horizontal Patch Panels)

a. Canyons School District Information Technologies copper patch panels in the horizontal patch fields shall be flat 1 RU or 2 RU Panduit modular Mini-Com® or Leviton Modular Faceplate Patch Panels, or approved equivalent as needed to accommodate UTP cable quantity.

b. Modular patch panels shall be standard density of 24 ports per rack unit.

c. Contractor shall populate modular panels with black Panduit or Leviton Category 6a jacks, or approved equivalent as described elsewhere in this document. See Appendix A for part numbers on jacks to go with modular patch panels.

d. Contractor shall pair modular patch panels in alternating fashion with workgroup switches allowing for use of 12” Category 6a patch cords for one-to-one switch patching, eliminating the need for horizontal cable managers between the switches and patch fields. See illustration below for example of one-to-one switch patching strategy.

Example of one-to-one switch patching

e. Patch Panels shall further meet the following criteria:

- Have release snap feature on faceplate to allow front access to installed modules.
- Accept Mini-Com®, Leviton or Canyons School approved equal Modules for UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
- Be available in label versions available for easy port identification, with replacement label/label covers available.
- Mount to standard EIA 19" racks or 23" racks with optional extender brackets.

- Be available in angled patch panels to facilitate proper bend radius control and minimize the need for horizontal cable managers.

f. For detailed part numbers see “Appendix A” at the end of this document.

8. Copper Patch Cords

a. Copper patching of Category 6a links in Canyons School District facilities shall use blue Panduit 28 awg “small diameter” slim patch cords, Leviton High-Flex HD6, or Canyons School approved equal.

b. Security camera patch cables shall be green. If other color patch cords are needed to designate particular applications, see Appendix A for instructions on changing patch cord colors.

c. In telecommunications rooms utilizing individual workgroup switches, Contractor shall alternate patch panels with switches, using 12” patch cord lengths in “one-to-one” switch patching strategy as indicated in the patch panel section of this specification (above).

d. Core (chassis) switches shall utilize whatever length patch cords necessary for an efficient and neat, workmanlike installation.

e. Small diameter patch cords shall have the following characteristics:

- Cable diameter not more than 0.185 in. (4.7mm) nominal.
- Category 6A/Class EA channel and component performance.
- Exceeds all ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class EA electrical performance requirements for all frequencies from 1 to 500 MHz
- FCC and ANSI compliance: Meets ANSI/TIA/EIA-1096-A; contacts plated with 50 micro inches of gold for superior performance.
- IEC compliance: Meets IEC 60603-7
- PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
- Operating temperature: 14°F to 140°F (-10°C to 60°C).
- Storage temperature: -40°F to 158°F (-40°C to 70°C).
- Plug housing: UL94V-0 rated clear Polycarbonate.
- Contacts: Gold plated phosphor bronze.
- RoHS compliance: Compliant.
- Flammability rating: CM/LSZH dual rated.

f. Note: These patch cords utilize 28 AWG conductors which do not meet the 22 to 26 AWG conductor size of patch cable referenced in ANSI/TIA-568-C.2, resulting in an increased attenuation de-rating value of 1.9. These patch cords support 96-meter channels that include 90-meter permanent links. And 6 meters of patch cord, or supports 93-meter channels with 10 meters of patch cords included in the channel.

g. See Appendix A for part numbers.

9. Surface Mount Raceway

   a. On brownfield installations, Contractor shall match raceway to that already installed in the facility unless instructed otherwise in project-specific documentation.

   b. On greenfield installations where environment (cinder block walls) or project documentation requires cable to be surface-mounted in the work area; horizontal cable shall be routed through Panduit LD10 International White (color), Leviton plastic latching-duct raceway or Canyons approved equivalent.

   c. Areas requiring power and data be run through single raceway with partition (separator), Contractor shall utilize Panduit LDP10, Leviton, or Canyons School approved equal raceway or T-70 raceway system as needed to accommodate all cable with not more than a 30% fill according to manufacturer fill tables.

   d. No raceway shall have greater than 30% fill upon installation, providing room for at least 50% growth in additional cables: i.e., a work area requiring 4 cables, raceway shall be sized to hold 6.

   e. Contractor is responsible that raceway installation includes all associated fittings, drop ceiling fittings, couplers and 1” control-bend-radius fittings where appropriate.

   f. Contractor shall not rely on the pressure sensitive adhesive foam to mount raceway, but rather use adhesive to hold raceway in place while screwing down the raceway to the structure beneath using anchors appropriate to the wall type at intervals not to exceed 2 ft (24 inches).

   g. Standard LD-10 Panduit, Leviton or Canyons School approved equal raceway shall have the following features:

      - For routing data and low voltage cabling.
      - One-piece hinged design allows cables to be laid in.
      - Factory applied adhesive backing speeds installation.
      - FT4 rated.
      - Terminates using surface mount outlet box solutions, Panduit Mini-Com, Leviton or Canyons School approved equal surface mount boxes.

   h. Installations requiring raceway shall use the same faceplates used in flush-mount applications as specified in this document, mounted on Panduit “JB1”, Leviton surface boxes, or Canyons approved equivalent. Contractor shall not rely on adhesive-backing to hold surface boxes in place, but must use appropriate wall anchors for firm, permanent installation.

   i. Some Canyons facilities may require metallic raceway systems. Consult project-specific documentation or the Canyons School District project liaison if clarification on raceway type is needed.

   j. See Appendix A at the end of this document for part numbers.

C. Cabling Subsystems II - Intrabuilding Backbone Fiber

1. Fiber Cable

   a. On additions to existing Canyons School District fiber cable plant (brownfield projects), Contractor shall match existing fiber and connector types.

   b. In new (greenfield) Canyons School District projects, backbone fiber running between telecommunications rooms on the same floor, or between floors in the same building shall be General Cable indoor/outdoor, Berk-Tek, plenum-rated, armored, 50 micron cable of 12 or 24 strand count, or Canyons approved equal. See “Substitution Policy” for mandatory process if offering equivalents.

   c. Contractor shall install OM4 version of cable described for all telecommunications spaces that are spaced 300 meters or closer for use with 10G Ethernet. Note this will be almost all instances in Canyons School facilities.

   d. Fiber optic cable shall further have the following features:

      - Product Construction: Fiber: 4–144 fibers, 900 µm tight buffer, Color-coding per TIA/EIA 598 B.
      - Overall Strength Member: Water-swellable aramid fiber yarn
      - Inner Jacket: Flame-retardant compound.
      - Armor: Interlock aluminum.
      - Outer Jacket: Flame-retardant compound, UV-resistant black jacket, Sequential footage markings/
      - Features: Interlock armor provides outstanding mechanical protection, Interlock armor is flexible and easy to use tight buffer provides individual fiber protection, sub-units are numbered for identification.
      - Performance: Temperature: Storage -40˚C (-40˚F) to +70˚C (+158˚F), Installation 0˚C (+32˚F) to +50˚C (+122˚F), Operating -20˚C (-4˚F) to +70˚C (+158˚F).
      - Minimum Bend Radius: 20 X OD—Installation, 10 X OD—In-Service.
      - Maximum Crush Resistance: 1,500 lbs/in (2,627 N/cm).
      - Applications: Harsh premises environments requiring heavy-duty protection, outdoor use in ducts and underground conduits.
      - ETL Type OFCP for installation in any premises location when installed in accordance with NEC article 770.154 and 770.179.
      - Compliances: ETL Listed Type OFCP, CSA FT6, TIA 568 C.3, ICEA S-104-696, GR-409, RoHS Compliant Directive 2002/95/EC.

e. Contractor shall bond to ground armor from fiber backbones at both ends as indicated in the grounding section of this document; using armored cable grounding kits listed in the Appendix A grounding section.

f. See Appendix A for all fiber cable part numbers.

2. LC Fiber Connectors

a. All tight-buffered indoor fiber trunks shall be terminated using Panduit LC OptiCam®, Leviton FastCam Fiber Optic Connectors or Canyons approved equal.

b. LC cam connectors shall further have the following properties:

- Be a TIA/EIA-604 FOCIS-10 compatible connector that exceed exceeds TIA/EIA-568-B.3 requirements.
- Have connector backbone and boot colors that follow TIA/EIA-568-C.3 suggested color identification scheme.
- Have insertion loss: 0.3dB average (multimode and singlemode).
- Have return loss: >26dB (10Gig ™multimode), >20dB (multimode), >50dB (singlemode).
- Be a spring-loaded “Senior” rear pivot latch LC connector.
- Be a pre-polished cam style termination for in less than half the time of field polish connectors.
- Have patented re-termination capability provides yield rates approaching 100%.
- Feature a factory pre-polished fiber end face eliminates time-consuming field polishing to reduce installation costs, labor, scrap and the number of tools required.
- Be cam activated, with fiber and buffer clamp mechanisms that provide superior fiber and buffer retention with less sensitivity to fiber tensile loading.
- Utilize OptiCam® or FastCam Termination Tools that simplifies tooling and termination, and virtually eliminates operator error by providing a visual indication of proper termination after the cam step has been completed.
- Have a range of cable retention boot assemblies that consistently provide higher than industry standard cable retention.
- Include a non-optical disconnect that maintains data transmission under tensile loads for jacketed cable.
- Have ability to accept 900µm tight-buffered fiber with included boot(s), and accept 1.6mm – 2.0mm and 3.0mm jacketed cable with available OptiCam ®Cable Retention Boot Assemblies (ten per package).

c. See Appendix A for part numbers on LC fiber connectors.

3. Fiber Enclosures

a. Fiber cable terminations shall be contained in 1 RU, or 2 RU Panduit FCE series, Leviton rack mount fiber enclosures, or Canyons approved equal.

b. Contractor shall select enclosure size as needed for the number of fibers projected to be in that telecommunication space when fully populated. The average horizontal telecom room (Distributor 1) will

not require more than one single RU fiber enclosure, which will house up 48 OM3 fiber strands.

c. Contractor shall fill any unused enclosure space with a blank fiber adapter panel (FAP).

d. FCE enclosures shall further have the following properties:

- Be able to hold Panduit QuickNet ™ Fiber Optic Cassettes, Opticom ® Fiber Adapter Panels, or splice modules, Leviton or Canyons School approved equal.
- Have a slide-out, tilt-down drawer to provide full front access to all fibers and cables.
- Employ integral bend radius control and cable management appliances for fiber optic patch cords.
- Have rear cable management for proper slacking/spooling of trunk cable break-outs and interconnect cables.
- Have multiple trunk cable entry locations and include fiber optic cable routing kit (grommets, cable ties, spools, strain relief bracket, and ID/caution labels) for different installation configurations.

e. See Appendix A for part numbers.

4. Fiber Adapter Panels

a. FCE fiber enclosures shall be populated with OM3 fiber adapter panels containing 6 duplex fiber adapters.

b. Contractor is responsible to blank out any enclosure spaces where adapter panels are not used.

c. Adapter panels shall further have the following features:

- Loaded with TIA/EIA-604 FOCIS-10 compatible adapters.
- Exceed TIA/EIA-568-B.3 requirements.
- Adapter housing colors follow TIA/EIA-568-C.3 suggested color identification scheme.
- Snap quickly into the front of all Opticom ® components
- LC fiber adapter panels are Sr/Jr. to conserve enclosure space.
- Accept FOCIS-10 compatible senior LC connectors at either end and FOCIS-10 junior LC connectors at the inside end for behind the wall applications.
- Both ends accept FOCIS-10 compatible senior LC connectors.
- Junior end also accepts FOCIS-10 compatible junior (fixed ferrule/springless) LC connectors.
- Choice of phosphor bronze or zirconia ceramic split sleeves to fit specific network requirements; zirconia ceramic split sleeves are recommended for OM4/OM4 multimode and OS1/OS2 single mode applications.
- Every adapter is laser marked with Q.C. number to assure 100% traceability.
- LC adapters are also available in QuickNet ™ Fiber Optic Cassettes, Leviton Opt-X fiber modules

and cassettes or Canyons School approved equal.

d. See Appendix A for fiber adapter panels and blank adapter panels.

5. Fiber Patch Cords

a. Fiber patch fields within Canyons School District facilities shall utilize Leviton, Panduit “push/pull” fiber jumpers (fiber patch cords) or Canyons School approved equal that have the following properties:

- Push-Pull LC Duplex Fiber Optic Patch Cords shall feature the push-pull strain relief boot and duplex clip, to allow users easy accessibility in tight areas when deploying very high density LC patch fields.
- Jumpers shall be available in OM3, OM4 and single-mode and be available in in riser (OFNR), plenum (OFNP), and low smoke zero halogen (LSZH) rated jacket materials.

b. See Appendix A for part numbers.

6. Category 5E, 25-Pair Building Controls Backbone Cable

a. One gray jacketed, plenum rated, 25 pair Cat 5e cable shall be installed from the MDF to reach every individual IDF to serve as backbone for building controls.

b. 25 Pair 5E cable shall be General Cable or Canyons approved equivalent and shall meet the following mechanical and performance criteria:

- Conductors: • 25 pairs of 24 AWG solid bare annealed copper.
- Insulation: Non-Plenum: Polyolefin Plenum rated Fluoropolymer,
- Color Code: Standard except no bandmarking; only solid colors.
- Rip Cord: Applied longitudinally under jacket.
- Jacket: Plenum: Low-smoke, flame-retardant PVC.
- Separator: Plenum: Core filler.
- Nominal Cable Diameter: .5”.
- Nominal Cable Weight (lbs/1000 ft): 160 lbs.
- Temperature Rating Centigrade (Installed): 0 to +60.
- Temperature Rating Centigrade (Operation): -20 to +75.

c. 25 pair 5E control backbone shall be terminated on wall mount 100 Pr 110 blocks with C5 clips at the MDF end and on a 24-port patch panel in the IDF end.

d. The patch panel in the IDF end is to be installed below the fiber enclosure at the top of the rack with one available rack unit reserved below it.

e. 5E patching in the IDF shall use white jacketed small diameter Panduit, Leviton 5E patch cords or Canyons approved equivalent.

f. Copper backbone must likewise be installed in satellite buildings. Consult project-specific documentation or Canyons project liaison is clarification is needed.

g. See Appendix A for complete part numbers for fiber and copper backbone cable and termination hardware.

D. Cable Pathways

7. J-Hooks

a. Bundles of 120 Category 6a cables or less may be required to be routed above ceilings using J-hooks. Check project documentation for clarification.

b. J-hook systems used by Canyons School District Information Technologies shall be Panduit “J-Pro” series, Leviton or School approved equivalent.

c. Contractor installing J-hook systems shall space them no more than 5 feet apart as per TIA 569-C standard.

d. Contractor is responsible for proper sizing of J-hook systems based upon cable count and manufacturers recommendations for fill, with new J-hooks to have not more than 30% fill per manufacturer’s fill charts based upon projected worst case future bundle size.

e. If J-hooks are deemed too small by above criteria, Contractor shall bring this to the attention of Canyons School District for resolution in writing. J-hook pathways that will not have sufficient capacity should be replaced in the design with the proper sized basket tray for future cable additions and flexibility.

f. J-hook systems used by Canyons School District Information Technologies shall have the following properties:

- Patented design provides complete horizontal and vertical 1" bend radius control that helps prevent degradation of cable performance.
- UL 2043 and CAN/ULC S102.2 listed and suitable for use in air handling spaces.
- Pre-riveted assemblies allow for attachment to walls, ceilings, beams, threaded rods, drop wires and underfloor supports to meet requirements of a variety of applications.
- Wide cable support base prevents pinch points that could cause damage to cables.
- Cable tie channel allows user to easily install 3/4" (19.1mm) Tak-Ty ® Cable Ties to retain cable bundle.
- Durable non-metallic J Hook materials provide the ability to manage and support a large number of cables.
- Material: Black Nylon 6.6 J Hook with metal attachments.

g. See Appendix A for part numbers.

E. 19” Racks and Rack-mount Cable Managers

1. Four-Post Communications Racks

    a. Contractor shall mount IT equipment and patching systems on threaded rail 7 foot, 4-post racks, unless forced to use 2-post due to telecommunications room space constraints.

    b. All racks shall utilize threaded hole rails. Cage nut rails are banned within Canyons facilities and will not be accepted.

    c. 4-post racks shall be of 30”, 36”, or 41.5” depth as needed by mounted equipment. Contractor is responsible for confirming proper depth to be used.

    d. 4-post racks shall be the 4 Post Cable Management Rack System or Canyons School District approved equivalent, and must have the following features:

        - Independent adjustable front and rear mounting rails can be adjusted while the rack is secured to the floor.
        - Printed rack space identification on all equipment rails allows for quick location of rack spaces, speeding installation of rack mount items (shipped numbers up per TIA-606B specifications; can be set to number down by flipping the rails).
        - Rack is UL listed for 2,500 lbs. load rating.
        - Rear rail construction provides a clear ventilation path for side ventilated switches.
        - Multiple mounting holes in top flanges for securing ladder rack.
        - Weld nut construction eliminates the need for a second wrench increasing speed and ease of assembly.
        - Multiple mounting locations for vertical power strips on any of the four posts or on the adjustable mounting rails.
        - PatchRunner™ and NetRunner™ Vertical Cable Managers mount directly to the 4 post rack at any of the four corners to provide a flexible end-to-end cable management solution.
        - Paint piercing washers included to electrically bond rack for simplified grounding.

    e. See Appendix A for part numbers.

2. Two-post Communications Racks

    a. Contractors may use 19”, 2-post communications racks only in telecommunication rack spaces too small to use 4-post racks. Prior notification must be given to the CSD Director of IT.

    b. 2-post racks, when necessary, will be Panduit or Leviton black-powdered aluminum (or Canyons approved equivalent) and have the following properties:

        - 19" EIA rack, aluminum.
        - Dimensions: 96.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).

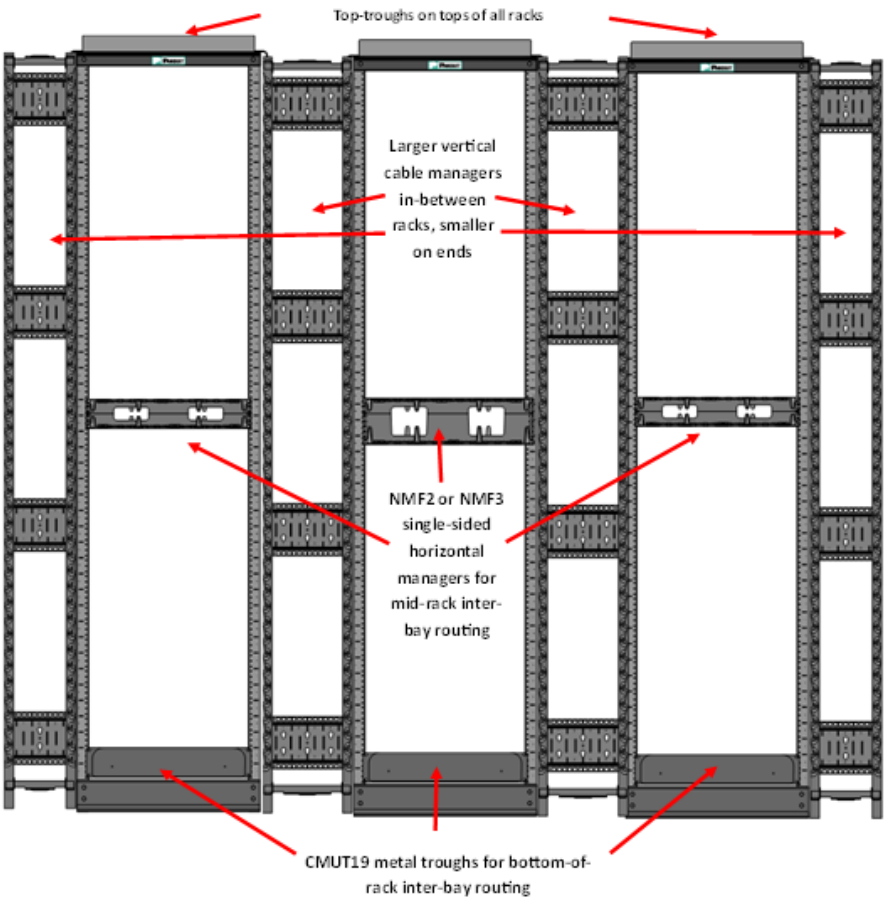
- Rack units numbering up from bottom to allow quick and easy location of rack mount items
- UL listed for 1,000 lbs. load rating.
- Double-sided #12-24 EIA universal mounting hole spacing with 24 #12-24 mounting screws included.
- Accepts all Panduit or Leviton cable management and patch panel products in addition to any industry standard 19" components or Canyons School approved equal.
- Includes paint piercing washers for assembly to assure electrical continuity between components as pert TIA 607-B Bonding and Grounding Standard.

c. In telecommunications rooms with multi-bay rack rows configured such that patching will take place between racks, Contractor is responsible to include in design interbay routing pathways at the top, middle and bottom of each bay to provide efficient and neat interbay routing.

d. Interbay routing shall be provided in the form of top troughs, interbay mid-rack path and flanged shelf at the bottom. (See “Illustration of Interbay Routing” below).

Illustration of Inter-bay Routing in Rack Systems

(Note: Doors left off vertical and horizontal managers for clarity)



e. For bottom-of-rack interbay routing where cable quantities exceed capacity of CMUT19 troughs, Contractor shall substitute 4RU trough CMLT19.

f. All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to TIA 607-B Bonding and Grounding Standard. See Bonding and Grounding section of this document for details.

g. See Appendix A for part numbers.

3. Rack-mounted Cable Management – Vertical Managers

a. Vertical cable managers shall be PatchRunner™ high capacity vertical Cable management system in sizes 6” wide, 8” wide, 10” wide and 12” wide, Leviton vertical cable management systems or Canyons School approved equivalent.

b. Contractor will use double-sided (front and back) vertical managers on fronts of 4-post racks.

c. All vertical cable managers shall have metal dual hinged doors.

d. Contractor shall choose vertical cable manager width according to manufacturer's fill tables to not represent more than a 35% fill at installation based on projected worst-case density when racks are fully populated.

e. Vertical cable managers shall have the following features:

- High density minimizes area required for network layout, freeing up valuable floor space.
- Allows mounting of many standard EIA 19" accessories, such as patch panels, vertically in the manager.
- Ventilated sidewalls provide maximum airflow for equipment cooling.
- Snap on finger sections can be removed to improve airflow, and breakaway fingers allow routing of large cable bundles.
- Large finger spacing accommodates up to 48 Cat6A cables.
- Optional sure-close dual hinged metal doors provide easy access to vertical pathway and provide visual and audible feedback on closure.
- Available in 7-foot version.

f. See Appendix A for part numbers.

4. Rack-mounted Cable Management – Horizontal Managers

a. One-to-one switch patching strategy largely eliminates the need for horizontal cable managers, but there still may be instances requiring them. One example is in the network core where chassis switches are used.

b. For these areas requiring horizontal cable managers, Contractor shall user double-sided NetManager ™ high capacity horizontal cable managers, Leviton horizontal cable managers or Canyons approved equal having the following features:

- Innovative inset fingers slope inward toward back of managers offering unobstructed access to network cabling for easier moves, adds, and changes.
- Large front finger openings easily accommodate Category 6a and 10 G/b E cables, speeding installation and reducing maintenance costs.
- Rear cable management finger spacing utilizes open D-rings for greater accessibility.
- Can be used to create large capacity horizontal pathways for routing cable.
- Patented front and rear dual hinged cover allows cable access without removing cover.
- Curved surfaces maintain cable bend radius.
- Pass-through holes allow for front to rear cabling.
- Built in cable retainers hold cable in place for easy moves, adds, and changes.
- Mount to 19" EIA racks and cabinets.

- Covers, #12-24 and M6 mounting screws included.
- Design fits flush to the front of the NetRunner ® High Capacity WMPVHCF45E and WMPVHC45E Vertical Managers or Leviton vertical cable managers.

c. See Appendix A for part numbers.

F. Cable Accessories

1. Cable Ties

   a. Cable bundles on racks and in pathways shall be bundled with re-enterable hook and loop cable ties that come in continuous rolls.

   b. Contractor is responsible for using plenum hook and loop ties in air-return spaces.

   c. See Appendix A for part numbers.

2. Physical Security Devices

   a. Some portions of Canyons School District networks require additional physical security devices. These take three forms:

   b. Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.

   c. Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.

   d. Devices that temporarily or permanently block USB ports on laptops and computers.

   e. Areas where such devices are required will be called out in the project documentation.

   f. See Appendix A for part numbers.

G. Communications Grounding Network

1. General

   a. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA 607-B Standard.

2. Room Busbars

   a. All Telecommunications spaces and distributor rooms shall have installed an appropriately sized wall-mount busbar with BICSI hole spacing that bonds to the building bonding backbone.

   b. See Appendix A for appropriate room telecommunications grounding busbar.

3. Rack and Equipment Grounding

   a. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding

them to the wall mounted busbars as described in the TIA 607-C standard.

b. All newly installed racks and cabinets shall have installed a vertical busbar mounted along one equipment rail to serve as a clean, low-resistance bonding place for any equipment not equipped with a designated grounding pad.

c. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.

d. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.

e. Contractor shall take care to clean (wire brush, scotchbrite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.

f. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.

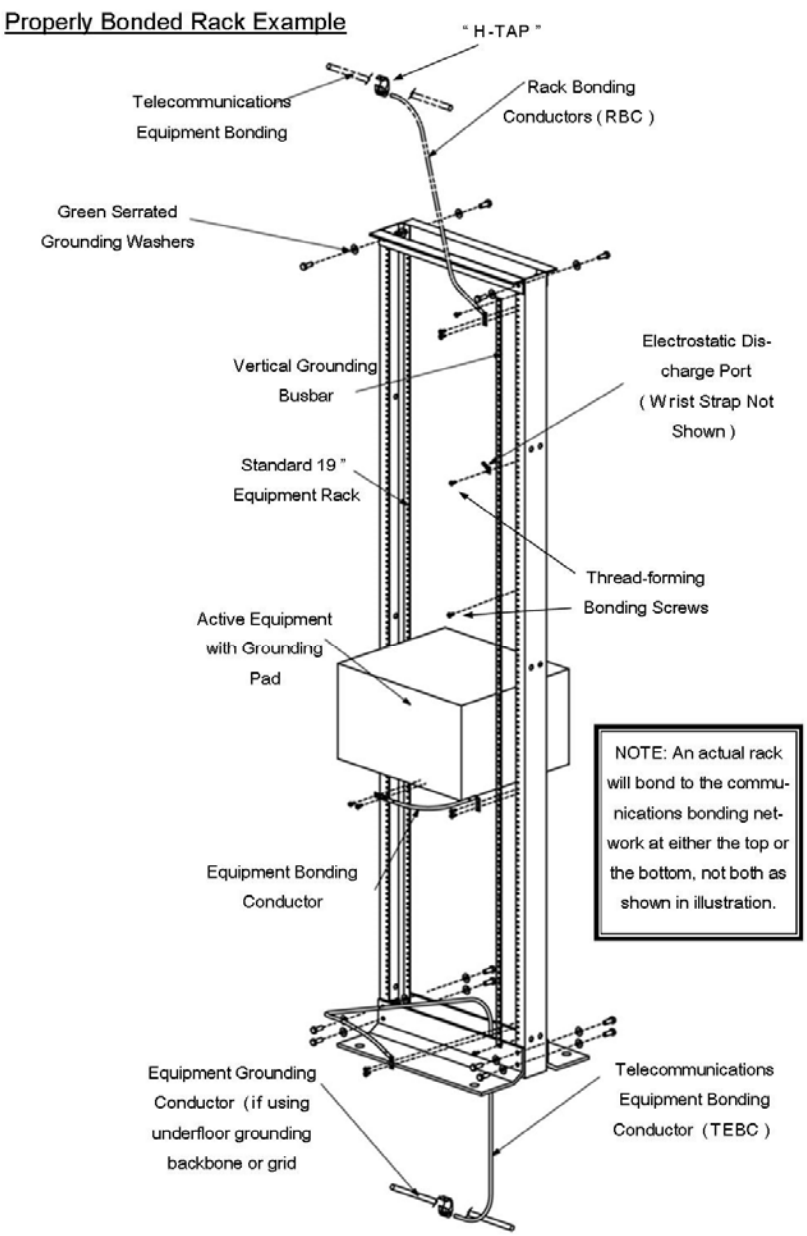
g. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy chaining) of racks is expressly forbidden and will not be accepted.

h. Rack Bonding Conductors (RBC) may tap into an overhead or under floor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.

i. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets, these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.

j. Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.

k. For examples of rack grounding, refer to the illustration below:



END OF SUB-SECTION SECTION III

H. Communications Entrance Facilities

1. General

    a. All entrance facilities shall be installed, grounded and bonded per applicable building, fire and electrical codes

    b. A minimum of qty 1 (one) 4” metal conduit shall extend from the Canyons School District owned handhole/vault at the property line to the MDF.

    c. A minimum of qty 1 (one) 4” conduit (item b – above) shall contain qty 3 (three) 1.25” innerduct from the handhole to the MDF.

    d. All innerduct shall contain a secured pull string/tape.

IV. Network Labeling

A. General Requirements

1. When labeling any Canyons School District Information Technologies network system, whether existing or new, Contractor shall always adhere to the following requirements:

    a. Contractor shall, wherever possible pre-print labels using Panduit Easy-Mark software and laser jet printer, Leviton or Canyons approved equivalent.

    b. The Panduit PanTher (LS8E) hand-held thermal transfer printer, Leviton or Canyons approved equivalent shall be used on site to print labels that were unanticipated, or that become damaged in application.

    c. This labeling strategy shall, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.

    d. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.

    e. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

    f. All label printing will be machine generated by either hand-held labeling systems or computer generated using programs and materials built specifically for communications labeling.

    g. Hand written labels will not be accepted and must be remedied at Contractors expense.

    h. Cabling system labels shall utilize materials designed to outlast the cabling elements to which they attach. Office quality labels will not be accepted.

    i. Cable labels shall be self-laminating, appropriately sized to the outside diameter of the cable and placed within view at the termination point on each end.

    j. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

    k. Machine-generated labels shall be installed behind the clear lens or cover on any device that provides such an option.

l. All labels will be permanently affixed to installed cables, patch panels, racks, cabinets, and enclosures.

m. Labels shall be legible and placed in a position that insures ease or visibility. Label type must be as listed in Appendix A - Materials section at the end of this document.

n. Conduit shall be marked indicating the identification of the cable within.

o. All cabling added to existing “legacy” installations shall follow the labeling convention in place at that location.

p. All labeling of installed cabling in new (greenfield) projects shall satisfy all requirements of TIA 606-B, or be modified as indicated in the project specific documentation.

END OF SUB-SECTION IV

V. Testing and Acceptance

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.

2. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.

3. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.

4. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the PANDUIT® Certification Plus or PanGen™ System Warranty, Leviton/Berk-Tek Limited Lifetime Warranty, or Canyons School approved equal guidelines and best industry practice.

5. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

a. Copper Link Testing

1. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA 1152 and ANSI/TIA 568-C.2 for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.

2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is the more stringent.

3. Contractor shall set references according to manufacturer’s recommendation prior to each day’s testing and reset references anytime tester is left unused for more than two hours.

4. For warranty purposes, Contractor shall perform the appropriate Permanent Link test. Channel Link testing is rendered void by the movement of patch cords and can be run but not used for final acceptance criteria.

b. Fiber Testing

1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA-C.0 and shall be within limits specified within ANSI/TIA-C.3, or as spelled out in the project documentation.

2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.

3. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

4. Backbone single-mode fiber cabling shall be tested at the 1310 and 1550 wavelengths in both directions.

5. Test set-up and performance shall be conducted in accordance with ANSI/568-C.0 standard, Method B.

6. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link-loss testing with a power meter is required. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above.

7. The values for calculating loss shall be those defined in the ANSI/TIA 568-C.3 Standard. If the link loss requirements defined within the standard are in conflict with those referenced in the project documentation, Contractor shall immediately bring this to the attention of Information Technologies for resolution.

c. System Documentation

1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to Canyons Schools for approval. Documentation shall include the items detailed in the sub-sections below.

2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.

3. Contractor shall submit with drawings a diagram of each telecommunications room with indicating which cabling drops will terminate in which rooms (classrooms). This is both to give an idea of contractor cable plant design, as well as to facilitate future troubleshooting.

4. At the request of the Information Technologies Engineer, the telecommunications contractor shall provide copies of the original test results in tester native format, not spreadsheet.

5. Information Technologies may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by Information Technologies, including a 100% re-test. This re-test shall be at no additional cost to the Canyons School District Information Technologies.

d. Test Results

1. Documentation shall be provided in electronic format within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year).

2. The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crewmember name(s). Documentation shall also include test equipment name, manufacturer, model number, serial number, software version and last factory calibration date.

3. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation.

4. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

5. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form.

6. The media shall contain the electronic equivalent of the test results as defined by the specification along with the software necessary to view and evaluate the test reports.

7. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

8. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations.

9. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The School District will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added.

10. These documents will be modified accordingly by the Telecommunications Contractor to denote as-built information as defined above and returned to the Canyons School District.

11. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.

END OF SUB-SECTION V

Appendix A – Materials List

Manufacturer	Part Number	Description
		COPPER DISTRIBUTION
General Cable	**7141819**	CAT6A GenSPEED ® 10 UTP plenum (CMP), 4-pair, UTP copper cable, 0.25 OD – blue
General Cable	**2131752E**	25 pair, plenum rated, Category 5E cable – gray.
General Cable	**8136100**	CAT6A GenSPEED® Outside Plant Cable
Panduit	**CJ6X88TGBL**	Category 6A, RJ45, 8-position, 8-wire, 10 Gb/s UTP Mini-Com® universal jack module has TG-style termination – color black. For other standard colors, replace suffix “BL” with IW (Off White) with EI (Electric Ivory), WH (White), AW (Arctic White), IG (International Gray), OR (Orange), RD (Red), BU (Blue), GR (Green), YL (Yellow), or VL (Violet). Canyons School District standardize on black unless otherwise indicated in project documentation. NOTE MODULAR PATCH PANELS MUST BE POPULATED WITH JACKS AS WELL AS STAINLESS FACEPLATES.
Panduit	**CMBBL-X**	Mini-Com blank module to blank out open spaces (holes) on faceplates and patch panels. For colors other than black replace “BL” with IW (Off White) with EI (Electric Ivory), WH (White), or IG (International Gray).
Panduit	**CPPL24WBLY**	24-port patch panel with labels, supplied with six factory installed CFFPL4 type front removable snap-in faceplates. Contractor to populate black Cat 6 jacks as specified in this document.
Panduit	**CPPL48WBLY**	48-port patch panel with labels, supplied with six factory installed CFFPL4 type front removable snap-in faceplates. Contractor to populate with black Cat 6 jacks as specified in this document.
Panduit	**UTP28X**BU**	Category 6A Performance, 28AWG, UTP patch cord. For lengths 1 to 50 feet (increments of one foot), replace ** with desired length in feet. For standard cable colors other than Off White, replace “BU” with color code: BL (Black), RD (Red), YL (Yellow), GR (Green), OR (Orange), GY (Gray), PK (Pink), or VL (Violet).
Panduit	**CFPSL4IWY**	Single gang, plastic, sloped vertical faceplate accepts four Mini-Com® Modules.
Panduit	**CFPSL6IWY**	Double gang, plastic, sloped vertical faceplate accepts eight Mini-Com® Modules. For labels use
Panduit	**UICFPSE8IW-2G**	Double-gang, plastic, sloped vertical faceplate holds up to eight Mini-Com® Modules.
Panduit	**CFPL4SY**	Single gang, stainless steel vertical faceplate accepts four Mini-Com ® Modules. Requires minimum 1.9" wide electrical box for proper mounting.
Panduit	**CFPL8S-2GY**	Double gang, stainless steel vertical faceplate accepts eight Mini-Com® Modules.
Panduit	**P110KB1005Y**	Panduit Pan-Punch 100 pair 110 block termination kits for 25pr 5E cable. Field terminated. Includes a base, 5-pair connector kit with five 5-pair connectors per row of 25 pairs, two label holders, and two white designation labels.
		FIBER DISTRIBUTION SYSTEMS
General Cable	**BE0121ANU-ILPA**	Plenum-rated, indoor/outdoor tight-buffered, armored OM3 12 strand fiber cable.
General Cable	**BE0241ANU-ILPA**	Plenum-rated, indoor/outdoor tight-buffered, armored OM3 24 strand fiber cable.
General Cable	**BL0121ANU-ILPA**	Plenum-rated, indoor/outdoor tight-buffered, armored OM4 12 strand fiber cable. (Use OM4 for any telecom rooms that are further than 300M apart).
General Cable	**BL0241ANU-ILPA**	Plenum-rated, indoor/outdoor tight-buffered, armored OM4 12 strand fiber cable. (Use OM4 for any telecom rooms that are further than 300M apart).
Panduit	**FLCDMCXAQY**	LC OptiCam® 10Gig™ 50/125µm Multimode Duplex Fiber Optic Connector for 900µm tight-buffered fiber installation.
Panduit	**FCE1U**	Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to four QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 1.73"H x 17.60"W x 16.30"D (43.9mm x 447.0mm x 414.0mm).

Panduit	**FCE2U**	Opticom® QuickNet™ Rack Mount Fiber Enclosures, holds up to eight QuickNet™ Cassettes, FAP adapter panels, or FOSM splice modules. Dimensions: 3.48"H x 17.60"W x 16.30"D (88.4mm x 447.0mm x 414.0mm).
Panduit	**FAP6WAQDLC**	LC 10Gig™ FAP loaded with six LC 10Gig™ Duplex Multimode Fiber Optic Adapters (Aqua) with phosphor bronze split sleeves.
Panduit	**FAPB**	Blank fiber adapter panel – reserves space for future use.
Panduit	**FX2ERQNQNSNM*** **	OM4 push/pull LC jumper/patch cord. Riser rated. *** At end of part number is for length in meters. Comes in 1 M increments up to 20 meters, then in lengths of 20 M, 25 M, 30 M, and 35 M. Put length in the following (3 digit) format: 001 for 1 M, 020 for 20 M, etc.
		RACKS AND CABLE MANAGERS
Panduit	**R4P**	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 30.0"D (2134mm x 591mm x 762mm).
Panduit	**R4P36**	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 36.0"D (2134mm x 591mm x 914mm).
Panduit	**R4P42**	4 post EIA rack with #12-24 threaded rails. Dimensions: 84.0"H x 23.25"W x 41.5"D (2134mm x 591mm x 1054mm). FOR TOP OF RACK INTERBAY ROUTING.
Panduit	**R4PWF**	Top trough with waterfall for 4-post racks creates pathway above rack. Dimensions: 1.9"H x 26.1"W x 8.5"D (50mm x 662mm x 216mm).
Panduit	**R2P**	19" EIA 2-post rack, aluminum. Dimensions: 84.0"H x 20.3"W x 3.0"D (2134mm x 514mm x 76mm).
Panduit	**R2PPEVWF**	Waterfall Trough for 2 Post Rack and PatchRunner high capacity ™ Vertical Cable Managers. FOR TOP-OF-RACK INTERBAY ROUTING.
Panduit	**PEV6**	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 6.0"W x 28.1"D(2120mm x 152mm x 714mm).
Panduit	**PED6**	Dual hinged metal door. Dimensions: 82.8"H x 6.1"W x 1.7"D (2103mm x 155mm x 43mm).
Panduit	**PEV8**	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 8.0"W x 28.1"D (2120mm x 203mm x 714mm).
Panduit	**PED8**	Dual hinged metal door. Dimensions: 82.8"H x 8.1"W x 1.7"D (2103mm x 206mm x 43mm).
Panduit	**PEV10**	High capacity dual-sided vertical manager. Dimensions: 83.5"H x 10.0"W x 28.1"D (2120mm x 254mm x 714mm).
Panduit	**PED10**	Dual hinged metal door. Dimensions: 82.8"H x 10.1"W x 1.7"D (2103mm x 256mm x 43mm).
Panduit	**NM1**	Horizontal Cable Manager High Capacity Front and Rear 1 Rack Unit. 1.7"H x 19.0"W x 13.1"D (44mm x 482mm x 332mm).
Panduit	**NMF1**	Horizontal Cable Manager High Capacity Front Only 1 Rack Unit. 1.7"H x 19.0"W x 6.2"D (44mm x 482mm x 157mm).
Panduit	**NM2**	Horizontal Cable Manager High Capacity Front and Rear 2 Rack Units. 3.5"H x 19.0"W x 13.1"D (88mm x 482mm x 332mm).
Panduit	**NMF2**	Horizontal Cable Manager High Capacity Front Only 2 Rack Units. 3.5"H x 19.0"W x 6.2"D (88mm x 482mm x 157mm). FOR MID-RACK INTERBAY ROUTING.
Panduit	**NMF3**	Horizontal Cable Manager High Capacity Front Only 3 Rack Units. 5.2"H x 19.0"W x 6.2"D (133mm x 482mm x 157mm). FOR MID-RACK INTERBAY ROUTING.
Panduit	**CMUT19**	2 RU upper trough with 1.3" bend radius mounts to the top of a standard 19" EIA rack. Dimensions: 3.5."H x 19.0"W x 4.5"D (89mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY.
Panduit	**CMLT19**	4 RU lower trough with 1.3" bend radius mounts to the bottom of a standard 19" EIA rack. Dimensions: 8.0"H x 19.0"W x 4.5"D (203mm x 483mm x 114mm). FOR BOTTOM-OF-RACK INTERBAY PATHWAY. LARGER OPTION THAN CMUT19 IF NEEDED.
		CABLE PATHWAYS
Panduit	**J-Pro J-Hook system**	Panduit J-Pro System. Plenum rated composite J-hooks with hardware available for various hardware applications.
B-line	**WB400**	B-line basket tray.

Panduit	**LD10IW10-A**	LD10 International White Plastic Raceway, see catalog or www.panduit.com for fittings. For 8' sections order LD10IW18-A.
Panduit	**LD2P10**	Dual Power/Data Raceway channel plastic raceway for concurrently running power and data. See catalog or www.panduit.com for fittings.
Panduit	**JBX3510IW-A**	Single gang two-piece snap together outlet box with adhesive backing. Box accepts Pan-Way ® Screw-On Faceplates or any NEMA standard single gang faceplate. For use with Pan-Way ® T45 or LD profile raceway. 5.00"L x 3.26"W x 1.62"H (127.1mm x 82.7mm x 41.1mm). Breakouts for 1/2", 3/4", or 1" diameter conduit.
Panduit	**JBP2IW**	Double gang two-piece screw together outlet box. Box accepts Pan-Way ® Screw-On Faceplates or any NEMA standard double gang faceplates. For use with Pan-Way ® LD profile raceway. 5.05"L x 5.05"W x 1.62"H (128.2mm x 128.2mm x 41.1mm). Breakouts for 1/2" or 3/4" diameter conduit.
Panduit	**T70BIW10**	Panduit T-70 dual channel plastic raceway for concurrently running power and data in computer labs. See catalog or www.panduit.com for partitions and fittings. For 8 foot sections replace "10" in part number with "8".
Panduit	**T70CIW10**	Cover for T-70 dual channel raceway. For 8 foot sections replace "10" in part number with "8".
		BONDING AND GROUNDING
Panduit	**ACG24K**	#6 AWG (16mm2) jumper for armored cable diameter up to 0.84" (21.3mm); 24" (609.6mm) length; factory terminated on one end with LCC6 two-hole copper compression lug and the other end with grounding terminal; provided with two each #12-24 and M6 thread-forming screws and a black polypropylene terminal cover.
Panduit	**LCC series**	Panduit two-hole compressing lugs for code conductors in BICSI hole spacing.
Panduit	**HTCT series**	Panduit HTAPs. Must be selected according AWG size of run and tap conductors.
Panduit	**CLRCVR series**	Panduit clear covers for HTAPs. Must be selected according to HTAP being covered.
Panduit	**RGS134-1Y**	Grounding strip (vertical busbar) for newly installed racks or cabinets with screw rails. 78.65" (2m) length; .67" (17mm) width; .05" (1.27mm)thickness; provided with .16 oz. (5cc) of antioxidant, one grounding sticker and three each #12-24 x 1/2" and M6 x 12mm thread-forming screws.
Panduit	**RGCBNJ660P22**	Jumper kit for bonding individual racks or cabinets into grounding backbone. #6 AWG (16mm²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread forming screws and a copper compression HTAP* for connecting to a #6 to #2 awg sized bonding backbone.
Panduit	**GJ672UH**	Rack jumper (and cabinet) kits for smaller TR (5 bays or less) to bond individual rack or cabinet directly back to wall mounted busbar. One 72" length #6 AWG green wire with yellow horizontal stripe. Jumper is pre-terminated on one end with LCC6-14JAWH-L and the other end with LCC6-14JAW-L. This rack grounding jumper is 72" long. For other lengths replace the "72" in the part number. Available lengths are 72, 96, 120, 144, 168, 192, 216, 240, 264 and 288 inches.
Panduit	**RGESD2-1**	Two-hole ESD port with 5/8" hole spacing; provided with an ESD protection sticker, .16 oz. (5cc) of antioxidant, and two each #12-24 x 1/2" and M6 x 12mm thread-forming screws. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH WRIST STRAP RGESDWS.
Panduit	**RGESDWS**	Adjustable fabric ESD wrist strap with 6' coil cord, banana plug, 1 megaohm resistor and 4mm snap. LOCATE ONE WITHIN REACH OF ALL EQUIPMENT. WORKS WITH ESD PORT RGESD2-1.
Panduit	**RGTBSG-C**	Green thread-forming bonding screws for use to mount equipment that does not have a built-in grounding pad (terminal).
Panduit	**RGEJ1024PHY**	24" long pre-terminated equipment grounding jumper #10 AWG (6mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).
Panduit	**RGEJ1036PFY**	36" long pre-terminated equipment grounding jumper#10 AWG (6mm²) jumper; bent lug on grounding strip side to straight lug on equipment; provided with .16 oz. (5cc) of antioxidant and two each #12-24 x 1/2", M6 x 12mm, #10-32 x 1/2" and M5 x 12mm thread-forming screws. FOR EQUIPMENT LIKE CHASSIS SWITCHES WITH BUILT-IN GROUNDING PAD (TERMINAL).

Panduit	**GB2B0306TPI-1**	Wall mounted telecommunications busbar suitable for small telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 12" in size.
Panduit	**GB2B0514TPI-1**	Wall mounted telecommunications busbar suitable for med telecom room. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 2" x 24" in size.
Panduit	**GB4B0624TPI-1**	Wall mounted telecommunications busbar suitable for main grounding busbar in medium sized facility. Pre-assembled with BICSI/TIA-607-B hole spacing. Bar is 1/4" x 4" x 20" in size.
Panduit	**LTYK**	Wall mounted busbar label kit. Label kit includes printed tag and one flame retardant cable tie.
		NETWORK LABELING SOFTWARE – FOR INK JET/LASER PRINTER
Panduit	**PROG-EM2GO**	Easy-Mark Labeling Software for PC, supplied on USB Flash Drive. For preprinting communications labels on laser/inkjet printer.
Panduit	**S100X150YAJ**	Self-laminating cable labels for Category 6 cable for use with Easy-Mark software and laser/ink jet printer.
Panduit	**C261X035Y1J**	Patch Panel labels for use with Easy-Mark software and laser/ink jet printer.
Panduit	**C195X040Y1J**	Faceplate labels for single gang stainless or sloped plastic - use with Easy-Mark software and laser/ink jet printer.
Panduit	**C288X040Y1J**	Faceplate labels for double gang stainless - use with Easy-Mark software and laser/ink jet printer.
Panduit	**S100X650YAJ**	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with Easy-Mark software and ink jet printer.
Panduit	**S100X160YAJ and NWSLC-3Y**	Label and turn-tell sleeve for labeling fiber jumpers. For use with Easy-Mark software and ink jet printer.
Panduit	**C200X100FJJ**	1" high, white, vinyl tape labels for labeling grounding busbars, racks, cabinets and pathways. For use with laser/ink jet printer.
		NETWORK LABELING – HANDHELD LABELER
Panduit	**LS8EQ-KIT-ACS**	Panduit PanTher hand-held label printing system in kit. Includes LS8EQ printer with QWERTY keypad, one cassette of S100X150VAC self-laminating labels, six AA alkaline batteries, LS8E-ACS, LS8-CASE, LS8-PCKIT, LS8-IB, LS8-WS, quick reference card and operator's manual. USE FOR LABELS THAT MUST BE PRINTED ON THE JOB SITE.
Panduit	**S100X150VAC**	Self-laminating cable labels for Category 6 cable for use with PanTher LS8E hand-held printer.
Panduit	**C261X035Y1C**	Handheld printer labels for modular faceplate patch panels.
Panduit	**C195X040Y1C**	Faceplate labels for single gang stainless - use with PanTher handheld labeler.
Panduit	**C288X040Y1C**	Faceplate labels for double gang stainless - use with PanTher handheld labeler.
Panduit	**S100X650VAC**	Cable label for indoor/outdoor tight-buffered armored fiber optic cable. For use with handheld labeler.
Panduit	**S100X160VAC and NWSLC-3Y**	Label and turn-tell sleeve for labeling fiber jumpers. For use with hand-held labeler.
Panduit	**T100X000VPC-BK**	1" high, continuous black on white, vinyl tape labels for labeling racks, cabinets and pathways with PanTher LS8E handheld labeler.
		PHYSICAL SECURITY LOCKING DEVICES
Panduit	**PSL-DCJB-C**	Package of 100 RJ45 jack blockout devices and one removal tool. Color red.
Panduit	**PSL-USBA-L**	Package of 50 USB Type 'A' blockout devices and one removal tool. Color red.
Panduit	**PSL-USBB-L**	Package of 50 USB Type 'B' blockout devices and one removal tool. Color red.
Panduit	**PSL-DCPLX-BL-C**	Package of 100 RJ45 plug lock-in devices compatible with flush mount jacks, and one installation/removal tool. Color black.

Panduit	**PSL-DCPLRX-BL-C**	Package of 100 RJ45 plug lock-in devices compatible with recessed jacks, and one installation/removal tool. Color black.
		CABLE TIES – HOOK AND LOOP
Panduit	**TTS-35RX0**	.75” wide, continuous roll Hook and Loop Cable Ties, black. 35 ft roll. Carton qty 10 rolls.
Panduit	**HLSP1.5S-X12**	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6” length.
Panduit	**HLSP3S-X12**	Plenum rated hook and loop cable ties for air return spaces. Maroon color, perforated at 6” length.

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SECTION 27 5123

INTERCOMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.

C. Refer to specification 26 0553 conduit and junction box color requirements.

D. Refer to specification 27 1500 for category and/or optical fiber cable and connectivity specifications and color requirements.

1. Fiber Optic Cable: Fiber optic cable is the designated media cabling for school backbone inter-building and intra-building wiring. This includes all MDF to IDF or IDF to IDF and vertical riser applications.
2. Copper Cable: Unshielded Twisted Pair (UTP) with the specified category cabling must be used for the horizontal wiring from the MDF, IDF, or CP to the individual communications outlets.
3. Rack and PoE Switches Requirement: low voltage contractor is responsible for equipment racks, and/or communications cabinets unless specifically noted withing the drawings.
    a. The racks must be installed in the MDF and IDFs to support communications systems equipment and the communications distribution system and must match the current School District Standard. Communications distribution cables must be terminated in jackfields and punch-down blocks mounted in the equipment racks or communications cabinets.

1.2 ADMINISTRATIVE REQUIREMENTS:

A. Bid Submittal:

1. Equipment Costs: Breakout cost of material and labor as different line items.
2. Provide separate line items for each section that you are being bid on.
    a. Contractor shall not provide a single number with all the sections/scopes combined.
3. There will be a demolition and upgrade phase at the beginning of this phase. During the construction intercom system shall be operational during school. Each Bid Package will add and remove Intercom devices from the system. Contractor to review the bid documents at each phase/Bid Package.

B. Coordination:

1. Coordinate final inspection of the systems installed, with Audiovisual (AV) Consultant, three (3) weeks in advance.
2. Obtain GANTT chart for construction time frame from the General Contractor.
3. Coordinate with Electrical contractor to meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate the mounting condition of all ceiling-mounted AV equipment with ceiling type. During second meeting, coordinate the location of all ceiling-mounted AV equipment in each area.

4. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all loudspeaker and duct work in all areas.
5. Meet with Electrical contractor prior to pathway rough-in to coordinate Intercom system requirements in each area.
6. Meet at least once, prior to rough-in, with horizontal cabling installer to verify all required drop points are accounted for. Coordinate cable color according to specification 27 1500.
7. Meet at least twice with owner to coordinate network requirements. Hold the first meeting before submittal of shop drawings to coordinate network protocols, including but not limited to: IP address schedules, MAC address schedules, patchbay schedules, security requirements, and VLANs. Hold the second meeting prior to system deployment.
8. Coordinate color and finish of all system components with Architect or Electrical contractor as appropriate.
9. Coordinate all system components within millwork/furniture with millwork shop drawings prior to rough-in.
    a. Intercom contractor shall attend the electrical pre-construction meeting per specification 26 0500.

1.3 DESCRIPTION OF WORK:

A. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system.

B. This section includes an expansion of the existing fully operational IP platform for school internal communications system incorporating school safety notifications and general communications. System is intended to provide 2-way communication within specific areas, mass notification, zone announcements, and more as indicated within this document.

C. All bids shall be based on the expansion of the existing school districts Intercommunication and Bell Schedule Server Systems and must be compatible with the existing Rauland-Borg Systems - No Exceptions. Equipment as specified herein. The catalog numbers and model designations are that of the RAULAND BORG CORPORATION.

D. Equipment submitted in bid proposal that has not been approved by intercom Consultant in writing will not be accepted and shall be replaced by approved equipment at contractor’s expense. Equipment not listed within this specification, or contract documents, that are required for a complete and working system, shall be of professional grade and used in the same manner as needed for a complete and working system.

E. The platform shall provide complete internal communications employing IP Technology including the minimum functions listed.

1. Two-way Loud Speaking Internal Intercommunications.
    a. Paging and two-way loud speaking features shall be accessible from any system console or SIP connected telephone.
2. Bell Event announcement
    a. Bell Schedules shall be easily assigned to days and changed simply with authenticated access to the system through any browser-based device.
    b. Provide a simple calendar-based scheduling system for bells. It shall provide the ability to have an unlimited number of bell schedules.
    c. Provide a calendar-based scheduling up to four years in advance. The system shall be capable of displaying a fully year calendar and differentiating which bell program is scheduled to run on each day in an easy-to-read format. The calendar shall be based on a standard school year and provide a selectable start month.

d. Provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone within the facility or outside the facility to any other location within the facility or district.

3. Emergency announcement that will override any pre-programmed zones assuring that all Emergency/Lockdown etc., are heard at each and every loudspeaker location.
   a. The system shall automatically broadcast emergency instructions throughout the entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions shall be preprogrammed and require no user intervention. The system shall provide a redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
   b. The system shall have the capability of maintaining a record of all alerts that are received and provide appropriate school personnel the capability to enter information about the alert, which shall be maintained in the systems database. That information shall also be made available to appropriate school personnel in the form of a report that shows all alerts that have occurred, their date, time, and the end alert information.
   c. Capability of prerecording emergency announcements that can be activated by a Soft Key or via a dedicated call-switch.
   d. Shall provide ability to clear status by individual location, region, or global.
   e. Shall provide pop up alarms on Lockdown, Shelter, or Evacuation events.
4. The system shall provide two I/O Ports on each classroom network interface, and common zone network interface which can be used as programmable inputs or outputs to control contact closures. Contact closures can be activated manually to turn on cameras, unlock doors, emergency lockdown, etc.
   a. Connect two (2) ports to the classroom sound amplification system (CSAS) for emergency notifications to and from the classrooms. The CSAS system shall notify the system and the system shall provide feedback to the CSAS indicating the notification went through.
5. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.
6. The system shall be a software-controlled system, whose primary interface is a web-based portal, accessible from any authorized computer, and with assignable permission levels for each user.
7. Classroom systems and common zone network interfaces shall be capable of utilizing standard Category based infrastructure, Category 6 or better, for installation from the intermediate distribution frames only to the classroom and/or zone, allowing for only one type of wiring infrastructure within the school. Distribution of all voice signaling shall utilize a shared or dedicated IP network.
8. The platform shall provide complete internal communications employing SIP (Session Initiation Protocol) including the minimum functions listed.
   a. Integration with any VoIP telephone system using SIP type integration. It shall allow the school(s) to upgrade or replace their telephone system without requiring the owner to replace, or lose any feature of, their internal communications (intercom) system.
   b. Support a SIP trunk from the building's VOIP phone system to provide hands free two-way communication from all administrative telephones to any location equipped with a talkback speaker or audio system with room microphone
   c. Provide its own SIP environment, and in the case of a failure of the schools VoIP telephone system, be capable of operating completely

independently for all functions, except access from the handsets connected to the schools VoIP system.

d. Access remote classrooms (trailers, temporary classrooms etc.) via IP interface or room audio system with room microphone. Integration with any VoIP telephone system using SIP type integration.

e. It shall allow the school(s) to upgrade or replace their telephone system without requiring the owner to replace, or lose any feature of, their internal communications (intercom) system.

f. Any authorized administrator shall be able to call from outside the school into any classroom, zone or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools)

9. The system shall utilize a shared data network (VLAN enabled) or dedicated network as means of distribution for all voice overhead paging, emergency paging, emergency tones, intercom, and class change tones.

F. The system shall support receiving multiple levels of priority, which shall be user definable, that is appropriate for the size of the project. Each end point to place a minimum of a; normal. emergency, ok, and help level priority call depending on the system state at the time of the notification.

G. Authorized system users shall be able to create a minimum of twenty (20) automated sequences with emergency instructions, emails and relay activations and replay them. Automated message strings shall be, manually played from a single-button access on the console, on a SIP connected telephone, a panic button or from the web interface.

H. The platform shall synchronize its system time to the network timeserver or a web-based time server.

I. Installation shall be locally survivable for intercom, paging bells, and emergencies such as lockdown, even when the district connection is unavailable.

J. Input plates shall match the color and style being used throughout the project.

K. Contractor is responsible for coordinating with all other trades for equipment locations, mounting requirements, supports and plenum space requirements.

L. Interconnect the Fire Alarm system to the intercommunications system such that upon activation of any initiating device, a preset audible alarm will be sent to all intercom speakers. In addition, the contractor shall provide all controls necessary between the two systems such that upon silencing the alarm on the fire alarm panel, it automatically silences the audio file in the intercom system.

M. Interconnect the Access Control system to the intercommunications system such that upon activation of an Emergency Lockdown or Preventative Lockdown from the administrative console, web browser, app, etc, a communication protocol will be sent from the intercom system to the access control system that will allow for all controlled doors to be locked, a designated campus wide communication throughout the building, emails, SMS text, etc. A minimum of two types of initiations process shall be programmed e.g. “Emergency Lockdown or “Preventative Lockdown” In addition, the contractor shall provide all controls necessary between the two systems such that the system can easily be reprogrammed to meet the needs of the School District.

N. AV contractor shall participate in a mandatory pre-construction meeting no more than (60) days prior to ordering equipment, and before work can begin. Contractor is responsible for coordinating meeting. The meeting will be held at AV Consultant’s office. All submittals, shop drawings, and bill of materials shall be completed and submitted to AV Consultant for review (8) working days prior to this meeting.

1. AV contractor shall attend the electrical pre-construction meeting per specification 26 0500.

1.4 QUALITY ASSURANCE:

A. MANUFACTURERS:

1. Firms regularly engaged in manufacturing of; sound equipment, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than five (5) years. Equipment supplier shall be authorized representative of the manufacturer of each major piece of equipment and be currently authorized by the manufacturer to furnish, install and service that particular equipment.

B. INSTALLER:

1. Qualified with at least 5 years of successful installation experience with similar systems.
2. Integrating firm shall have worked satisfactorily for a minimum of (5) years of completing systems equal to this scope, quality, type and complexity.
3. Key personnel assigned to the project shall each have minimum of (10) years of experience in completing systems equal to this scope, quality, type and complexity.
4. Contractor shall be a factory authorized distributor of all equipment specified for the geographical area of the project.
5. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
6. Contractor shall have current manufacturer certificates for system and equipment listed within this specification.
7. All contractors biding on this project must have local representation that is within 4 hours of the job site.
8. Any contractor that cannot meet this requirement shall not bid on this project.

C. Contractor must follow the standards described within:

1. BICSI/AVIXA AV Design Reference manual.
2. ANSI/AVIXA 2M-2010 Standard guide for Audiovisual Systems Design and Coordination Processes.
3. ANSI/AVIXA 10:2013 Audiovisual Systems Performance Verification Guide.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. Comply with NFPA 70 and with NEMA Standard SB-40 for Emergency Communications in K-12 schools.

F. Comply with UL 60950.

1.5 SUBMITTALS: Refer to Section 26 0502 for requirements.

A. The following items shall be included in the shop drawings submittal.

1. All submittals shall be submitted in a digital format with bookmarks for each section of equipment. Any submittals that are partial or incomplete shall be rejected and count as one submittal against the submittal allowance.
2. Project manager to provide written proof, signed and dated, that shop drawings and/or brochure has been checked for accuracy prior to submittal. Shop drawings to comply in all respects with the requirements of the contract drawings and specifications for this project.

3. Provide a complete bill of materials for all components, accessories and hardware to be provided in order to assemble a complete and working system as described within the contract documents.
4. Submit manufacturer's data and installation details for all devices, plates, cables and similar equipment. Product data showing multiple options, products and/or models shall be clearly marked identifying the specific options, products and/or models being provided.
5. Submit dimensioned drawings and device wiring layouts for Audio, Video, Control, and power.
6. Submit equipment rack elevation diagrams.
7. Submit all manufacturer training, 3rd party and/or organization certificates for each equipment and/or systems required for the implementation of this specification.

1.6 WARRANTY:

A. Systems shall be guaranteed for a period of one (1) year from the date of substantial completion against defective materials, inferior workmanship or improper installation adjustment. Guarantee shall cover all parts and labor.

B. If system failure causes audiovisual system to be inoperative or unusable for its intended purpose, contractor, when notified of the problem, shall repair system so it will be operational and usable within three (3) business days. If defective components cannot be repaired in time, provide temporary equipment as required.

C. Contractor shall supply a one (1) year warranty on all system programming from the date of substantial completion. During this time period, upon owner request, the contractor shall provide programming changes up to four (4) times free of charge. During this time the programs shall be password protected. At any time during the (1) year, the owner can terminate the warranty and request the programming of each system. At this time the programs are to be turned over to the owner and all passwords are to be removed. The owner shall own all rights to the programming after this time, to be used in this facility.

D. Contractor shall honor equipment warranties for term established by manufacturer if greater than warranty time frame mentioned above.

E. Prior to the end of the 1-year warranty. The Intercom Integrator shall preform the following:

1. Three (3) months prior to end of warranty remind the owner and design consultant that the end of the warranty is approaching. At this time coordinate the events below with the owner and notify the design consultant of the time of the walk through(s).
2. One (1) month prior to end of warranty, walk through campus and verify all components are working. Supply list of components with location, type equipment and status to the design consultant and Owner. Correct any and all malfunctions as necessary.

PART 2 - PRODUCTS

2.1 GENERAL:

A. The platform shall utilize state of the art IP Technology, Call-in Notification, School Safety Paging and Evacuation tones, IP infrastructure, Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone, Two-way hands-free Internal Intercommunications and Paging, and Program Distribution. The system shall be easy to learn and operate. All standard programming shall be web based and user friendly to allow the system administrator the ability to easily program system features.

B. Provide complete and satisfactorily operating school communications and school safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

C. Intercom paging system power and network intercom interface:

1. Shall allow users to install intercom paging systems spanning multiple building or facilities connected through a VLAN. Provide a 100/1000 Ethernet switch port configured on a dedicated VLAN.
2. All Network interfaces used in the classroom and for the common zones shall be powered via PoE+ from the network switches.
    a. PoE+ switches and network cabling from MDF (Main Distribution Frame) and IDF (Intermediate Distribution Frame) to devices.

D. All network switches shall include an uninterruptable power source to provide adequate runtime. In the event the school has a generator the UPS systems shall hold the switches long enough until generator power can be provided.

E. The platform shall be a single electronic system consisting of intercom channels, (classroom) IP loudspeakers, corridor loudspeakers, inside and outside horns, call-in switches, and SIP phone integration.

F. Call-ins shall:

1. Be automatically annunciate (display of priority and location) to administrative consoles, SIP enabled phones and outside phones.
2. Be programmed to automatically change priority and annunciation route based on age of call-in and original priority.
3. Have priority and annunciation routing changed by user action from a console or SIP enabled phone.
4. Be annunciation routing shall include playing pre-recorded audio over speakers, sending a pre-configured e-mail and/or activating relays.

G. The platform shall lend itself to expansion by simple addition of hardware modules.

H. The platform shall directly connect to the WAN/LAN without the need for a separate server at each school location. Configuration, including bell schedules, calendars, and emergency sequences can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser-based interface.

I. The platform shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone within the facility or outside the facility to any other location within the facility or district.

J. The platform shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands free and will not require any interaction by the classroom user.

K. IP addressable loudspeaker modules for individual rooms shall be system programmable and may be assigned any two, three, four, five or six digit number as well as name and description. Any extension may be reassigned at any time.

L. IP-enabled two way voice communication shall be available from any provided telephone or administrative console through any IP loudspeaker in the system. This shall allow hands free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when

loudspeaker monitoring is active, complying fully with all privacy legislation. Pre announce tone and supervisory tones shall be disabled during designated emergencies automatically.

M. Integrated Master Clock with unlimited schedules, unlimited events, and automatic Daylight Savings time correct. Up to 5 schedules may be active on any given day for each school. User shall be able to select from 25 standard included tones or unlimited user created and uploaded audio files for class change signaling and messaging. In addition scheduled events shall include relay actions and email notifications. The platform shall allow control of the bell schedules via the district WAN/LAN without the need for a separate computer at the school location. Bell schedules can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser-based interface.

2.2 SYSTEM FUNCTIONS/SOFTWARE

A. Server Software TCU2000SW

1. Provides district wide paging, bell event scheduling, emergency notification and configuration for entire district.
2. Reports on feature usage, system activity, etc. shall be available from the district-wide web interface.
3. Ability to perform configure system and initiate system features via district wide web based interface.
4. The software has the ability to sync system time to the Atomic Clock Signal or to the school's or districts network time server
5. The software will provide a web-browser to deliver district wide emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The software must be capable of automatically notifying district personnel via the WAN of an alarm condition.
6. The software can automatically broadcast page emergency instructions via associated system hardware throughout an entire district when an alarm (e.g. lockdown, lockout, security, fire) is initiated via the web-based interface. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging loudspeakers and is not meant to replace primary fire alarm or security systems
7. The software shall support VoIP Telecenter Campus Controllers for a minimum of 1000 facilities.
8. The software shall support a minimum of 50,000 IP Loudspeaker modules, district wide.

B. VoIP Single Campus Controller Rauland-Borg Telecenter Series TCC2000 with the following features and capabilities:

1. Provides call routing for paging and intercom for a single facility
2. System shall connect to the district provided Telephone Network via a SIP connection.
3. The VX Works based Operating System and system programming database shall be stored in non-volatile flash memory. The Operating System can be easily upgraded through configuration without requiring replacement of any chips.
4. Support a flexible numbering plan allowing two, three, four, five, or six digit extensions.
5. SIP interface to a district provided Telephone Network shall be capable of allowing connected phones to display classroom call-ins, answer internal intercom call-ins, make pages and change priorities of call-ins in progress.

6. Direct Dialing, two way amplified voice intercom between any provided telephone or admin console and loudspeaker without the use of a press to talk or talk listen switch.
7. Ability to place up to 5 levels of call-in from any call in switch per area.
8. The ability to answer intercom call-ins registered at pre-selected telephones.
9. The ability to automatically escalate incoming call-ins to an alternate administrative console or SIP telephone or group of telephones if they remain unanswered for a predetermined amount of time.
10. The ability to remotely locate IP Campus Controller. The controller shall not need direct connection to any classroom via home run or distributed wiring. It shall communicate solely through the IP LAN network.
11. Single button access from any telephone on the system to distribute emergency announcements within the facility to all or select locations equipped with loudspeakers. Emergency announcements originating from any assigned administrative telephone shall have priority over all regular system functions.
12. Store a minimum of 48 hours of Bell Event Schedules, all emergency notification sequences as well as facility wide configuration.
13. System has the ability to sync system time to the Atomic Clock Signal or to the school's or districts network time server.
14. System's SIP Interface shall provide:
    a. Audio paging access from any telephone to any single intercom loudspeaker, zone (group) of intercom/paging loudspeakers, or all loudspeakers/paging horns throughout the entire facility.
    b. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with loudspeakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
15. The system will have the ability to utilize a web-browser and USB microphone to deliver district wide live emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.
16. The system can automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging loudspeakers and is not meant to replace primary fire alarm or security systems.

C. IP addressable Modules TCC2011:

1. System shall provide multiple IP addressable modules for intercom, paging and relay activation.
    a. All modules are POE 802.3af compliant
    b. All Modules support DHCP
    c. All Modules connect to network with a single RJ45 connector
2. IP Loudspeaker Module shall interface to school's data network, a loudspeaker, and multiple call switches.
    a. A minimum of 5 levels of call-in can be placed from an IP Loudspeaker Module. The call-ins route to designated administrative consoles and select SIP connected telephones and can only be cleared from the system once answered. If a call-in is not answered within a preprogrammed time the call-in may reroute to other telephones and consoles, and announce over selected or all loudspeakers.

b. The ability to belong to one or more of a minimum of 100 independent zones for zone paging, program/music distribution zones and class change tone reception; this assignment is a programmable function, change able by time of day. Each IP Loudspeaker Modules location shall be programmed in software to belong to any combination of software zones. Software/hardwired zones must be configured as part of an unlimited number of district wide groups for school district emergency announcements. These district announcements must be accessed via microphone, a web-browser or telephone.

c. IP Loudspeaker Modules shall be designed to mount near ceiling and wall loudspeakers and in the plenum space.

D. IP-addressable Zone Paging Module TCC2022:

1. Zone paging module shall connect multiple loudspeakers for all page, zone paging, bells, audio events and, emergency notification.
2. Zone Paging Modules shall be rack and wall mountable.
3. Zone Paging modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio and emergency notification

E. IP Addressable Aux I/O Module TCC2033:

1. Aux I/O Module shall have two input contacts and two output contacts.
2. Input and output contacts are individually addressable.
3. Aux I/O Module shall be wall and rack mountable.
4. User can program relays to be activated manually, through an event/bell schedule and during emergency notification

F. IP Addressable Program Line Input Module – Rauland Model TCC2055

1. Line Input Module converts stereo or mono line-level analog audio to IP-Based Data for use in the Telecenter U system.
2. Equipped with 3.5mm (headphone style) input socket.
3. Desktop or rack mountable with Rauland Model TCC2099 Universal Rack Mounting Kit.
4. Includes a male 3.5mm to dual male RCA connector cable.

G. IP Addressable Gateway TCC2024:

1. (24) Port gateway for intercom, zone paging, emergency notification program/music and event tone distribution.
2. 25 Watt amp with 5 watt maximum per port.

H. IP Addressable Administrative Console TCC2044:

1. A full color screen with 4 soft keys, 3 line select, volume control, push to talk, speakerphone mode and left/right and up/down scrolling.
2. Audio paging access from any Console to any single intercom loudspeaker, zone (group) of intercom/paging loudspeakers, or all loudspeakers/paging horns throughout the entire school.
3. Programmable soft key access from any console on the system to initiate alarm signals within the school to all or select locations equipped with loudspeakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
4. Programmable soft key access from any console to automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging loudspeakers and is not meant to replace primary fire alarm or security systems.

5. Ability to perform intercom to any single IP Addressable Loudspeaker Module.
6. Ability to display 3 call-ins at a time on the screen, with unlimited number of call-ins annunciating and the ability to scroll to view all call-ins.
7. Ability to upgrade a call-in via soft key
8. Ability to change which bell event schedule(s) are active on current day.
9. Programmable soft key access from any console for activating relays, school wide
10. Ability to maintain, along with controller and other IP Modules system functions, including intercom, bells and paging in the event of district wide connection loss.
11. Provide (3) administrative consoles. One in each reception area and another in the principal's office. (2) of the (3) locations are in the existing building. coordinate with the horizontal cabling installer for location of data drops for consoles.

I. Normal/Emergency Call Switch – Rauland TCDPB2 Dual Level Call In Switch Cancel

1. Normal/Emergency Call Switches indicated on the drawings shall provide the following functions and features:
   a. One (1) "Normal" call switch that shall activate a distinctive "NORM" level call from a single button activation. The button shall be clearly marked "NORM" and will route the call-in to any one or more Administrative Telephones or SIP interface to offsite telephones. This button may also be used as a "check-in" button during crisis situations.
   b. One (1) "Emergency" call switch that shall activate a distinctive "EMERGENCY" level call from a single button activation. The button shall be red in color and shall be clearly marked "EMERGENCY" and will route the call-in to any one or more Administrative Telephones or SIP interface for quick and easy response from an Administrative Telephone or off-site telephone.

J. SIP Gateway

1. The SIP Gateway shall provide a communications path to the phone system from the intercom system.

2.3 AMPLIFIER AND LOUDSPEAKERS:

A. Audio Paging/Program Amplifiers: Atlas Sound – CP400, Powersoft – Mezzo 322 A, Stewart Audio – CVA25-1 70V, and/or Manufacturer's equivalent.

1. Power amplifier(s) shall be provided to provide a minimum of 2 watts of power to all paging loudspeakers, and 15 watts of power to all paging horns.
2. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.
3. Provide 25 or 70 volt transformer output for all zones that connect more than 3 loudspeaker together and/or the distance from amplifier to the loudspeaker is greater than 25'.
4. Any exterior zone shall be connected to a minimum of 200 watt amplifier channel.

B. Loudspeakers:

1. AtlasIED and Quam loudspeaker assemblies are the basis of design. Intercom manufacturer equivalent loudspeakers are allowed if they meet the function and form of the loudspeakers listed below.
2. Loudspeaker cabling for common zones shall use a 16 AWG 2-pair stranded conductor cable assembly unless otherwise noted. Refer to Audiovisual Cable and Conduit Schedule on the drawings for approved cabling manufacturer.
3. Type 'IC1' - loudspeaker assembly:
   a. Quam – System 5 or equal

b. 1'x2' ceiling tile replacement loudspeaker with 5 oz. magnet and 5 watt 24/70V transformer. 92dB SPL 1W/1M with 99dB max SPL at maximum tap. 65Hz – 17kHz frequency response ±3dB and 100-degree dispersion angle.

4. Type 'IC1' - loudspeaker assembly:
   a. Atlas – SD72W w/ 81-8R mounting ring and CS95-8 enclosure
   b. Quam – C10X/BU/WS w/ SSB-2 mounting ring and ERD-8U enclosure
   c. Manufacturer equivalent
   d. Gyp loudspeaker with 10 oz. magnet and 5 watt 24/70V transformer. 95dB SPL 1W/1M with 102dB max SPL at maximum tap. 60Hz – 8kHz frequency response ±3dB and 90-degree dispersion angle.
5. Type 'IC2' - loudspeaker assembly:
   a. Atlas – SD72W w/ 76-8 mounting ring and BMTT95-8 enclosure
   b. Quam – C10X/BU/WS w/ SSB-7 mounting ring and ERD-8U enclosure
   c. Manufacturer equivalent
   d. Gyp loudspeaker with 10 oz. magnet and 5 watt 24/70V transformer. 95dB SPL 1W/1M with 102dB max SPL at maximum tap. 60Hz – 8kHz frequency response ±3dB and 90-degree dispersion angle.
6. Type 'IC3' - loudspeaker assembly:
   a. Atlas – SD72W w/ BMTT95-8 enclosure
   b. Quam – C10X/BU/WS w/ ERD-8U enclosure
   c. Manufacturer equivalent
   d. Open ceiling direct mount to structure loudspeaker with 10 oz. magnet and 5 watt 24/70V transformer. 95dB SPL 1W/1M with 102dB max SPL at maximum tap. 60Hz – 8kHz frequency response ±3dB and 90-degree dispersion angle.
7. Type 'IC4' - loudspeaker assembly (lay-in tile IP);
   a. Intercom Manufacturer specific assembly with an IP Addressable module and loudspeaker.
8. Type 'IW1' - loudspeaker assembly:
   a. Quam – 8C5PAX/TBLU w/ ES-8 enclosure and BS8W grill
   b. Indoor recessed wall 8" loudspeaker with 5 oz. magnet and 5 watt 24/70V transformer. 92dB SPL 1W/1M with 99dB max SPL at maximum tap. 65Hz – 17kHz frequency response ±3dB and 100-degree dispersion angle.
9. Type 'IW2' - loudspeaker assembly:
   a. Atlas – VTF-152UCN or VTF-157UCN w/ AR Adapter Ring
   b. Exterior recessed wall 4" loudspeaker with 5 watt 24/70V transformer. 96dB SPL 1W/1M with 107dB max SPL at maximum tap. 600Hz – 5.5kHz frequency response ±5dB and 170-degree dispersion angle.
10. Type 'IW3' loudspeaker assembly:
    a. Atlas – AP-15T
    b. Exterior Horn with compression driver and 15 watt 24/70/100V transformer. 106dB SPL 1W/1M with 120dB max SPL at maximum tap. 400Hz – 14kHz frequency response ±5dB and 70-degree dispersion angle.

C. UPS – Juice Goose – SCV-30001 or equal

1. Contractor to verify UPS load requirements prior to purchase of UPS. Intercom system shall maintain power for 30 minutes after building loses power.

D. Cabling:

1. Provide and install appropriate number of analog and horizontal cables, patch cables, for all terminated data drops, between switches, etc. so that building-wide networking will be operational once all installation is complete.

a. Provide manufacturer recommended cabling for all locations shown on plans.
    i. Horizontal/Category provided per specification 27 1500 (i.e. IP addressable Speakers, Classroom Modules, Call Switches, Zone Modules, Console, Controller, etc.)
    ii. Loudspeaker cabling shall be 18 gauge or better. Refer to drawings for cable types and requirements.
b. Provide cabling rated for the environment that it is installed in (i.e underground conduit, conduit in slab on grade). All cabling installed in wet locations shall be listed for use in wet locations.

2.4 ZONES, PROGRAM DISTRIBUTION, CLOCK/TIME SIGNALING SYSTEM

A. Separately addressable paging zones shall be provided as indicated on the drawings. Zones shall be capable of being grouped for various call scenarios as defined or requested by the owner.

B. Refer to the intercom drawings for identification of zones, zone types, and ceiling construction type.

1. Individual zones are designated with “Z-ID”.
2. Common and exterior distributed zones are identified with a unique zone number “Z-#X#”.
3. Intercom drawings are intended to be printed in color in addition to having the zone information under the room tag.

C. Space requirements:

1. Classrooms/Teaching spaces.
    a. The IP module/loudspeakers for each space shall be utilized for the intercommunication system.
    b. One (1) Call switch shall be provided in each room near the CSA antenna location. Refer to drawings for location of devices.
    c. One (1) Clock located above the entrance door.
2. Shared spaces between Classrooms/Teaching spaces.
    a. The IP module/loudspeakers for each space shall be utilized for the intercommunication system.
    b. One (1) Call switch shall be provided on the wall adjacent to the main hallway.
    c. One (1) Clock located above the entrance door.
    d. These rooms will be used as shelter in place rooms for adjoining classrooms.
3. Specialty Teaching spaces with high ambient noise floor (Wood/Metal/AG shops, Band/Choral/Orchestra rooms, etc).
    a. Distributed ceiling recessed loudspeakers (Qty. as required) at 14’ by 14’ minimum spacing, type as required for ceiling construction.
    b. Visual strobe located in a highly visible area.
    c. One (1) Call switch shall be provided at the primary teaching station. Coordinate location of primary teaching location with drawings.
    d. One (1) Clock located above the entrance door
4. Private Offices, Conference rooms, Faculty Lounges & Work Rooms (outside of the main office/administration suite)
    a. One (1) ceiling mounted loudspeaker, type as required for ceiling construction.
    b. Connect to adjacent corridor zone you enter the office from.
    c. Offices off of a classroom shall be on the same zone as the classroom.
    d. Refer to floor plans for offices that require an individual zone.
5. Gymnasium

a. Wall mounted horn type loudspeaker above the entrance door. If there is a dividable curtain provide a loudspeaker for each side along with one on the stage, if applicable.
b. Additional loudspeakers may be required as needed to maintain adequate coverage (< 6dB level variation).
c. One (1) Call switch shall be provided co-located with any light switches adjacent to each entrance from within the school.

6. Cafeteria/Commons/Dining
   a. Ceiling mounted loudspeakers, Qty. and type as required for ceiling construction and adequate coverage (< 6dB level variation).
7. Kitchen
   a. Ceiling mounted loudspeakers, Qty. and type as required for ceiling construction and adequate coverage (< 6dB level variation).
   b. One (1) Call switch shall be provided co-located with any light switches adjacent to main entrance.
   c. Within the Kitchen office provide a two-way system with call button and loudspeaker.
8. Corridors, Vestibules & Open Collaboration/Circulation areas
   a. Distributed ceiling recessed loudspeakers (Qty. as required) at 20' minimum spacing, type as required for ceiling construction.
   b. Rooms that are wider than 25' shall require an additional row of loudspeakers and located on a maximum of a 20' x 20' spacing centered in the room.
   c. Coordinate with ceiling devices and locate adjacent to smoke detectors when within few feet of one. Loudspeakers shall be in line with any lighting within the space
   d. Provide a minimum of one (1) loudspeaker for each space type
9. Stairwells
   a. One (1) ceiling mounted loudspeaker, type as required for ceiling construction.
   b. Connect to the adjacent corridor zone unless otherwise specified.
10. Restrooms
    a. One (1) ceiling mounted loudspeaker, type as required for ceiling construction.
    b. Connect to the adjacent corridor zone
    c. Do not provide loudspeakers in single use restrooms adjacent to a corridor zone. Locate corridor loudspeakers within 10 to 12 feet of the door.
11. Administration Suite (Private offices, Conference rooms, Nurse areas, work rooms, reception, etc. within the main administration suite)
    a. Distributed ceiling recessed loudspeakers (Qty. as required) at 20' minimum spacing down corridors and 14' x 14' in open areas, type as required for ceiling construction.
    b. Provide a minimum of one (1) loudspeaker for each space type.
    c. Provide a minimum of one (1) loudspeaker on an individual zone in the reception area and adjacent areas where it would be heard in the reception area. General pages from the reception area shall not play over this zone, it shall only be used for prerecorded messages.
12. Building Exterior
    a. Distributed recessed loudspeakers (Qty. as required) to cover all sides of the building and all entrances.
    b. Coordinate and co-locate loudspeaker rough-in with exterior fire alarm horn strobe locations.
    c. Provide unique zone for each side of the building (North/South/East/West)

d. Provide ‘IW3’ type loudspeakers on areas with:
    i. Playground equipment
    ii. Fields
    iii. Other play surfaces
e. Provide ‘IW2’ type loudspeakers on the front of the building and in locations where the property line is less than 30’ from the building.

13. Rooms smaller than 100 sqft and that are adjacent to a corridor/hallway will not require a loudspeaker when an announcement is audible within the room. Audible within the room shall be defined as 15 dB above the ambient noise within the room.
    a. Vestibules are excluded from small rooms and will require a loudspeaker tied to the adjacent corridor zone.
14. Field coordinate the tap setting on each loudspeaker to be 15dB above the ambient noise floor. The ambient noise floor shall be measured when the area is fully occupied. The following areas have the anticipated noise floor:
    a. Hallways – 80 dB
    b. Classrooms – 70 dB
    c. Offices/conference rooms – 60 dB
    d. Gym/multipurpose rooms – 85 dB
    e. Exterior areas – Max tap setting

D. All class-change bell signaling shall be sounded over the intercommunication system.

1. Each dialing administrative console in the system shall be programmable for the following options:
    a. Allow zone paging.
    b. Allow All-Page announcements.
    c. Allow Executive Override.
    d. Allow Emergency paging.
    e. Allow activation of Time Zone tones.
    f. Set the priority level and target display of "normal" calls.
    g. Set the priority level and target display of "emergency" calls.
    h. Assignment of architectural number.
    i. Class of Service.
    j. Assignment of associated speaker to paging zone.
    k. Automatic Call-Back-Busy.
    l. Call Forward-No Answer.
    m. Call Forward-Busy.
    n. Allow activation of security monitoring functions on a per room and per zone basis.

E. All class-change signaling shall be sounded over system loudspeakers as programmed.

PART 3 - EXECUTION

3.1 GENERAL

A. Wiring shall be installed in metallic conduit to cable trays and provided with necessary junction and pull boxes. All wiring shall be color coded and in accordance with the manufacturer’s instructions, local and national codes. Care shall be exercised in wiring to avoid damage to the cables. All boxes shall be plumb and square. Cables shall be pulled continuous without splicing, leaving ends in lengths as directed by the manufacturer’s representative.

B. After all circuits and cables have been pulled and completed from one extremity to the other, the electrical contractor shall check all circuits free of opens, shorts and grounds. The electrical contractor shall identify and tag all cables at the head end.

C. Provide all equipment, wiring, conduit, boxes, rough-in, etc., according to the plans and

specifications.

D. The manufacturer’s representative shall make all final connections to the equipment, shall test and adjust the systems, and shall instruct the proper parties as to care and operation.

E. Any additional equipment required for a fully functional system to meet the intent of the specifications shall be provided whether or not specifically listed herein.

F. Mount punch down block for system terminations, within the equipment rack.

3.2 INSTALLATION OF SOUND SYSTEMS:

A. Install sound systems as indicated, in accordance with equipment manufacturer's instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with requirements of NEC and applicable portions of NECA's "Standard of Installation" practices.

B. Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

C. Coordinate with other electrical work, including cable/wire, raceways, electrical boxes and fittings, as appropriate to interface installation of clock and program systems work with other work.

D. Control Circuit Wiring:

1. Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
2. The contractor shall mount a main distribution frame behind the Integrated Electronic Communications Network console. All wires shall be laid down on terminal punch blocks and identified by the actual room location it serves. All the communications points shall be wired into this main distribution frame, laid down in sequence, and identified by which line it is on and the point position it serves.
3. All housings are to be located as specified and shown on drawings.
4. Make installation in strict accordance with approved manufacturer's drawings and instructions.
5. The contractor shall provide necessary transient protection on the AC power feed, all station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.

E. Wiring Within Enclosures:

1. Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.
2. Provide physical isolation from each other for speaker-microphone, line-level, speaker-level, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12 inch minimum separation between conductors to speaker-microphones and adjacent parallel power and telephone wiring. Provide physical separation as recommended by equipment manufacturer for other Integrated Electronic Communications Network system conductors.

F. Weatherproofing:

1. Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

G. Repairs:

1. Wherever walls, ceilings, floors, or other building finishes are cut for installation, repair, restore, and refinish to original appearance.

H. Equalize systems using industry recognized practices and equipment.

I. Pathway Requirements:

1. General:
   a. All pathways shall be designed, constructed, grounded and installed in accordance with all recommendations delineated within TIA 569-B and Standard TIA 942.
   b. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. Arrangements to remove any major obstructions not identified on plans need to be determined at that time with the Engineer.
2. Conduits:
   a. Contractor shall provide a minimum of 1-1" EMT conduit from device to accessible ceiling space unless otherwise noted. Then utilize non-continuous cable support from devices to connecting device. Refer to symbol schedule for specific conduit requirements.
      i. Provide non-continuous open top cable supports every 5' above accessible ceiling.
   b. Achieve the best direct route parallel with building lines with no single bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
   c. Provide large radius elbows on all bends.
   d. Conduit runs shall not have continuous sections longer than 100 feet without a pull box. Refer to rough-in schedule for conduit fill capacity.
   e. AV conduits should not be routed over or adjacent to heat sources such as boilers, hot water lines, or steam lines. Neither should they be routed near large motors, generators, photocopy equipment, or electrical power cabling and transformers.
   f. After installation, conduits shall be clean, dry, unobstructed, capped for protection, labeled for identification, reamed and fitted with bushings.
   g. A 200lb pull cord (nylon, 1/8" minimum) shall be installed in any empty conduit.
3. Open Top Cable Support Requirements:
   a. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables
   b. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
4. Pull Box Requirements:
   a. NEC sized pull boxes are not acceptable. Follow BICSI and EIA/TIA 569-B guidelines for pull box sizing.
   b. Provide pull boxes in sections of conduit that are 100 feet or longer, contain more than two 90 degree bends, or contain a reverse bend.
   c. Conduits that enter a pull box from opposite ends should be aligned.
   d. Pull boxes shall have a length 12 times the diameter of the largest conduit.
   e. All pull boxes must be accessible.

J. Cabling System:

1. Follow T568B scheme for copper category cabling terminations.
2. Provide a minimum 6" service loop in each AV system junction box. Cables shall be coiled in the in-wall boxes if adequate space is present to house the cable coil without exceeding manufacturers bend radius.
3. In a false ceiling environment, a minimum of 3 inches shall be maintained between cable supports and false ceiling. At no point shall cable(s) rest on lay-in ceiling grids or panels.

4. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
5. Cables shall not be attached to ceiling grid seismic support wires or lighting fixture seismic support wires. Where support for AV cable is required, the contractor shall install appropriate carriers to support the cabling.
6. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
7. Pulling tension for balanced twisted pair shall not exceed 25lbf and for optical fiber shall not exceed 50lbf.
8. Pair untwist at the termination shall not exceed 0.125". The cable jacket shall be maintained as close as possible to the termination point.
9. Cable shall not be draped on, tied or otherwise secured to electrical conduit, plumbing, ventilation ductwork or any other equipment. Cable shall be secured to building supports or hangers or to additional blocks or anchors specifically installed for this purpose.

K. Cabling groups and conduit separation:

1. Refer to "CABLING GROUPS AND CONDUIT SEPARATION SCHEDULE".

L. Firmly secure all equipment in place that is not intended for portability.

M. Mount projectors permanently and provide mechanical index ensuring precise alignment of the projected image.

N. Provide adequate structural support for AV system components. Provide fastenings and supports with a safety load factor of at least five.

3.3 GROUNDING:

A. All grounding and bonding shall be done according to ANSI J-STD-607-A, TIA 942, and NEC.

B. All cabinets/racks shall utilize paint piercing grounding washers, to be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.

C. All racks shall further utilize a full-length rack ground strip attached to the rear of the side rail with the thread-forming screws provided to ensure metal-to-metal contact. Similar to Panduit RGS.

D. All active equipment shall be bonded to ground. If the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. All active equipment shall be bonded using the appropriate jumper for the equipment being installed using the thread-forming screws. Similar to Panduit RG.

E. Racks shall have individual, appropriately sized conductors bonded to the grounding backbone. Do not bond racks or cabinets serially – daisy-chained rack grounds will not be accepted.

F. Refer to electrical diagrams for additional ground connection requirements.

3.4 LABELING

A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and wall plates. The labeling system shall designate the cables

origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

B. All labels shall meet UL 969 requirements for legibility, defacement and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size and color.

C. Provide laminated plans (minimum size 11x17) of all AV as-built plans (including riser diagrams) intercom rack. Contractor shall be responsible for providing a 1RU drawer.

D. Label each equipment with the date (month/year) that it was installed along with the IP address, if applicable, and equipment type.

3.5 CYBER SECURITY

A. Contractor shall change all default username and passwords for all network devices provided. A Strong Password should include at a minimum the following:

1. Be at least 12 characters in length
2. Contain both upper and lowercase alphabetic characters (e.g. A-Z, a-z)
3. Have at least one numerical character (e.g. 0-9)
4. Have at least one special character (e.g. ~!@#$%^&*()_-+=)
5. Cannot contain full words

B. No written username or passwords shall be located in any areas of installation.

C. Network devices to be set up on a separate network other than owner’s LAN ensuring no internal or external users can access system without authorization.

D. Follow manufacturers hardening guide and use best industry practices to secure network and devices provided by contractor and associated with system.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

1. Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Inspection:

1. Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.
2. The installation technician from the installer / manufacturer shall perform all system tests as specified. Perform all tests in the presence of the Owner, Architect / Engineer and any designated personnel as deemed necessary by the Owner or Architect / Engineer. This test shall be performed with the devices at their operational location and under normal operational conditions. Bench or default settings for devices are not acceptable. All test and test report costs shall be included in the contractors bid. A checkout report shall be generated by the installation technician and submitted to the Owner and Architect. The report shall include but not be limited to the following:
    a. A complete list of all equipment installed with corresponding serial numbers.
    b. Indication that all equipment is properly installed, functions and conforms to the specifications.
    c. Serial numbers, locations by device and model number for each installed device.

d. Technician's name, specified certification credentials and date of system test.

e. Any additional information as deemed necessary by the Owner and or Architect / Engineer.

C. TESTING:

1. Upon completion of installation of each system and after electrical circuitry has been energized, demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units on site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with testing.

2. Before inspection by owner and AV Consultant, and after completion of the installation, conduct system tests and make necessary corrections for proper system operation.

3. Adjust, balance and align equipment for optimum quality and to meet the manufacturer's published specifications.

4. All limiters and/or compressors shall be set to prevent operators from over-adjusting sound levels and damaging system components.

5. System shall have no audible hum, noise, RFI, or distortion when operating under normal conditions. System shall reproduce material at the loudspeakers rated output level without audible distortion. All input levels shall be pre-set so system may be operated without causing unstable feedback under normal use.

6. System shall have no image distortion, hum bars, color shift, or any other picture distortion while operating under normal conditions. Provide cable equalizers, located near displays, on all cables that are more than 30 feet in length and/or have more than 4 connection points.

7. Adjust gain controls for optimum signal-to-noise with 0 dBu at a line-level input.

8. Perform polarity checks of loudspeaker lines by means of a polarity tester or use DC source at one end of each line and a voltmeter at the other end. Loudspeaker lines shall be identically polarized with respect to color coding.

9. Loose parts and poor workmanship or soldering shall be replaced.

10. Sweep Loudspeaker systems with high-level sine wave or 1/3 octave pink noise source. Correct causes of buzzes or rattles related to Loudspeakers or enclosures. Notify owner of external causes of buzzes or rattles.

11. Contractor shall provide system testing as described herein using up-to-date and industry accepted test equipment appropriate to the types of links being tested and in accordance with the latest edition of IEC 61935-1.

12. Horizontal cabling contractor shall test all twisted pair cabling used within the system following the standards in specification 27 1500 under the testing section. Provide documentation of testing to Intercom Consultant prior to final walk through.

D. At the time of final commissioning, if the Intercom consultant determines that the systems are not sufficiently complete to do a final punch list, and was not notified at least three (3) days prior to the visit, then a return visit will be required. The Intercom Consultant's return visit will be paid for in advance by the Intercom integrator at a flat rate of $500 per person, at no cost to the owner.

3.7 OCCUPANCY ADJUSTMENTS:

A. When requested by the Architect within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions.

3.8 TRAINING

A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.

B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.

C. All staff development training is to be coordinated through the owner's designated representative. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff a document listing all of the staff and faculty members who attended, received and completed the training program.

D. Provide a minimum of one (1), one (1) hour sessions of in-service training with this system. These sessions shall be broken into segments that will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.

E. Schedule training with Owner through the Architect, with at least fourteen (14) days advance notice.

F. Training shall be recorded using a video recording device that support a minimum resolution of 1080P/60 with an integrated microphone connection for an external microphone and a camera tri-pod mount. Presenter shall be wearing a lapel microphone that connects to the recording device and a Tri-pod shall be used for stabilizing the recording device. Recordings that are shaky, poor audio and/or video quality, incomplete, or other issues will not be accepted and the contractor will be responsible for providing a new recording and training within five (5) business days of notification. Provide a digital copy to the Owner and Intercom Consultant. If Digital copy is sent in a link, verification of end user download shall be provided to the owner and Intercom Consultant showing IP address or user that download and what date. The link cannot have an expiration date and will be the responsibility of the contractor to maintain. Links shall be included in the Operating and Maintenance manuals in the first section. Video files shall also be provided on a flash drive within the intercom equipment rack adjacent to the server location. Flash drive shall be clearly labeled.

3.9 CLEANING AND PROTECTION

A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up.

3.10 OPERATING AND MAINTENANCE MANUALS: Refer to Section 26 0502 for requirements.

3.11 RECORD DRAWINGS: Refer to Section 26 0502 for requirements.

END OF SECTION 27 5123

SECTION 28 3111

FIRE ALARM AND DETECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Provide new addressable fire alarm devices as required to expand the existing fire alarm system as required.

B. Install all new wiring in steel conduit (3/4" minimum). All conduit runs shall form a complete loop from the fire alarm control panel.

C. Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories. Provide components and systems, which are UL-listed and labeled for fire alarm. Provide fire alarm and detection systems and accessories, which are FM approved. Comply with State and local requirements as applicable. Provide wiring of horn/strobe units such that the horn section and the strobe section are controlled separately. Provide the ability to silence the horns and maintain the operation of the strobes.

D. Comply with applicable provisions of current NFPA Standards 72 National Fire Alarm Code (as applicable), local building codes, and meet requirements of local authorities having jurisdiction.

1.3 SUBMITTALS:

A. PRODUCT DATA: Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.

B. SHOP DRAWINGS: Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel. Provide dimensioned drawing of Fire Alarm Control Panel and Building Graphic.

C. CERTIFICATION: Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system will be installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72.

D. Provide to the Fire Marshall's office the following:

1. A complete set of shop drawings indicating:
    a. Location of all alarm-initiating and alarm-signaling devices.
    b. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.

2. Wiring diagrams for:

a. Alarm control panels.
b. Auxiliary function relays and solenoids.
c. Remote signaling equipment.
d. Standby battery calculations, including voltage drop calculation.

3. A complete equipment list identifying:
   a. Type
   b. Model
   c. Manufacturer
   d. Manufacturer catalog data sheets
   e. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)

4. A complete zone list identifying all:
   a. Alarm-initiating and alarm-signaling devices.
   b. Remote signaling and auxiliary function zones.
   c. Specific devices associated with each zone.

E. Submit to State and Local Fire Marshall, a complete Certificate of Compliance

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. MANUFACTURER: Subject to compliance with requirements, provide fire alarm and detection systems of one of the following:

1. The existing system is FCI Gamewell. Contact Nelson Fire Systems for requirements of the system. Fire alarm supplier shall be Gamewell-FCI Platinum Level Distributor.

2.2 FIRE ALARM AND DETECTION SYSTEMS:

A. GENERAL: Add to and maintain the existing electrically operated, electrically supervised fire alarm system as required. Include control units, power supplies, alarm initiating and indicating devices, conduit, wire, fittings and accessories required to provide maintain the operating system. Enclose entire system in raceway. Provide basic wiring materials which comply with Division 26, Basic Materials and Methods Sections for raceways, conductors, boxes, fittings, supports, etc. Minimum wire size to be #14 AWG copper.

B. SYSTEM TYPE: Analog addressable, non-coded. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes all fire alarm signaling devices, sounding a non-coded alarm and providing device identification on an annunciator panel.

C. SYSTEM OPERATION: Add to the system as required such that any manual station or automatic initiating device annunciates all alarm indicating units (bells, horns, buzzers, chimes, visual alarm lamps, etc.) continuously until the manual station or initiating device is restored to normal and the fire alarm control unit reset. Annunciate alarm signals by device at the control panel and all remote annunciators. Provide all conductors, raceway, equipment and labor to accomplish the following:

D. For fans which are not part of the smoke evacuation system, deactivate air supply and return fan units simultaneously by means of a supervised master fan shutdown relay with slave relays as required. Restart air units automatically after panel has been reset.

Provide a bypass switch for master fan shut down relay for drill purposes, and indicate by a locked-in lamp that the circuit has been bypassed.

E. Selectively activate and/or deactivate fan units as required.

F. Release all magnetic door holders upon activation of an alarm from any device by use of a master relay in the control panel.

G. Provide supervised circuits for the following:

1. Close dampers upon activation of an alarm from any device through the HVAC interface relays at the Fire Command Center.
2. Recall elevators, upon activation of an alarm, to the floor of building egress unless the alarm is on the egress floor, in which case recall elevator to the level designated by the Fire Marshall. Cooperate with the elevator supplier to ensure complete operable system. Provide shunt trip breaker(s) as required.

H. Central Station Monitoring. Provide a UL listed fire control communicator in accordance with NFPA 71 with a minimum of two reporting zones to the central station. Provide a communicator with dual phone lines for central station reporting by using Contact I.D. format. Provide integral trouble annunciator. Provide with compatibility for automatic test reports every 24 hours. Provide system and components which comply with UL 2635 and UL 864.

I. Provide fire alarm control panel with capability of shutting down individual initiating devices for maintenance purposes without affecting the continued operation of other initiating devices.

2.3 MONITOR MODULE:

A. Remote identification module devices shall be attached to any single normally open initiating device (heat detector, waterflow switch, duct detectors, sprinkler, tamper switches, kitchen hood, pull station, etc.). The modules shall supply addressing and status information to the Fire Alarm Control Panel through the dual loop module.

2.4 CONTROL POINT MODULE:

A. The control point module shall be connected to the same loop as the initiating devices, and shall provide a relay output (Form "C" 2 Amp @ 24 VDC, resistive only).

B. This relay output shall be used to perform auxiliary functions.

C. When the AOM is activated, the red "ACTIVE" LED shall be on solid. Under normal conditions, the red "ON LINE" LED shall flash.

2.5 IONIZATION SMOKE DETECTORS):

A. All ionization smoke detectors shall be capable of being replaced without disconnecting any wires or wire connectors from the base of the detector. Each detector shall be installed on a separate base. The detector base shall be capable of receiving a photoelectric, ionization, or electronic thermal detector. All ionization fire detectors shall be UL 268 listed. All detectors shall have (2) viewable LEDs to indicate the status of the device.

2.6 DUCT FIRE DETECTORS:

A. Provide ionization type with UL 268A listings. Each detector shall be equipped with a remote light. Each detector shall have (2) form "c" alarm contacts rated at 10 amps (at 120VAC).

2.7 THERMAL DETECTOR:

A. Thermal detectors shall operate on the Rate-of-Rise principal. The detectors shall have a fixed temperature rating of 135 degrees Fahrenheit. Exception: in Boiler rooms, provide temperature rating of 200 degrees Fahrenheit.

1. The heat detector shall consist of a base and a head.
2. The base shall be capable of accepting either a smoke detector or a 135 (or 200) degree heat detector.
3. The head shall automatically restore to its normal standby condition when the temperature returns to its normal range.

2.8 AUDIOVISUAL ALARM HORNS:

A. Provide audio-visual alarm horns with selectable multi-candela strobes (15/30/75/110 cd) and selectable horn (90 or 95 dba). Provide outdoor devices listed for exterior use. Provide white devices inside and red devices outside, or as instructed by the architect.

B. All strobes shall be synchronized.

2.9 VISUAL ALARM STROBES:

A. Provide visual alarm strobes with selectable multi-candela strobes (15/30/75/110 cd). Provide white devices.

B. All strobes shall be synchronized.

2.10 CARBON MONOXIDE (CO) DETECTOR (EST SIGA2-COS):

A. Provide a carbon monoxide detector. Provide detectors with the following features:

1. Compliance with UL2075.
2. Trouble relay.
3. Wiring supervision with SEMS Terminals.
4. A six year end-of-life timer.
5. Sounder base for sound audible alarm.

2.11 VISUAL ALRM STROBES (BLUE):

A. Provide a visual alarm strobe with blue light for CO notification.

2.12 AUXILIARY RELAY:

A. Remote auxiliary relay boards shall be rated at 10 AMPS @ 120 VAC. A red LED shall light to indicate relay activation. All relays shall transfer on general alarm and latch on until reset. All relays shall be supervised. The control output provided can be used in conjunction with fire alarm applications (i.e. fan controls, dampers, doors, and any other general alarm control).

2.13 INITIATING MODULES:

A. Provide style "6" initiating modules capable of receiving and annunciating an alarm from any detector, even with a single fault condition on any initiating circuit.

B. Power all smoke detectors from the "Style 6" initiating loop wiring. For systems which power smoke detectors separately from the "Style 6" loop, provide monitoring for both the power source and the independent initiating wiring, so that complete trouble and alarm indication is achieved by loop. Provide capability to operate all smoke detectors, even with a single fault condition on the smoke detector power wiring. Provide one spare initiating circuit.

2.14 SIGNALING MODULES:

A. Provide signaling as required. Provide power adequate to sound all signaling devices concurrently. Provide supervised indicating circuits for polarized 24V D.C. alarm signaling devices. Provide 2 spare signaling circuits.

B. Each signal circuit shall have a separate disconnect switch for servicing the fire alarm system. Each and every indicating circuit shall have a distinct location description. Power supply shall be at fire alarm control panel. Remote power supplies and indicating circuits will not be acceptable.

2.15 SUPPLEMENTAL NOTIFICATION CIRCUITS:

A. Provide supplementary notification appliance circuit panel(s) as required. The ‘PANELS’ shall be capable of supplying up to four Class A, Style Z notification appliance circuits. The panel shall contain its own battery charger, regulated power supply, and shall be supervised for ground fault, overcurrent, open circuits and low battery conditions. Ground fault, battery and circuit trouble conditions shall transmit a trouble signal to the main fire alarm control panel.

2.16 SYSTEM CONFIGURATION PROGRAMMING:

A. Update system programming as a result of the remodel. To help the owner in programming, system changes, and servicing, the fire alarm system shall have the following functions:

1. The FACP shall be capable of an auto-configuration, which, via a password, all analog devices and panel modules are automatically programmed into the system. At this point the system will operate as a general alarm system without any other programming.

2. If any two devices are addressed the same, the LED's on both devices will light steady and the panel will read "extra address with the address number".

3. If any device is installed and not programmed into the system, the LED will light steady and the panel will read the same as above.

2.17 BATTERIES/POWER SUPPLIES:

A. Provide standby batteries capable of operating fire alarm system for minimum of 24 hours, then operating all indicating units for at least five minutes. Locate batteries in fire alarm control unit, or in similar type enclosure located as directed. Provide all interconnecting wiring. Place batteries which vent hydrogen gas in separate enclosure. Provide 30 percent spare capacity.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

A. Install fire alarm and detection devices as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECA's "standard of installation".

B. Wire each CO detector to deactivate the HVAC fan unit feeding the zone served by the detector to shut down the fan when CO levels exceed the allowable levels set by the Utah State Fire Marshal.

C. Review proper installation procedure for each type of device with equipment supplier before installation.

D. Where surface installation is required, it must be approved by the architect. Use wiremold as approved in each application

3.2 GUARANTEE:

A. Furnish a three-year guarantee for all equipment, materials and installation, including all labor, transportation, and equipment.

B. Emergency Response. The fire alarm equipment supplier shall provide an emergency response within four hours of any reported system failure to resolve the problem on a continuous basis.

3.3 PRE-TEST:

A. The contractor shall with a representative of the manufacturer conduct a test 3 days before the final test to verify operation of all devices, new and existing. Any problems must be corrected before the final test.

3.4 FINAL TEST:

A. Before the installation shall be considered completed and acceptable, a test on the system shall be performed as follows:

1. The contractor's job foreman, a representative of the manufacturer, a representative of the owner, shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel. Fan shutdown and door holder circuits shall operate.
2. Conduct a full 24 hour test of battery operation. System shall be put on the batteries for a full 24 hours and all notification appliances shall be operational for a period of 5 minutes.
3. The supervisory circuitry of the initiating and indicating circuits shall also be verified.
4. Provide printout demonstrating successful performance of all devices.
5. Re-certify the system as compliant with State regulations.

3.5 LABELING:

A. All devices shall be labeled with their appropriate address. The labels shall be 18 point pressure sensitive labels.

B. All initiating devices shall be programmed to include the device address and a complete user text English location description, i.e. Device L4S76, Smoke Detector, 1st floor Rm.17.

C. Label the end of all wires in all boxes including panels, power supplies, pull boxes, etc.

3.6 RECORD DRAWINGS

A. Update existing recording drawings and building map. The building map shall indicate the various devices and wiring by the use of different colors (minimum of five colors).

3.7 OPERATING AND MAINTENANCE MANUALS:

A. Operating and maintenance manuals shall be submitted prior to testing of the system. Manuals shall include all service, installation, and programming information.

END OF SECTION 26 3111

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