SECTION 00100 - TABLE OF CONTENTS Vol. 1

BID PACKAGE DOCUMENTS -- INTRODUCTORY INFORMATION, BIDDING REQUIREMENTS, AND CONTRACT REQUIREMENTS

DIVISION 0 -- GENERAL

DIVISION 1 -- GENERAL REQUIREMENTS

END OF TABLE OF CONTENTS

SECTION 003000 - INFORMATION AVAILABLE TO BIDDERS

PART 1 - EXISTING REPORTS AND SURVEYS

1.1 REPORTS

A. SUBSURFACE INVESTIGATION REPORT
   1. A geotechnical report with respect to soils recommendations has been done:
      a. Prepared by: Anderson Perry & Associates Inc.
      b. A copy is bound into manual following Division 30's section.

B. HAZARDOUS MATERIAL REPORT
   1. A report with respect to existing conditions has been done:
      a. Prepared by: Fulcrum Environmental.
      b. A copy is bound into the manual following Division 2 sections.

C. Validity: Surveys and reports on subsurface conditions are not part of Contract Documents and are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data is made available for convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

D. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.

E. Prerequisite: Review this material prior to bid.

F. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

1.2 PREVAILING WAGE DETERMINATIONS

A. Current wage rate information can be found at the following website: http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/

1.3 EXISTING CONDITION DRAWINGS

A. Design drawings of previous work are available to bidders for reference. The architect makes no representation as to the accuracy of the information contained in the documents. Bidders shall remain responsible for field verifying existing conditions. Documents can be accessed under the "addenda/other" tab within the project documents posted at the following location: https://www.architectswestplans.com/

PART 2 - PRODUCTS – N/A

PART 3 - EXECUTION – N/A

END OF SECTION 003000

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Work covered by the Contract Documents.
   2. Type of the Contract.
   3. Use of premises.
   4. Owner's occupancy requirements.
   5. Work restrictions.
   6. Specification formats and conventions.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Walla Walla High School Additions and Modernizations

B. Project Location: 800 Abbott Road, Walla Walla, WA 99362.

C. The Work consists of the following:
   1. The Work includes selective demolition and new building construction.
      a. The building construction includes wood framing, cast-in-place concrete, unit masonry, structural steel, steel stud framing systems, exterior and interior finish carpentry, foundation waterproofing, building insulation, sheet metal flashing and trim, new roofing systems, roof accessories, fire stopping systems, joint sealants, steel doors and frames, interior wood doors, overhead coiling doors, overhead sectional doors, sound control door assemblies, aluminum framed entrances and storefronts, curtain wall systems, door hardware, glass, gypsum board, tiling, suspended ceiling systems, painting, building specialties, residential appliances, window blinds and shades, manufactured casework, fire sprinkler systems, HVAC and plumbing systems, electrical power, lighting and communication systems, as indicated on the Drawings and specified herein.
      b. The site construction includes site clearing, water, gas, electric and fire water services, grading, drainage control, site and building excavation and backfilling, concrete paving, asphalt paving, landscaping, irrigation, and other site improvements as indicated on the Drawings and specified herein.

1.4 TYPE OF CONTRACT

A. General contract for construction.

1.5 WORK UNDER SEPARATE CONTRACTS

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

1.6 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated for contractor installation. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products unless noted otherwise:
   1. Toilet Tissue Dispensers.
   2. Soap Dispensers.
   3. Paper Towel Dispensers.
   4. Sanitary Napkin Venders.
   5. Appliances
   6. Commercial Kitchen equipment as noted on food service equipment schedule.
   7. Theatrical equipment as noted.

1.7 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, to the extent shown on the Phasing plan and the other Drawings during construction period. Contractor's use of premises is limited only by Owner's right occupy and maintain operations during the time that school is open and as indicated in the phasing plan, and to perform work or to retain other contractors on portions of Project. The Contractor shall cooperate and coordinate with the Owner's Representative for all construction activities.
   1. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, students, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Condition of Existing Building: Maintain occupied portions of existing buildings, and the buildings that are to remain that are affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations. Spaces must also be secure from entry by unauthorized persons.

C. Existing Educational Activities: The owner will be conducting educational activities associated with a high school for grades 9-12. The contractor shall coordinate all activities on an ongoing basis with the owner to minimize and disruptions to the owner's school activities.

1.8 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises, as indicated in the Phasing Plan. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits where they are not affected by the construction. Provide temporary egress and enclosures from portions of the building where existing exits are affected by the new

construction, comply with authorities have jurisdiction for safe egress paths of occupants to the public way.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
3. Coordinate with owner all access and egress requirements for the conduction of school activities concurrent with construction activities.

1.9 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal working hours of between 7 a.m. to 5 p.m., Monday through Friday, except otherwise arranged by agreement between the Contractor and the Owner.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities in use by others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify authorities having jurisdiction of not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without written permission.

C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Construction Manager not less than two days in advance of proposed disruptive operations.
2. Obtain Construction Manager's written permission before proceeding with disruptive operations.

D. Nonsmoking Building: Smoking is not permitted on School District property, including the construction site.

E. Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.

F. Contractors doing demolition, excavation, clearing, construction, or landscaping work must file a Dust Control Plan with City of Wapato and get approval prior to the start of any of the work.

G. Burning is prohibited at all times.

H. A Notification of Demolition and Renovation (NODR) application must be filed with City of Wapato and the appropriate fee (if any) should be paid.

1.10 STATE OF WASHINGTON RCW’S

A. The contractor shall comply with the following RCW’s:

1.	RCW 18.27	Contractor Registration
2.	RCW 39.08	General Contractors Bonding
3.	RCW 39.12	Wage Rates
4.	RCW 49.28	Hours of Labor
5.	RCW 49.60	Non Discrimination
6.	RCW 70.92	Aged and Physically Handicap Requirements
7.	RCW 39.04.320	Apprenticeship Utilization

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

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

B. Related Sections:
1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Architect's Supplemental Instructions form.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Construction Manager or Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
1. Proposal Requests issued by Construction Manager or Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager or Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Construction Manager or Architect will issue a Change Order for signatures of Owner and Contractor.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

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

B. Related Sections:
   1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
   3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Construction Manager or Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
   4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values correlated with each element.

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

1. Identification: Include the following Project identification on the schedule of values:
    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
        1) Labor.
        2) Materials.
        3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
    a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling two percent of the Contract Sum and subcontract amount.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. 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.
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.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager 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.
   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

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

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager or Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Materials previously stored and included in previous Applications for Payment.
      b. Work completed for this Application utilizing previously stored materials.
      c. Additional materials stored with this Application.
      d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. When an application shows completion of an item, submit conditional final or full waivers.
   2. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   3. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
   5. Products list (preliminary if not final).
   6. Schedule of unit prices.
   7. Submittal schedule (preliminary if not final).
   8. List of Contractor's staff assignments.
   9. List of Contractor's principal consultants.
   10. Copies of building permits.
   11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   12. Initial progress report.
   13. Report of preconstruction conference.
   14. Certificates of insurance and insurance policies.
   15. Performance and payment bonds.
   16. Data needed to acquire Owner's insurance.

I. 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.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims".
   5. AIA Document G706A, "Contractor's Affidavit of Release of Liens".
   6. AIA Document G707, "Consent of Surety to Final Payment".
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General project coordination procedures.
   2. Administrative and supervisory personnel.
   3. Coordination drawings.
   4. Requests for Information (RFIs).
   5. Project meetings.
   6. Web based document management platform

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

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

1.3 DEFINITIONS

A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information from each other during construction.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

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

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

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.5 KEY PERSONNEL

A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site to the Construction Manager and the Architect. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

B. Web-Based Project Software: Utilize Owner provided web-based project software site for purposes of hosting and managing Project communication and documentation until Final Completion. Platform Name: Procore.
1. Web-based Project software site includes, at a minimum, the following features:
a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
c. Document workflow planning, allowing customization of workflow between project entities.

d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, and submittals
e. Track status of each Project communication in real time, and log time and date when responses are provided.
f. Distribution of meeting minutes and field reports.
g. Document posting and management for Drawings, Specifications, and coordination drawings, including revision control.
h. Management of construction progress photographs.
i. Mobile device compatibility, including smartphones and tablets.
j. Management and posting of miscellaneous project documentation.

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

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form using software log that is part of web-based Project software.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect and Construction Manager.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Utilize web based management generated form and submit substantially the same content as indicated above via the platform.
1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
   1. The following RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for coordination information already indicated in the Contract Documents.
      d. Requests for adjustments in the Contract Time or the Contract Sum.
      e. Requests for interpretation of Architect's actions on submittals.
      f. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

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

F. RFI Log: Use log generated by specified web based management system.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Architect will conduct meeting and will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three business days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Construction Manager, Architect, Contractor, and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.

h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Submittal procedures.
l. Sustainable design requirements.
m. Preparation of record documents.
n. Use of the premises and existing building.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Procedures for steam shutdown and refill.
v. Procedures for Existing gym electrical shutdown and re-feed
w. Procedures for remaining electrical services to remain and protection
x. Construction waste management and recycling.
y. Parking availability.
z. Office, work, and storage areas.
aa. Equipment deliveries and priorities.
bb. First aid.
cc. Security.
dd. Smoking.
ee. Weapons.
ff. Interaction with students and parents.
gg. Child molester/sex convictions.
hh. Progress cleaning.

4. Minutes: Conduct meeting and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.

r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.
z. Protection of District property, students, and staff.

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

D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing sustainable design documentation.
e. Requirements for preparing operations and maintenance data.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at biweekly intervals unless otherwise agreed to.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, members of the Design Team, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Progress cleaning.
        10) Quality and work standards.
        11) Status of correction of deficient items.
        12) Field observations.
        13) Status of RFIs.
        14) Status of proposal requests.
        15) Pending changes.
        16) Status of Change Orders.
        17) Pending claims and disputes.
        18) Documentation of information for payment requests.
4. Minutes: Record and distribute the meeting minutes to each party present and to parties requiring information.
    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Conduct Project coordination meetings at regular appropriate intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to Construction Manager, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

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

c. Review present and future needs of each contractor present, including the following:
   1) Interface requirements.
   2) Sequence of operations.
   3) Status of submittals.
   4) Deliveries.
   5) Off-site fabrication.
   6) Access.
   7) Site utilization.
   8) Temporary facilities and controls.
   9) Work hours.
   10) Hazards and risks.
   11) Progress cleaning.
   12) Quality and work standards.
   13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Start-up construction schedule.
   2. Contractor's construction schedule.
   3. Daily construction reports.
   4. Special reports.

B. Related Sections:
   1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
   2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

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

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

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

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

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. PDF electronic file or--
   2. Two paper copies.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working electronic copy of schedule. Include type of schedule (initial or updated) and date on label.

C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

D. Daily Construction Reports: Submit at monthly intervals.

E. Field Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

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

B. Activities: Treat separate area as a separate numbered activity for each principal element of the Work. Comply with the following, unless otherwise provided by the General Contractor:
   1. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   2. Startup and Testing Time: Include not less than 15 days for startup and testing.
   3. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
   4. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.

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

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by other Owner contracts.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.
5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Startup and placement into final use and operation.
6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    a. Structural completion.
    b. Permanent space enclosure.
    c. Completion of mechanical installation.
    d. Completion of electrical installation.
    e. Substantial Completion.

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

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

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

B. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule to the Construction Manager with copy to the Architect so it can be accepted by the Construction Manager for use prior to date established for the Notice to Proceed.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Construction Manager's approval of the schedule.

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

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.
j. Punch list and final completion.
k. Activities occurring following final completion.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

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

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float". Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
   1. Identification of activities that have changed.
   2. Changes in early and late start dates.
   3. Changes in early and late finish dates.
   4. Changes in activity durations in workdays.
   5. Changes in the critical path.
   6. Changes in total float or slack time.
   7. Changes in the Contract Time.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow.
   7. Accidents.
   8. Meetings and significant decisions.
   9. Unusual events (refer to special reports).
   10. Stoppages, delays, shortages, and losses.
   11. Meter readings and similar recordings.
   12. Emergency procedures.
   13. Orders and requests of authorities having jurisdiction.
   14. Change Orders received and implemented.
   15. Construction Change Directives received and implemented.
   16. Services connected and disconnected.
   17. Equipment or system tests and startups.
   18. Partial completions and occupancies.
   19. Substantial Completions authorized.

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

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner’s Representative within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

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

B. Contractor's Construction Schedule Updating: Update schedule to reflect changes to the work and actual construction progress and activities when they occur. Issue revised schedule before each regularly scheduled progress meeting.
   1. Revise schedule immediately where revisions have been recognized or made in the work.
   2. Update schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

C. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES AND FORM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:
   1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   5. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.

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

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

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

4. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: Action, informational.
   d. Name of subcontractor.
   e. Description of the Work covered.
   f. Scheduled date for Architect's and Construction Manager's final release or approval.
   g. Scheduled dates for installation.
   h. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Certain electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for Contractor's use in preparing certain submittals when requested by the Contractor.
   1. Architect will furnish Contractor digital data drawing files of the Contract Drawings for use in preparing Shop Drawings as needed and requested by the Contactor under the following conditions:
      a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
      b. Digital Drawing Software Program: In AutoCAD or PDF. The Architects title block information and registration stamp will be removed.
      c. Contractor shall execute a data licensing agreement included at the end of this section.
      d. The following plot files will be furnished for each appropriate discipline:
         1) Floor plans.
         2) Reflected ceiling plans.
         3) Irrigation plans.
         4) Other plans from Fire Protection, Structural, Mechanical and Electrical Engineering Consultants would be provided if those individual firms allow by their own policy.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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

1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow 7 days for review of each resubmittal.
3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 days for initial review of each submittal.
4. Consultant Submittal Review: Submittals may be transmitted directly to Architect's consultants with copy of transmittal letter to the Architect. Submittal will be returned to Architect before being returned to Contractor.

D. Identification and Information: Place a permanent label or title block on each copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 5" by 6" on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.
        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

E. Options: Identify options requiring selection by the Architect.

F. Deviations: Identify deviations from the Contract Documents on submittals.

G. Format: All submittals shall be submitted electronically in PDF format via web based management system specified in project management and coordination section. Paper submittals, except samples for color or texture selection, will be rejected and returned to the contractor. When physical samples are transmitted to the Architect, Contractor shall generate a log entry in the web based management system, including a photo of the sample(s).

H. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
1. Transmittal Form: Use AIA Document G810, a similar form, or Web based management system generated form that contains substantially the information noted below is acceptable.
2. Provide locations on form for the following information:
    a. Project name.
    b. General Contractor Name.
    c. General Contractor Address.
    d. Date.

e. Destination (To:).
f. Source (From:).
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Indication of full or partial submittal.
l. Drawing number and detail references, as appropriate.
m. Transmittal number, numbered consecutively.
n. Submittal and transmittal distribution record.
o. Remarks.
p. Signature of transmitter.

3. On a separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

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

K. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

L. **All submittals must be submitted for review within 30 calendar days after receipt of Notice to Proceed**.

PART 2 - PRODUCTS

2.1 COMMISSIONING

A. Provide Commissioning Authority with one additional copy of equipment and system submittals for the systems to be commissioned as listed in the commissioning specifications.

B. In addition to the product data submittal, include the manufacturer’s recommended installation and start-up procedures with associated checklist or form for each unique piece of equipment. These procedures and forms shall be for the specific piece of equipment to be provided.

C. Include the installation and startup information under a separate tab titled “Installation/Startup”.

2.2 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files. Large submittals, such as full size shop drawings shall be submitted electronically unless otherwise approved by the Architect and Construction Manager in advance to the submission. It is very unlikely

that paper submittals will be allowed unless there is a compelling reason electronic submittal cannot be submitted. In experience by any tier in submitting electronically will not be considered a compelling reason.

2. Action Submittals: A/E will make comments and marked-up submittal electronically.
3. Informational Submittals: Submit electronically each submittal, unless otherwise indicated. Architect and Construction Manager will not return.
4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures".
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a notarized statement on certificates and certifications where indicated or required.
6. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements".

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
    a. PDF electronic file unless otherwise agreed to between the Contractor, Construction Manager and Architect.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8½ by 11 inches but no larger than 24"x 36".
3. Submit Shop Drawings in the following format:
    a. PDF electronic file for small size submittals as approved by the Architect and Construction Manager. When printed shop drawings are requested by the Architect, submit the following:
        1) Two opaque (bond) copies of each submittal. Architect will copy marked-up copy and return two copies to the General Contactor and one copy to the Construction Manager.

D. Samples: 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.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: 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 applicable Specification Section.
3. 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 three full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
4. 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 unless additional copies are requested. Architect will retain Verification Sample.
        1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation".

F. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures".

G. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures".

H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A or similar document. Include the following information in tabular form:
1. Name, address, and telephone number of entities performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.

3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit subcontract list in the following format:
    a. PDF electronic file.

I. Coordination Drawings, when required: Comply with requirements specified in Division 01 Section "Project Management and Coordination".

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

K. Welding Certificates, when required: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

L. Installer Certificates, when required: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates, when required: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates, when required: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates, when required: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports, when required: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports, when required: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports, when required: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

S. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements".

T. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

U. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data".

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.3 DELEGATED-DESIGN SERVICES

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

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file, unless paper copies are requested by the Architect of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, calculations, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures".

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

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

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

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

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t. 208.667.9402
architectswest.com

LICENSING AGREEMENT FOR ARCHITECTS DIGITAL FILES

Project Name:_____

Street Address:_____

City/State/Zip:_____

NAME/ADDRESS OF PARTY REQUESTING DOCUMENTS

Company Name:_____

Street Address:_____

City/State/Zip:_____

Phone:_____

Contact Name:_____

Email address for sending files to:_____

Architects and its consultants (Hereafter referred to as the 'transmitting party') digital files are provided as a matter of convenience for use by the general contractor, it's sub-contractors, and/or material suppliers (Hereafter referred to as the 'receiving party') in preparation of shop drawings and submittals for the project.

The Transmitting Party retains its rights in the Digital Data. By transmitting the Digital Data, the Transmitting Party does not grant to the Receiving Party an assignment of those rights. The receiving party is granted to use the digital files provided solely for use in preparation of shop drawings and submittals specifically required and applicable to the project. The license to use the digital files shall expire at the date of substantial completion of the project. The transmitting party makes no guarantee as to the accuracy or quality of the digital files. The use of the digital files by the receiving party is solely at the risk of the receiving party.

To the fullest extent permitted by law, the Receiving Party shall indemnify and hold harmless the Transmitting Party from and against all claims arising from or related to the Receiving Party's use of the digital data.

Documents Requested (Provide Sheet Number List):

_____

_____

_____

_____ _____

Receiving Party Authorized Signature Date

_____

Printed Name

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

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

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
   4. Required testing and special inspections services for this project are indicated in schedule at the end of this section, the Owner will engage a qualified testing and special inspections firm for these services. All other testing and special inspections that may be identified in Divisions 02 through 33 bound in the Project Manual, except those noted above, are optional as determined by the Owner. Where conflict occurs between the required testing and special inspection services as outlined in the schedule at the end of this section, and those in the individual sections or those that maybe indicated on the drawings, this section shall supersede.

C. Related Sections:
   1. Divisions 02 through 33 Sections for specific test and inspection requirements.
   2. Refer to Structural drawings for additional requirements. DEFINITIONS

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

E. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

F. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to

show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies, and subassemblies.
2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

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

H. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

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

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

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

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

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

1.3 CONFLICTING REQUIREMENTS

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

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

C. **If there are conflicts between structural drawing testing requirements and this specification's testing requirements the more stringent testing requirement takes precedent.**

1.4 INFORMATIONAL SUBMITTALS

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

B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work.

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

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

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

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

C. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, following the schedule provided at the end of this section and the following:
   1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
   2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections".
   3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

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

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

1.6 REPORTS AND DOCUMENTS

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

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement weather conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement that equipment complies with requirements.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   4. Statement whether conditions, products, and installation will affect warranty.
   5. Other required items indicated in individual Specification Sections.

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

1.7 QUALITY ASSURANCE

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

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

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

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

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

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

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

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

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

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.

M. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished in accordance with requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Architect room or rooms for room mockup.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures".

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

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

F. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of the Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
   1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing and special inspector to conduct special tests and inspections required by the schedule at the end of this section and as follows:
   1. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Construction Manager, with copy to Contractor and to authorities having jurisdiction.
   3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   5. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

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

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution".

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

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

3.3 SCHEDULE OF REQUIRED TESTING AND SPECIAL INSPECTIONS

A.

Division of Work	**Required Testing and Special Inspections**
Earthwork	*Building Pad* Collect samples for laboratory proctor test and sieve analysis for each type of material prior to any fill placement. Visually inspect compaction methodology and proof-rolling and perform density tests of testable material per ASTM D1557 and D4718. One density test shall be taken for each 8" thick compacted lift of material placed in accordance with ASTM D2922 method. At subgrade and each compacted fill and backfill layer, at least one (1) test for every 5000 SF or less of the building slab, but in no case fewer than three (3) tests. For oversized material (non-testable material with a nuclear density gauge) visually inspect and verify that the material has been placed to a dense and non-yielding surface.
	Foundation Subgrade (Bearing Grade) Testing and Inspection Collect samples for laboratory proctor test and sieve analysis for each material type prior to any fill placement. Visually inspect compaction methodology and proof-rolling and perform density tests of testable material per ASTM D1557 and D4718. One (1) density test shall be take for each 8" thick compacted lift of material placed in accordance with ASTM D2922 method. At least one (1) test for every 100 LF of the foundation trench at bearing grade. For oversized material (non-testable material with a nuclear density gauge) visually inspect and verify that the material has been placed to a dense and non-yielding surface.
	Foundation Backfill Collect samples for laboratory proctor test and sieve analysis, visually inspect compaction methodology. One (1) density test shall be taken for each 8" thick compacted lift of material placed in accordance with ASTM D2922 method.

Division of Work	Required Testing and Special Inspections
Utility Trenching	*Storm and Sewer Trench Backfill* For testing requirements and testing frequency refer to GN Northern's Geotechnical report t bound in this project manual . At a minimum one (1) compaction test shall be taken for each 100 LF of the pipeline trench and one (1) test for each street crossing. At alternative 100 foot locations along the main trench line, density test shall be taken at 1 foot, 2 foot and 3 foot depths below finished grade. For oversized material (non-testable material with a nuclear density gauge) visually inspect and verify that the trench backfill material has been placed to a dense and non-yielding surface.
	Waterline Trench Backfill Monitor trench backfill placement of testable material per ASTM D1557 and D4718 perform one (1) density test for each 8" thick compacted lift. At a minimum one (1) compaction test shall be taken for each 100 LF of the pipeline trench and one (1) test for each street crossing.
Cast in Place Concrete & Reinforcing Steel Inspection	*Foundation/Footings, Stem Walls* Submit Concrete Mix Design, for each strength class, to the Architect and the Structural Engineer for approval. Inspect during placement of concrete, including structural concrete foundations, walls and slabs including concrete structural topping slabs, or where concrete is a part of other structural systems and where structurally reinforced. Provide inspection during concrete placement. Verify batches are consistent. For each structural category, for placement of 5 cubic yards of concrete and greater, cast and cure on sit of four (4) compression strength test cylinders for every 50 or fewer cubic yards, or for each day's placement, whichever is greater, in accordance with ASTM C31. Provide slump test at each pour in accordance with ASTM C143. Determine compressive strength of concrete test cylinders in accordance with ASTM C39. Break one (1) cylinder at 7 days and two (2) cylinders at 28 days and hold one (1) test cylinder for later testing unless otherwise directed by the structural engineer. Evaluate strength in accordance with ACI 214. Inspect concrete placement around bolts and anchors. Prior to placing of reinforcing steel, verify that reinforcing complies with the requirements noted on the Structural Drawings. Verify grade, size and placement of reinforcing steel fabric, and embedded items prior to closing off by form work and concrete placement. Check condition of reinforcing and embedded items for bond integrity with concrete. Concrete strength tests failing to meet minimum requirements are subject to further testing and evaluation by the testing agency. Conduct additional tests of questionable concrete in accordance with ASTM C 42.

Division of Work	Required Testing and Special Inspections
Cast in Place Concrete & Reinforcing Steel Inspection	*Concrete Floor Slabs* For placement of 5 cubic yards of concrete and greater, cast and cure one (1) set of 4 compression strength test cylinders for every 50 or fewer cubic yards, not less than 5000 SF of slab area or for each day's placement, whichever is greater, in accordance with ASTM C31. For structural slabs, in addition to laboratory cured test cylinders, cast and field cure one set of four (4) test cylinders. Determine compressive strength of field cured test cylinders at one at 3-day age, one at 7-day age and two at 28-day age.
	Perform Floor Flatness and Floor Levelness test in accordance with ASTM E1155 within 24 hours of placement. Floor slab areas to be tested for FF & FL shall be determined by the Architect. Floor Moisture Vapor Emission Test. Perform, using calcium chloride moisture test kit, at least one (1) test for every 5,000 SF of slab area receiving resilient flooring.
	Sidewalks Cast and cure one set of four (4) compression strength test cylinders for each day's placement in accordance with ASTM C31. Determine compressive strength of concrete test cylinders in accordance with ASTM C39. Break one (1) cylinder at 7 days and two (2) cylinders at 28 days and hold one test cylinder for later testing unless otherwise directed by the structural engineer.
Adhesive Anchors	Perform continuous inspections. Inspect anchor/adhesive installation, anchor embedment, and tightening torque.
Structural Masonry & Reinforcing Steel Inspection	Inspect grout spaces and clean-outs, take prism and test samples, inspect during placement of all masonry units, placement of reinforcing steel, and during grouting operation, except as otherwise permitted by the 2009 IBC. Prior to masonry work verify mix proportions of mortar and grout mixes, verify size and location of structural elements, verify anchorage of masonry to frames, structural members and diaphragms including type, size, and locations of anchors, type size and grade of reinforcing steel and connector placement. Place grout only after inspector has verified grout spaces and grades, sizes, and location of reinforcement. Comply with requirements in ACI 530.1 for cleanouts and for grout placement including minimum grout space and maximum pour height. Cast one (1) set of four (4) grout prisms for each 5,000 SF of wall area or for each day's placement. Compressive strength of grout prisms shall be determined per ASTM C1019. Test grout specimens one (1) at 7 days and three (3) at 28 days. Cast one (1) set of three (3) grouted CMU prisms halfway through the grouting schedule. Test one (1) CMU prism at 7 days and two (2) at 28 days.
Structural Steel Welding	For a WABO approved steel fabrication shop perform a quality assurance inspection of the fabrication shop. Inspection shall include review of the QA manual, welder qualification certifications, weld procedures and mill certifications. Inspect welding of all structural steel, reinforcing steel, and other members and connections design to resist loads and forces required by 2009 IBC, except welding performed by approved fabricators as defined by the IBC.

Division of Work	Required Testing and Special Inspections
Asphalt Concrete Paving	*Paving Subgrade* Subgrade preparation shall comply with WSDOT Standard Specifications Section 2-06. At subgrade at least one (1) density test for every 5,000 SF of paved area but in no case fewer than three (3) density tests. Inspect subgrade to verify that subgrade is dense and non-yielding.
	Base Aggregate Course Material shall conform to WSDOAT Standard Specifications Section 9-03.9(3) for Crushed Surfacing Base Course. Base shall be prepared in accordance with WSDOT Standard Specifications Section 4-04.
	Asphalt Concrete Mix (HMA) Submit asphalt mix design prepared in accordance with Section 5-04.3(7)A prior to paving. Paving shall comply with WSDOT Standard Specification Section 5-04. Aggregate for asphalt concrete paving shall conform to Section 9-03.8. Acceptance sampling and testing of HMA mixture shall be in accordance WSDOT Standard Specification Section 5-04.3(8)A. Compaction shall comply with Section 5-04.3(10).

END OF SECTION 014000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

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

B. Related Sections:
   1. Division 01 Section "Alternates" for products selected under an alternate.
   2. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

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

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

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

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

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

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

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

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on

product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

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

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

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

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. For products specified by name and accompanied by the term “or equivalent” "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
    b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:
    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
    b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

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

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 – EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Selective demolition.
   6. Coordination of Owner-installed or Owner-furnished-Contractor-installed products.
   7. Progress cleaning.
   8. Starting and adjusting.
   9. Protection of installed construction.
   10. Correction of the Work.

B. Related Sections:
   1. Division 01 Section “Cutting and Patching”.
   2. Division 01 Section "Submittal Procedures" for submitting surveys.
   3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   4. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.
   5. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

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

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

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

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

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

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

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

1.5 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

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

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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

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

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

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners. Site survey is bound in the drawing set.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 80-inches in unoccupied spaces.

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

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

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

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

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

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

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

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

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

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

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

1. In general, use hand or small power tools designed for sawing and grinding, not hammering, and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
a. Where patching occurs in a painted surface, prepare substrate, and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

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

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's separate contracts.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's separate contracts. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's separate contractors if portions of the Work depend on Owner's separate contract work.

3.8 OWNER-FURNISHED-CONTRACTOR-INSTALLED PRODUCTS

A. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work for Owner-Furnished-Contractor-Installed products.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner furnished products. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Construction Manager at preinstallation conferences covering portions of the Work that are to receive Owner's products.

3.9 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Utilize containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

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

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

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

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

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

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

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

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

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

3.10 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements".

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

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

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

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements".

3.11 PROTECTION OF INSTALLED CONSTRUCTION

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

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

3.12 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
   1. Division 02 Section "Selective Demolition" for demolition of selected portions of the building.

1.3 DEFINITIONS

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

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 14 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
   6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
   7. Construction Manager's or Architects Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include but are not necessarily limited to the following:
   1. Primary operational systems and equipment.
   2. Air or smoke barriers.
   3. Fire-suppression systems.
   4. Mechanical systems piping and ducts.
   5. Control systems.
   6. Communication systems.
   7. Conveying systems.
   8. Electrical wiring systems.
   9. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include but are not necessarily limited the following:
   1. Water, moisture, or vapor barriers.
   2. Membranes and flashings.
   3. Exterior curtain-wall construction.
   4. Equipment supports.
   5. Piping, ductwork, vessels, and equipment.
   6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting, and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

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

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering, and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
   4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.

B. Related Sections:
   1. Division 01 Section "Execution" for progress cleaning of Project site.
   2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
   5. Division 27 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   8. Complete startup testing of systems.
   9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures".
2. Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
    a. Project name.
    b. Date.

c. Name of Architect and Construction Manager.
d. Name of Contractor.
e. Page number.

4. Submit list of incomplete items in the following format:
   a. PDF electronic file.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

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

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
   4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
   1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

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

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
        1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
    m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
    o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
        1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
    r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
    s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests.

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

END OF SECTION 017700

SECTION 017820 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Operation manuals for systems, subsystems, and equipment.
   3. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. Related Sections include the following:
   1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
   3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
   4. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Initial Submittal: Submit 1 electronic draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return the copy mark whether general scope and content of manual are acceptable. An electronic copy will be given to the Owner for their use until final copies are available.

B. Final Submittal: Submit one electronic and one hard copy of each manual in final form at least 15 days before final inspection.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name, address, and telephone number of Contractor.
   6. Name and address of Architect.
   7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in **each** volume of the set.

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

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

E. Manual Contents, hard copy: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
   1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary, to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included

in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

F. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

G. 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.

H. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.2 OPERATION AND MAINTENANCE MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
1. Product name and model number.
2. Manufacturer's name.

3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

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

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

2.3 PRODUCT MAINTENANCE INFORMATION

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

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

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

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

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE INFORMATION

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

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

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard printed maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

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

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

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
   1. Do not use original Project Record Documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents".

D. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017820

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record Survey
   3. Record Specifications.
   4. Record Product Data.

B. Related Sections include the following:
   1. Division 01 Section "Closeout Procedures" for general closeout procedures.
   2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Divisions 02 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of Record Drawings as follows:
      a. Initial Submittal: Submit one set of marked-up Record Prints. Architect will review and provide comments whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return and prints for organizing into sets, printing, binding, and final submittal.
      b. Final Submittal: Submit one set of marked-up Record Prints, including detail manual. Provide complete set of Drawings, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.
   1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD SURVEY

A. Coordinate first paragraph below with qualification requirements in Division 01 Section "Quality Requirements" and as supplemented in "Quality Assurance" Article. Contractor's professional engineer may be capable of performing certain field-engineering tasks, however for

more complex tasks and for certified surveys, qualified land surveyors are more frequently required.

B. Certified Survey: Submit two copies and electronic AutoCAD, and PDF files showing major site alterations from as designed documents, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

C. Certified Foundation Survey: On completion of foundation walls, prepare a certified survey showing dimensions, locations, angles, and elevations of construction.

2.2 RECORD DRAWINGS

A. Record Prints: Maintain new clean set of prints of the Contract Drawings, Detail Manual and Shop Drawings.
   1. Preparation: Mark Record Prints with legible neat markings using red pen or pencil to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Addendums.
      j. Locations of concealed internal utilities.
      k. Changes made by Change Order or Construction Change Directive.
      l. Changes made following Architect's written orders.
      m. Details not on the original Contract Drawings.
      n. Field records for variable and concealed conditions.
      o. Record information on the Work that is shown only schematically.
   3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
   4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original Drawings.
   6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS".
      d. Name of Architect and Construction Manager.
      e. Name of Contractor.

2.3 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Use clean set of specifications for mark up.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
   5. Note related Change Orders and Record Drawings where applicable.

2.4 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.5 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

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

C. Upon completion of substantial completion deliver to the architect a complete set of field record drawings for the architect to make changes to the electronic files to deliver to the owner a complete set of electronic record drawings.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training digital video stored on DVD disks.

B. Related Sections include the following:
   1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
   2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. At completion of training, submit Two complete training manual(s) for Owner's use.

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

C. Demonstration and Training DVD: Submit two copies within seven days of end of each training module.
   1. Identification: On each copy, provide an applied label with the following information:
      a. Name of Project.
      b. Name and address of photographer.
      c. Name of Architect and Construction Manager.
      d. Name of Contractor.
      e. Date video was recorded.
      f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video. Include name of Project and date of video on each page.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

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

C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

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

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

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows as applicable:
   1. Motorized doors, including overhead coiling doors, overhead coiling grilles.
   2. Motorized accordion partition.
   3. Equipment, including stage equipment, motorized projection screens, motorized rolling shades, food-service equipment, and residential appliances.
   4. Fire-protection systems, including fire alarm.
   5. Intrusion detection systems.
   6. Heating equipment, including furnaces.
   7. Refrigeration systems, including cooling towers, pumps, and distribution piping.
   8. HVAC systems, including air-handling equipment and terminal equipment and devices.
   9. HVAC instrumentation and controls.

10. Electrical service and distribution, including transformers, switchboards, panel boards, and motor controls.
11. Lighting equipment and controls.
12. Communication systems, including intercommunication, surveillance, clocks and programming voice and data.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.
2. Documentation: Review the following items in detail:
    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.
5. Adjustments: Include the following:
    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
    a. Diagnostic instructions.

b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

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

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

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

3.3 DEMONSTRATION AND TRAINING VIDEO

A. General: 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.
   1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video Format: Provide high-quality digital color video on DVD disks.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. 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.

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

END OF SECTION 017900

SECTION 263363 – UNINTERRUPTIBLE POWER SUPPLY (E-RATE)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. This specification describes a three-phase, on-line, continuous operation, solid state uninterruptible power supply (UPS). The UPS shall operate as an active power control system, working in conjunction with the building electrical system to provide power conditioning and on-line power protection for the critical loads.

1.3 RELATED SECTIONS

A. Section 260000 - Electrical General Provisions (for reference only)

B. Section 260526 - Grounding and Bonding for Electrical Systems (for reference only)

C. Section 260553 - Identification for Electrical Systems (for reference only)

D. Section 270000.1 - E-Rate supplemental instructions.

1.4 REFERENCES

A. ANSI/IEEE C62.41, "Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits" NEMA, "National Electrical Manufacturers Association".

B. ISO 9001, "Quality Management Systems - Requirements."

C. ISO 14001, “Environmental Management Systems - Requirements with Guidance for Use” UL 1008, “Standard for Automatic Transfer Switches”.

D. NEMA PE 1, " Uninterruptible Power Systems (UPS) - Specification and Performance Verification”

E. NFPA 70, "National Electrical Code”

F. UL 1778, 5th edition, "Standard for Uninterruptible Power Supply Equipment"

G. UL 891, "Standard for Dead-Front Switchboards"

H. UL 1558, "Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear”

I. IEC 62040-1: 2008/A1: 2013 “General and safety requirements for UPS”

J. IEC 62040-2: 2006/AC:2006 Category C2, “Electromagnetic compatibility (EMC) requirements”

K. IEC 62040-3, “Uninterruptible Power Systems - Method of Specifying the Performance and Test Requirements”

L. FCC part 15 Subpart B Class A.

1.5 DEFINITIONS

A. Definitions as described in Section 26 00 00 shall apply to this section.

1.6 SUBMITTALS

A. Comply with Submittal requirements as described in Section 26 00 00.

B. Submit the following:

1. System bill of materials (level one).

2. Product technical specifications or equipment brochures.

3. Product specifications.

4. System operation diagram.

5. Installation manual.

6. Drawings for requested optional accessories.

7. Manufacturer's installation requirements.

8. Operating and maintenance manuals.

C. Test Reports:

1. Prior to shipment the manufacturer shall complete a documented test procedure to test functions of the UPS and batteries (via a discharge test), when supplied by the UPS manufacturer, and warrant compliance with this Section.

2. Submit test readings made after installation, and certification of performance as specified.

1.7 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 26 00 00.

B. Conform to NEC and applicable inspection authority.

C. Generator manufactured to NEMA standards and UL listed.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 26 00 00.

1.9 WARRANTY

A. Comply with warranty requirements as described in Section 26 00 00.

B. Special Warranty: The Contractor shall warrant the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for period indicated below. This special warranty shall extend the one-year period of limitations contained in the General Conditions. The special warranty shall be countersigned by the Installer and the manufacturer.

1. UPS: The UPS shall be covered by a full parts and labor warranty from the manufacturer for a period of 12 months from date of installation or acceptance by the Owner or 18 months from date of shipment from the manufacturer, whichever occurs first.

2. Battery: The battery manufacturer's warranty shall be passed through to the final Owner and shall have a minimum period of one year.

PART 2 PRODUCT

2.1 GENERAL

A. Comply with Products requirements as described in Section 26 00 00.

2.2 SUSBSTITUTIONS

A. Comply with the Products, Substitutions requirements of Section 27 0000.1.

B. Manufacturer shall be Schneider Electric: Galaxy VS However, if a brand other than Schneider is proposed, a "differentiation report" must be submitted with proposal. This report shall address each paragraph of the specification individually and list any difference from what is specified. If there are no differences, a report stating so shall be provided.

C. For the purposes of this proposal, propose on the Galaxy VM Series # GVMSB160KG65S - 160 kVA UPS Single 480-480 V, 65kAIC, Start up 5x8 with Galaxy VM #GVMMODBCN - UPS Modular Battery Cabinet Narrow for 6 battery modules. When the Galaxy VS becomes available, the Owner would like to modify the UPS to be #GVSUPS150KB4GS as specified below.

2.3 SYSTEM DESCRIPTION

A. General:

1. The UPS shall be housed in a freestanding cabinet with casters and contain smart battery modules. Maintenance shall be possible from the front.

2. The UPS shall be in a self-contained cabinet and shall be the following model:

a. 150 kW UPS for up to 3 internal 9 Ah smart modular battery strings. Modular battery cabinets shall be available for increased runtime.

3. Output power factor: 1.0

4. Backfeed contactor included

5. The UPS shall support installation with 3-wire (L1, L2, L3, PE) WYE.

6. The UPS shall contain a static bypass switch and a display. The UPS shall be of the double conversion on-line topology with power factor corrected inputs.

7. The UPS shall have a short circuit rating of 65 kA RMS.

8. The UPS shall be tested against EMC (electromagnetic compatibility) according to FCC part 15 Subpart B Class A.

B. System Input:

1. Nominal input voltage rating: 480 V 3-phase.

C. System Output:

1. Nominal output voltage rating: 480 V 3-phase.

2.4 OPERATION MODES

A. Normal: In normal operation, the UPS supports the load with conditioned power.

B. Battery: If the utility/mains supply fails, the UPS transfers to battery operation and supports the load with conditioned power from the batteries.

C. Requested Static Bypass: The UPS can be transferred to requested static bypass following a command from the display. During static bypass operation, the load is supplied from the bypass source. If a fault is detected, the UPS will transfer to normal operation or forced static bypass operation. If there is an interruption to the utility/mains power supply during requested static bypass operation, the system will transfer to battery operation.

D. Forced Static Bypass: The UPS is in forced static bypass following a command from the UPS system or because the user has pressed the inverter OFF button on the UPS. During forced static bypass operation, the load is supplied directly by the bypass source.

E. Internal Maintenance Bypass: When the internal maintenance bypass breaker (IMB) is closed, the UPS transfers to internal maintenance bypass operation. The load is supplied with unconditioned power from the bypass source. Service can be performed only on power modules, the static bypass switch module, and on the controller box during internal maintenance bypass operation. The internal maintenance bypass breaker IMB can only be used in single systems with no external maintenance bypass breaker.

F. External Maintenance Bypass: When the maintenance breaker (MBB) is closed in the external maintenance bypass panel/cabinet, the UPS transfers to external maintenance

bypass operation. The load is supplied with unconditioned power from the bypass source. Service can be performed on the entire UPS during external maintenance bypass.

G. Static Bypass Standby: The UPS enters static bypass standby if the UPS is prevented from entering forced static bypass and the other UPS units of the parallel system can support the load. In static bypass standby, the output of the specific UPS is off. The UPS automatically changes to the preferred operation mode when possible. Note: If the other UPS units cannot support the load, the parallel system enters forced static bypass. The UPS in static bypass standby will then transfer to forced static bypass.

H. ECO Mode: ECO mode allows the UPS to be configured to use requested static bypass, with the load supplied through the bypass, as the preferred operation mode under predefined circumstances. If a fault is detected (bypass voltage out of tolerance, output voltage out of tolerance, etc.), the UPS will immediately transfer to normal operation or forced static bypass. The main advantage of ECO mode is a reduction in the consumption of electrical power. In case of interruption to the utility/mains supply, the UPS transfers to inverter operation for a continuous supply of the load. The batteries are charged when the UPS is in ECO mode.

I. ECOnversion Mode or other manufacturer's equivalent: ECOnversion allows the UPS system to supply the active part of the load through the static bypass. The inverter is kept running in parallel with the bypass source and supplies the reactive part of the load. The input power factor of the UPS is, regardless of the load power factor, maintained close to unity as the reactive part of the load is significantly reduced in the UPS input current. In case of an interruption to the utility/mains supply, the inverter immediately maintains the output voltage so that breaks or drops during the transfer from ECOnversion mode are practically eliminated. The batteries are charged when the UPS is in ECOnversion mode.

2.5 COMPONENTS

A. Rectifier

1. The UPS shall include an active power factor corrected rectifier.

2. The input current limiter shall be designed to:

a. Fast battery recharging:

1) 80% of the UPS output rating at 0-40% load.

2) 20% of the UPS output rating at 100% load.

b. Provide regulation with input deviation of up/down to +/-15% of the nominal input voltage.

3. The battery charging shall keep the float voltage of 545 VDC for 40 battery blocks.

4. The battery charging voltage shall be compensated against temperature variations (battery temperature compensation) to always maintain optimal battery float

charging. Temperature compensation rate shall be 3.3 mV/degree/cell for ambient temperatures > 25 °C and 0mV/°C for ambient temperatures < 25 °C.

5. Input power factor shall be 0.98 lagging at 100% load without the use of passive filters. Rectifier shall employ electronic waveform control technology to maintain the current sinusoidal.

6. Pulse Width Modulation (PWM) current control shall be used. Digital Signal Processors (DSP) shall be used for all monitoring and control tasks. Analog control shall not be acceptable.

B. Inverter:

1. The inverter shall consist of fast switching IGBTs.

2. The inverter shall be a 3-level hybrid inverter.

3. Inverter shall be PWM controlled using DSP logic. Analog control shall not be acceptable.

4. The inverter modules shall be rated for an output power factor at 1.0.

5. Nominal output voltage shall be 480 V 3-phase.

C. Static Bypass Switch

1. The static bypass switch shall consist of fully rated Silicon Controlled Rectifiers (SCRs). Partly rated SCRs with a wraparound contactor shall not be acceptable.

2. The static bypass switch shall be of modular design with connectors at the rear.

3. The static bypass switch shall automatically transfer the load to bypass supply without interruption after the logic senses one of the following conditions:

a. Inverter overload beyond rating.

b. Battery runtime expired and bypass available.

c. Inverter inoperable.

d. Control system inoperable.

4. The static bypass switch shall automatically retransfer from bypass to the inverter.

5. The inverter shall be active (on).

6. The static bypass switch shall be equipped with a manual means of transferring the load to bypass and back to inverter.

D. Battery

1. General:

   a. The UPS shall contain up to 5 internal 9 Ah smart modular battery strings for 150 kW UPSs using 3 batteries.

   b. End of discharge voltage at full load: 384 VDC for 40 battery blocks.

   c. Battery charge current limit: The selection shall be made from the display. The battery charge current limit should be software and hardware current limit.

   d. The battery charging circuit shall remain active when the PFC operates normally.

   e. The standard/long-life batteries shall be embedded in modules that contain battery blocks, a monitoring board, fuse, and temperature sensors.

   f. The battery modules shall be user swappable using a simple, front-access disconnecting device integrated in the UPS cabinet.

   g. The battery solution shall be scalable and redundant.

2. Battery Monitoring

   a. Battery monitoring shall be provided at system level.

   b. The UPS shall incorporate a battery capacity test that will determine the available runtimes.

2.6 MECHANICAL

A. The UPS shall be housed in a freestanding cabinet with casters.

B. Dust filter shall be available.

C. The cable entry shall be from the rear of the UPS.

D. The cabling section shall be large enough to accept copper and aluminum cables.

E. The UPS shall have the following dimensions:

   1. 1970x550x847 mm (77.56x21.65x33.35 in) and shall meet an ingress level of minimum IP20.

F. The UPS shall have a seismic kit option.

2.7 DISPLAY, CONTROLS, AND ALARMS

A. A color touch screen display shall be located on the front of the UPS.

B. The following metered data shall be available on the display:

1. Year, month, day, hour, minute, second of occurring events.

2. Input voltage.

3. Input current.

4. Input frequency.

5. Output voltage.

6. Output current.

7. Output frequency.

8. Battery voltage.

9. Battery current.

10. Battery temperature.

C. The display shall allow the user to display active alarms.

D. The following controls or programming functions shall be accomplished by use of the display unit.

1. Silence audible alarm.

2. Set the alphanumeric display language.

3. Display and set the date and time.

4. Enable or disable the automatic restart feature.

5. Transfer load to and from static bypass.

6. Test battery condition on demand.

E. LEDs for indication of operation mode.

F. Push button user controls:

1. Inverter ON.

2. Inverter OFF.

G. For purposes of remote communications with the UPS, a network management card shall be integrated.

2.8 ACCESSIBILITY

A. Software and Connectivity

1. The Ethernet Web/SNMP Adaptor shall allow one or more network management systems (NMS) to monitor and manage the UPS in TCP/IP network environments. The management information base (MIB) shall be provided in MIB formats. The SNMP interface adaptor shall be connected to the UPS via the RJ45 serial port on the standard communication interface board.

2. The UPS shall offer a Modbus interface.

3. The UPS shall be equipped with eight dry contacts (four inputs, four outputs) for user-assignable alarms or remote monitoring.

B. Remote UPS Monitoring: three methods of UPS monitoring shall be available:

1. Smartphone application: With remote monitoring and live system status and remote alarms.

2. Web monitoring: Remote monitoring shall be available via a web browser such as Internet Explorer.

3. Simple Network Management Protocol (SNMP): Remote UPS monitoring shall be possible through a standard MIB II compliant platform.

C. Software Compatibility: The UPS manufacturer shall have available software to support shutdown and or remote monitoring for the following systems.

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 26 0000.

3.2 INSTALLATION

A. Comply with the proposal requirements of Section 270000.1 in which the installation shall be by the electrical contractor of the Campus Wide project. Start-up, warranty, and training shall be provided by the e-rate proposer.

B. Preparation and installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written recommendations, and as indicated on the Drawings.

3.3 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs as specified in Section 26 0553.

B. Switchboard/Panelboard Nameplates: Label each switchboard/panelboard with engraved nameplates as specified in Section 26 0553.

3.4 GROUNDING

A. Connect equipment grounding conductors to ground bus.

B. Ground the switchboard per the requirements of the National Electrical Code and as indicated on the Drawings.

3.5 CONNECTIONS

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

3.6 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test the equipment and electrical circuits for proper connection, continuity, and absence of undesirable shorts and grounds. Check for continuity, visual damage, marking, and proper phase sequence before performing insulation testing.

2. Make insulation-resistance of each bus, component, and connecting supply, feeder, and control circuits. Megger bus work, breakers, and circuits phase-to-phase and phase-to-ground disconnecting and reconnecting equipment which cannot be meggered as required. The minimum acceptable steady-state value is 50 megohms. Record ambient temperature and humidity during testing.

3.7 MANUFACTURER ASSISTED START-UP

A manufacturer assisted UPS start-up shall be available, manufacturer trained service personnel shall perform the following inspections, test procedures, and on-site training:

A. Visual Inspection

1. Inspect equipment for signs of damage.

2. Verify installation per manufacturer's instructions.

3. Inspect cabinets for foreign objects.

4. Inspect batteries.

B. Mechanical Inspection

1. Check internal power wiring connections on all UPSs and external battery cabinets.

2. Check tightness on terminal screws, nuts, and/or spade lugs on all UPSs and external battery cabinets.

3. Check that all smart battery modules in the UPS and the modular battery cabinets are fastened to the shelves.

C. Electrical Inspection

1. Verify correct input and bypass voltage.

2. Verify correct phase rotation of all input and bypass connections.

3. Verify correct UPS control wiring and terminations.

4. Verify voltage of batteries.

5. Verify neutral and ground conductors are properly landed.

D. Site Testing

1. Ensure correct system start-up.

2. Verify correct firmware control functions.

3. Verify correct firmware bypass operation.

4. Verify correct internal maintenance breaker operation.

5. Verify system set points.

6. Verify correct inverter operation and regulation circuits.

7. Simulate input power failure.

8. Verify correct charger operation.

9. Document, sign, and date all test results.

E. On-site Operational Training: On-Site Operational Training: During the manufacturer assisted start-up, operational training for site personnel shall include LED indicators, start-up and shutdown procedures, maintenance bypass and AC disconnect operation, and alarm information.

3.8 MANUFACTURER FIELD SERVICE

A. Worldwide Service: The UPS manufacturer shall have a worldwide service organization available, consisting of factory trained field service personnel to perform start-up, preventative maintenance, and service of the UPS system and power equipment. The service organization shall offer 24 hours a day, 7 days a week, 365 days a year service support.

3.9 DEMONSTRATION

Provide the services of a manufacturer-authorized service representative of the manufacturer to provide start-up service and to demonstrate and train the Owner's personnel.

A. Test and adjust controls and safety. Replace damaged or inoperable controls and equipment.

B. Train the Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.

C. Review data in operation manual with the Owner's personnel.

3.10 MAINTENANCE

A. Maintenance contracts: A complete offering of preventative and full-service maintenance contracts for the UPS system and the battery system shall be available. All contract work shall be performed by Schneider Electric-trained service personnel.

B. The manufacturer shall, upon request, provide spare parts kits for the UPS in a timely manner as well as provide access to qualified and trained service personnel to provide preventative maintenance and service on the UPS when required.

C. The UPS shall be repairable by replacing standard subassemblies requiring no adjustments.

D. UPS subassemblies shall be accessible from the front. UPS design shall provide maximum reliability and minimum MTTR (mean time to repair). To that end, the UPS shall be equipped with a self-test function to verify correct system operation. The self-test function shall identify the subassembly requiring repair in the event of an alarm condition. The electronic UPS control and monitoring assembly shall therefore be fully microprocessor-based, thus doing away with potentiometer settings. This shall allow:

1. Auto-compensation of component drift.

2. Self-adjustment of replaced sub-assemblies.

3. Extensive acquisition of information vital for computer-aided diagnostics (local or remote).

4. Socket connection to interface with computer-aided diagnostics system.

3.11 TRAINING

UPS service training workshop: A UPS service training workshop shall be available from the UPS manufacturer. The service training workshop shall include a combination of lecture and practical instruction with hands-on laboratory sessions. The service training workshop shall include instruction about safety procedures, UPS operational theory, sub-assembly identification and operation, system controls and adjustment, preventative maintenance, and troubleshooting.

END OF SECTION

SECTION 270000 - COMMUNICATIONS GENERAL PROVISIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and provisions of the Contract. The revised General Conditions, Special Project Conditions, and other Division 0 and 1 Specification Sections apply to the Work of this Section.

1.02 SUMMARY

A. In circumstances where the Specifications and Drawings conflict, the most stringent requirement shall apply. Generally, the Drawings shall govern quantity and the Specifications shall govern quality.

B. The requirements described herein include the following:

1. References

2. Definitions

3. Submittals

4. Quality Assurance

5. Delivery, Storage and Handling

6. Warranty

7. Scheduling

8. Permits and Fees

9. Substitutions

10. Project Management and Coordination Services

11. Field quality control

12. Project Closeout and Record Documents

1.03 RELATED SECTIONS

A. Consult other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable installation.

B. General and Supplementary Conditions and general provisions of Contract apply to Division 27 Sections.

C. Sections within Division 27:

1. Section 27 0000.1 - E-Rate supplemental instructions

2. Section 27 0526 - Grounding and Bonding for Communications Systems

3. Section 27 0528 - Pathways for Communications Systems (E-Rate)

4. Section 27 0533 - Conduits and Backboxes for Communications Systems

5. Section 27 0800 - Commissioning of Communications (E-Rate)

6. Section 27 1100 - Communications Equipment Rooms and Fittings (E-Rate)

7. Section 27 1310 - Communications Backbone Cabling (E-Rate)

8. Section 27 1513 - Communications Horizontal Cabling (E-Rate)

9. Section 27 4117 - Integrated Audio-Video Systems and Equipment – Classrooms

10. Section 27 5123 - Intercommunications and Program Systems

1.04 REFERENCES

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the proposal. Consider such codes or standards a part of this Specification as though fully repeated herein.

B. Codes: Perform Work executed under this Section in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. United States Department Of Labor (DOL) Regulations (Standards - 29 CFR)

   a. Part 1910, “Occupational Safety and Health Standards”

2. National Fire Protection Agency (NFPA)

   a. NFPA 70, “National Electrical Code” (NEC)

   b. NFPA 75, “Protection Of Information Technology Equipment”

3. Washington Administrative Code (WAC)

4. International Building Code (IBC)

5. International Fire Code (IFC)

6. International Mechanical Code (IMC)

7. National, State, Local and any other binding building and fire codes.

8. FCC Regulations:

a. Part 15 – Radio Frequency Devices & Radiation Limits

b. Part 68 – Connection of Terminal Equipment to the Telephone Network

C. Standards: Equipment and materials furnished under this Section shall conform to the following standards where applicable:

1. Underwriter's Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:

a. UL 444: Communications Cables

b. UL 497: Protectors for Paired-Conductor Communication Circuits

c. UL 1651: Optical Fiber Cable

d. UL 1690: Data-Processing Cable

e. UL 1963: Communications-Circuit Accessories

f. UL 2024A: Optical Fiber Cable Routing Assemblies

2. ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard

a. Part 1: General Requirements

b. Part 2: Balanced Twisted-Pair Cabling Components

c. Part 2, Addendum 1: Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling

d. Part 3: Optical Fiber Cabling Components Standard

3. ANSI/TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces, including the following addenda:

a. TIA/EIA-569-A-1 Surface Raceways

b. TIA/EIA-569-A-2 Furniture Pathways and Spaces

c. TIA/EIA-569-A-3 Access Floors

d. TIA/EIA-569-A-4 Poke-Thru Fittings

e. TIA/EIA-569-A-6 Multi-Tenant Pathways and Spaces

f. TIA/EIA-569-A-7 Cable Trays and Wirelines

4. ANSI/TIA/EIA-598-B Optical Fiber Cable Color Coding

5. ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

6. ANSI/J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

7. ANSI/TIA/EIA-758 Customer-Owner Outside Plant Telecommunications Cabling Standard

    a. TIA/EIA-758-1 Addendum No. 1

8. EIA testing standards

9. Insulated Cable Engineers Association (ICEA):

    a. ANSI/ICEA S-80-576-2002 Category 1 & 2 Individually Unshielded Twisted Pair Indoor Cables for Use in Communications Wiring Systems

    b. ANSI/ICEA S-83-596-1994 Fiber Optic Premises Distribution Cable

    c. ANSI/ICEA S-87-640-1999 Fiber Optic Outside Plant Communications Cable

    d. ANSI/ICEA S-90-661-2002 Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems

    e. ICEA S-104-696-2001 Standard For Indoor-Outdoor Optical Cable

10. Building Industry Consulting Services International (BICSI):

    a. Telecommunications Distribution Methods Manual (TDMM)

    b. Customer-Owner Outside Plant Design Manual

    c. Wireless Design Reference Manual (WDRM)

    d. Network Design Reference Manual (NDRM)

D. Make a copy of each document readily available during the course of construction for reference by field personnel.

1.05 DEFINITIONS

A. The Definitions of Division 0 shall apply to the Division 27 sections.

B. In addition to those Definitions of Division 0, the following list of terms as used in this Section and Division 27 sections shall be defined as follows:

1. “Provide”: To furnish and install for a complete and working (operable) system, ready for intended use.

2. "Furnish": Supply and deliver to the project site ready for unloading, unpacking, assembly, installation, and similar activities.

3. "Install": To place in position for service or use. Includes operations at project site, such unloading, unpacking, assembly, erection, placing, preserving, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, programming, and similar activities.

4. "Connect": To install required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.

5. "Cabling": A combination of cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling].

6. "Identifier": A unique code assigned to an element of the telecommunications infrastructure that links it to its corresponding record.

1.06 SUBMITTALS

A. Submit required submittals in accordance with Section 01 45 23.

B. Obtain approval in writing by the Engineer for the Product Data submittals and for the Shop Drawings (as required) prior to release of order for materials and equipment, and prior to installation. Review of A/E does not relieve the Contractor of their responsibilities to furnish and install materials and equipment required for work in the project, nor does such review relieve the Contractor of their responsibilities for the coordination with other trades and designers to ensure that such materials and equipment will fit and be suitable for purpose intended.

C. Provide submittals as required below and submit a CD or DVD with PDF format documents of the same information as submittal of each sub paragraphs D, E, F, and G. Provide printing instruction to re-create physical submittals.

D. Product Data Submittal Requirements

1. Quantity: Submit quantity of product data submittals as described in Section 01 45 23. In the absence of requirements given, submit six product data submittals.

2. Format:

a. Product data sheets shall be 8-1/2 x 11 inch pages or 11x17 for oversized information.

b. Package each submittal with an outer cover. Examples include:

1) 3-ring binder with front cover and spine having clear pockets for insertion of the submittal information.

2) 3-hole report cover with transparent front cover.

c. Clearly label each submittal on the outer cover with the following information:

1) Project name and address

2) Submittal Title (e.g., “Product Data Submittal For Telecommunications Equipment Rooms”)

3) Project submittal number

4) Specification section number/s (e.g., “Section 27 11 00”)

5) Date and revision; date format: <month> <day>, <year> (e.g., “January 1, 2011”)

6) General Contractor / Prime Builder

7) Telecommunications Installer

d. Include index dividers for improved navigation through the submittal. Dividers shall match the Table of Contents.

3. Content:

a. Table of Contents: Include a Table of Contents at the beginning of submittal that lists materials by article and paragraph number (e.g., “2.02-A Equipment Racks”).

b. Cover Letter: Include a cover letter that states the scope of the submittal and states the submittal is in full compliance with the requirements of the Contract Documents, with a specific reference that the submittal complies with Section 01 45 23 procedures. The cover letter shall be signed (and stamped, if applicable) by the person who prepared the submittal. Failure to comply with this requirement shall constitute grounds for rejection of submittal.

c. Product Information: Product Data submittal shall consist of manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary). Also include applicable Materials Safety Data Sheet (MSDS) for each item complying with OSHA’s Hazard Communication Standard 29 CFR 1910.1200. This data shall clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color & finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories, which are included and those which are excluded. At a minimum, include products listed in the specifications numbering 27 XX XX. Also include relevant products that will be installed, which are not listed in the specifications.

d. Seismic Calculations: Where required, include in the product data submittal the manufacturer's anchorage calculations for floor-mounted, fully loaded equipment (racks, frames, cabinets, etc.) such that it shall remain attached to the mounting surface after experiencing forces in conformance with IBC for Seismic Zone and Importance Factor. Specify proof loads for drilled-in anchors, if used.

e. Resubmittals: Resubmittals shall include a cover letter that lists the action taken and revisions made to each product submittal in response to Submittal Review Comments. Resubmittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.

E. Shop Drawings Submittal Requirements

1. Quantity: Submit quantity of shop drawings as described in Section 01 45 23. In the absence of requirements given, submit six sets of shop drawings.

2. Media: Submit shop drawings on media as described in Section 01 45 23. In the absence of requirements given, submit shop drawings full size on bond or eco-bond.

3. Format:

a. Prepare shop drawings using AutoCAD 2007 or later; or REVIT.

b. Full size shall equal the Contract Documents.

c. Use the company title block, and insert the project information in title block.

d. Text shall be minimum 3/32" high when plotted full size.

e. Device symbols shall match those used in the Contract Drawings or be of the company's own with Legend describing each.

f. Screen background information.

g. Plot system components (devices, cable routes, etc.) and text at a sufficient line weight to stand out against background information.

h. Label each sheet in the shop drawings set with the Specification Section Number (e.g., "27 13 10").

i. Scaling:

1) Scale floor plans and reflected ceiling plans at 1/8"=1'-0".

2) Scale enlarged room plans at 1/4"=1'-0".

3) Scale wall elevations at 1/2"=1'-0".

4) Scale rack elevations at 1”=1’-0”.

4. Content:

a. Submit detailed shop drawings if the proposed installation differs from the Contract Documents or the design intent.

b. Cover Letter: Accompany each shop drawing submittal with a cover letter stating that the shop drawings have been thoroughly reviewed by the Contractor and are in full compliance with the requirements of the Contract Documents. Cover letters shall include a drawing index, and shall be signed (and stamped, if applicable) by the person who prepared the submittal. Failure to comply with this requirement shall constitute grounds for rejection of submittal.

c. Drawings: Shop drawing submittals shall consist of floor plans, reflected ceiling plans, enlarged room plans, wall and rack elevations, installation details, and any other aspect of the system that differs from the Contract Documents or the design intent. Scales shall be the same as the Drawings (e.g., 1/4" = 1'-0" for enlarged room plans).

d. Seismic Calculations: Where required, include in the product data submittal the manufacturer’s anchorage calculations for floor-mounted, fully loaded equipment (racks, frames, cabinets, etc.) such that it shall remain attached to the mounting surface after experiencing forces in conformance with IBC for Seismic Zone and Importance Factor. Specify proof loads for drilled-in anchors, if used.

e. Resubmittals: Accompany resubmittals with a cover letter that lists the revisions made to each drawing in response to Submittal Review Comments. Resubmittals will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.

F. Record Drawings Submittal Requirements

1. Quantity: Submit quantity of record drawings as described in Section 01 45 23 and 01 77 00. In the absence of requirements given, submit six sets of as-built drawings.

2. Media: Submit shop drawings on media as described in Section 01 45 23. In the absence of requirements given, submit shop drawings full size on bond or eco-bond.

3. Format:

a. Prepare record drawings using AutoCAD 2007 or later; or REVIT.

b. Use the same sheet size as the Contract Documents, and use the project title block.

c. Text shall be minimum 3/32” high when plotted full size.

d. Device symbols shall match those used in the Contract Drawings or be of the company’s own with Legend describing each.

e. Screen background information.

f. Plot system components (devices, cable routes, etc.) and text at a sufficient line weight to stand out against background information.

4. Content:

a. Record Drawings shall fully represent actual installed conditions and shall incorporate revisions made during the course of construction.

b. Floor plans shall show:

1) Locations and identifiers of outlets/devices

2) Size, quantity, location, and routes of pathways (such as cable basket, conduits, cable hangers, and other cable support devices)

c. Enlarged room floor plans scaled at 1/4”=1’-0” showing exact placement of equipment cabinets/frames, rack bays, and other equipment. Enlarged room overhead plans scaled at 1/4”=1’-0” showing exact placement of overhead cable support devices (e.g., cable basket, cable runway, conduit sleeves, etc.).

1) Applicable rooms: Telecommunication Room(s), Computer Lab(s).

d. Wall elevations scaled at 1/2”=1’-0” showing exact placement of termination hardware (e.g., termination/cross-connect blocks).

e. Installation details

G. Operation and Maintenance (O & M) Manuals Submittal Requirements

1. Quantity: Submit quantity of O&M Manuals as described in Section 01 45 23 and 01 77 00. In the absence of requirements given, submit six product data submittals.

2. Format:

a. Package each O & M Manual in a white, 3-ring binder with front cover and spine having clear pockets for insertion of the project information.

b. Clearly label the cover of each O & M Manual with the following information:

1) Client name

2) Project name and address

3) Manual title (e.g., “Operation and Maintenance Manual for Telecommunications Cabling System”)

4) Date; date format: <month> <day>, <year> (e.g., “January 1, 2011”)

5) Telecommunications Contractor and General Contractor names

c. Include tabbed separators for improved navigation through the manual.

3. Content:

a. Include a Table of Contents at the beginning that lists the contents.

b. 11”x17” prints of Record Drawings, as described above.

c. One CD-ROM of AutoCAD or REVIT files of as-built drawings.

d. Manufacturer's original catalog information sheets for each component provided under applicable Section.

e. Warranty certificate from the manufacturer and the Contractor.

f. Manufacturer’s instructions for system or component use.

g. Instructions for maintenance and warranty issues.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. Five continuous years, minimum, design and manufacture of the materials and equipment specified herein.

2. Manufacturer(s) of all products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that the specifications are met. The program shall include, as a minimum, provisions for:

a. Incoming inspection of raw materials

b. In-process inspection and final inspection of the cable product

c. Calibration procedures for test equipment to be used in the qualifications of the product.

d. Recall procedures in the event that out of calibration equipment is identified.

3. Conformance to certain government standards on quality assurance may be required for some applications within these specifications.

B. Contractor Qualifications

1. Current, active, and valid Washington State Contractors License. Provide a copy of Contractor's License in the proposal submission.

2. Five continuous year's minimum experience.

3. Five, minimum, completed projects similar to scope and cost. Provide a list of projects, including references, in the proposal submission.

4. Technicians qualified for the work. Provide evidence in the proposal submission of Technician qualifications. Evidence shall consist of manufacturer certifications, manufacturer training, industry training, relevant project experience, etc.

5. Also refer to additional requirements stated in other Division 27 Sections.

C. Materials

1. Materials and equipment furnished shall be new, unused and without defects.

2. Furnish only specified products and equipment, or products and equipment that have been approved in writing.

D. Regulatory Requirements

1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Nothing in these specifications is to be construed to permit work not conforming to the most stringent of the applicable codes.

2. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the proposal. Consider such codes or standards a part of this Specification as though fully repeated herein.

3. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this series of Sections, nothing in said codes shall be construed or inferred authority for reducing the quality, requirements or extent of the Drawings and Specifications. The Contract Documents address the minimum requirements for construction.

E. Project Management and Coordination Services

1. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility shall include, but shall not be limited to the items listed in this section.

2. Review of Shop Drawings Prepared by Other Subcontractors:

a. Obtain copies of shop drawings for equipment provided by others that require telecommunication service connections or interface with Division 26 and 28 work.

b. Perform a thorough review of the shop drawings to confirm compliance with the service requirements contained in the Division 26 and 28 contract documents. Document any discrepancy or deviation as follows:

1) Prepare memo summarizing the discrepancy.

2) Provide a copy of the specific shop drawing, indicating via cloud, the discrepancy.

c. Prepare and maintain a shop drawing review log indicating the following information:

1) Shop drawing number and brief description of the system/material.

2) Date of your review.

3) Indication if follow-up coordination is required.

F. Drawings

1. Layout: Follow the general layout shown on the Drawings except where other work may conflict with the Drawings.

2. Accuracy: Drawings for the Work within this Division are essentially diagrammatic within the constraints of the symbology applied.

3. The Drawings do not fully represent the entire installation for the Telecommunications Cabling System. Drawings indicate the general route for the cables and the location of outlets.

4. Complete the details necessary for point-to-point design. This allows the Contractor to achieve desired results applying their own procedures and methods. Submit shop drawings for review prior to installation.

1.09 DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Products shall not be delivered to the site until protected storage space is available.

2. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.

3. Deliver materials in manufacturer's original, unopened, undamaged packaging and containers with identification labels (name of the manufacturer, product name and number, type, grade, UL classification, etc.) intact.

4. Replace equipment damaged during shipping at no cost to the Owner.

B. Storage and Protection

1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.

2. Comply with manufacturer's requirements for each product. Comply with recommended procedures, precautions or remedies as described in the Material Safety Data Sheets (MSDS) as applicable.

3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.

4. Storage outdoors covered by rainproof material is not acceptable.

5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling

1. Handle in accordance with manufacturer's written instructions.

2. Damaged equipment shall not be installed.

3. Replace damaged equipment at no cost to the Owner.

4. Handle with care to prevent internal component damage, breakage, denting, and scoring.

1.10 WARRANTY

A. Service must be rendered within 4 hours of system failure notification. Note any deviation – exceptions or improvements – to this requirement at the time of proposal.

B. Refer to Sections listed in 1.01, for specific subsystem warranty period requirements.

C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. A complete parts department or stocking distributor shall be located close enough to the job site area to supply replacement parts within a 4-hour period.

D. Warrant installed hardware, under normal use and service, to be free from defects and faulty workmanship during the warranty period. Keep the system in operating condition at no additional material or labor costs to the Owner during the warranty period.

E. The manufacturers shall demonstrate that a quality assurance program is in place to assure that the specifications are met. The program shall include, as a minimum, provisions for:

1. Incoming inspection of raw materials

2. In-process inspection and final inspection of the product

3. Calibration procedures of test equipment to be used in the qualifications of the product

4. Recall procedures in the event that out of calibration equipment is identified.

F. Conformance to certain government standards on quality assurance may be required for some applications outlined in these specifications.

G. OFCI equipment suppliers shall pass on the Contractor start-up information, maintenance and parts information, and warranty provisions of their products in accordance with the equipment supplier's contract requirements. Organize and coordinate start-up and warranty requirements for OFCI equipment.

1.11 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Division 27 sections may be combined.

B. Submit schedule within 30 days after Notice to proceed. Refer to Part 3, 3.02 for additional information.

C. Attend a communications pre-constructions meeting to be scheduled TBD.

1.12 PERMITS AND FEES

A. Secure and pay for all permits and certificates as required by the State of Washington and Labor and Industries, for work in this Division.

B. Consult with Phone, Internet, and Cable TV utilities, and include in the proposal, labor and materials to meet requirements which may be imposed by each utility and have included in their proposals, costs and fees to be paid to such utilities, including temporary services, and temporary and permanent connections.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.

B. Product numbers listed in the Division 27 sections are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the Owner in writing prior to ordering the material and

performing any installation work. Provision and installation of the approved changed product will be at no additional cost to the Owner.

2.02 SUBSTITUTIONS

A. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 01 73 23.

B. Where items are noted as "or approved equivalent", a product of equivalent function, design, construction, quality and performance will be considered. Include in the substitution request: catalog cuts, product information, and pertinent test data required to substantiate that the product is in fact equivalent to that specified. Only one substitution will be considered for each product specified.

C. Do not provide substitution material, processes or equipment without written authorization from the Engineer.

D. Substitutions shall be equivalent, in the opinion of the Engineer, to the specified product. The burden of proof of such shall rest with the Contractor. When the Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Specifications.

E. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Owner, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when “or approved equivalent” follows the manufacturers' names and model number(s).

F. Whenever any material, process or equipment is specified in accordance with a TIA/EIA specification, an ANSI specification, UL rating or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance at no additional cost.

G. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or other Contractor's work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Conditions: Verify conditions, provided under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

B. Pathways: Verify that pathways and supporting devices, provided under other sections, are properly and permanently installed, and that temporary supports, devices, etc., have been removed.

C. Field Measurements: Verify dimensions of pathways, including length of pathways. For example, “true tape” the conduits to verify cabling distances.

3.02 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman who is in charge of the Work and who is present at the job site at times Work is being performed. Supervise the work force executing the Work. Perform the installation within the restraints of the construction schedule.

B. Project Management: Coordinate and attend weekly/monthly status meetings to review the overall progress and issues to be resolved throughout the course of construction. Prepare and distribute meeting agenda prior to and meeting notes after meetings in a format acceptable to the General Contractor. At a time of no less than 3 months prior to substantial completion, setup a coordination meeting where the Owner, Owner’s representative, Engineer, General Contractor, and Division 25, 26, 27, and 28 sub contractors shall attend in person. This and subsequent weekly meetings will determine final critical scope and deadlines for each sections responsibilities.

C. Scheduling: Prepare an overall construction schedule based on the results of the planning meetings with the General Contractor. Issue schedule to General Contractor for approval. Prepare and issue updated schedules whenever there are modifications.

D. Inspection: Perform inspection after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion released for inspection. Document completion and inspection as required.

E. Construction Meetings: Setup a communications meeting on a weekly basis, with the first meeting no less than 3 months prior to substantial completion and with periodic meetings set on the same date and time for each week prior. The first meeting each contractor and sub contractor under Division 27 must attend in person, and then via conference call subsequent. If major problems on the project, should arise, plan on attending the critical meetings in person again.

F. Record Drawings: Maintain and annotate on the job at all times a separate set of Record Drawings in accordance with the General Conditions. Deviations from the Drawings, stubouts, changes from the original work, routing of hidden raceways, actual fixture and equipment locations, equipment sizes and dimensions and building outline changes shall be shown on the Drawings in a manner equivalent to that of the original Drawings

3.03 INSTALLATION

A. Conform to applicable federal, state and local codes, and telephone standards.

B. Coordinate the entire installation with the General Contractor, and their subcontractors, to meet the construction schedule. Include coordination meetings as required to fulfill this requirement.

C. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

D. Manufacturer's Instructions:

1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

2. Maintain jobsite file and comply with Material Safety Data Sheets (MSDS) for each product delivered to jobsite.

E. Adjusting:

1. Make changes and revisions to the system to optimize operation for final use.

2. Make changes to the system such that any defects in workmanship are corrected and cables and the associated termination hardware pass the minimum test requirements.

F. Protection:

1. Protect installed products and finish surfaces from damage during delivery and construction.

2. Provide protective coverings on adjacent surfaces for protection from dust and debris.

3.04 REPAIR/RESTORATION

A. Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement.

B. Paint damaged areas to existing painted surfaces caused by Work.

C. Punch List:

1. Inspect installed work in conjunction with the General Contractor and develop a punch list for items needing correction.

2. Provide punch list to Owner for review prior to performing punch walk with Owner.

D. Re-Installation:

1. Make changes to adjust the system to optimum operation for final use. Make changes to the system such that any defects in workmanship are correct and cables and the associated termination hardware passes the minimum test requirements.

2. Repair defects prior to system acceptance.

3.05 CLEANING

A. Clean daily. Remove temporary coverings and protection of adjacent work areas. Remove unused products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Legally dispose of debris.

E. Once equipment is ready to arrive on site, telecommunications rooms should be sealed as best possible and wiped down clean prior to installation of any equipment. Telecommunications room A/C unit filters should be cleaned on a regular basis, daily if necessary to maintain a clean room.

3.06 CERTIFICATION

A. Provide to Owner or Owner's Representative a written form of acceptance for signature. Corrections must be completed before Owner or Owner's Representative and Engineer will give acceptance.

B. All systems should be ready for acceptance testing and punch-lists no later than three weeks prior to substantial completion. Schedule the Engineer, and the Owner's representative for a walk-through on-site of each system for testing and review.

C. Final acceptance testing and punch-list items should be demonstrated/completed no later than one week prior to substantial completion.

3.07 DEMONSTRATION / TRAINING

A. On completion of the acceptance test, schedule a time convenient with the Owner or Owner's Representative for instruction in the configuration, operation, and maintenance of the system.

B. Provide a schedule of training sessions to the General contractor and Owner. Schedule should be coordinated with the Owner in advance for dates, times, and personnel staff attending.

C. For each system, provide 4 hours, minimum, of on-site orientation and training by a factory-trained representative. Document dates and times of training, and submit a "sign in" sheet for individuals trained, as part of the close out documentation. Systems may be combined into a larger multi-day training session at the request of the Owner. These training sessions should focus on user functions, operation, and inter-functionality between systems at the end user equipment.

D. Provide a separate 4 hours of on-site orientation and training by a factory-trained representative for the Owner's IT staff. Document dates and times of training, and submit a "sign in" sheet for individuals trained, as part of the close out documentation. This

training should focus on setup, function, operation and maintenance of the head end equipment and systems.

E. At a period of time, no less than one month and no more than three months after startup, provide a one day on-site service and operational review for the Owner on the use of the system(s) and the use of any special features which may require time to become familiar with.

F. At a period of time, no less than six months and no more than one year after startup, provide a one day on-site service and operational review for the Owner.

G. After each visit to the project provide a written statement to the Engineer, outlining who visited the site, which of the Owner's representatives was present, and what items were covered and/or services provided, and the response to all questions.

END OF SECTION 27 00 00

SECTION 270000.1 E-RATE SUPPLEMENTAL INSTRUCTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions "Bid Package 4 (E-Rate)", General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. The general intent of this section is to provide instructions for a complete e-rate proposal package.

1.3 RELATED SECTIONS

A. Sections that are related to this Section include, but are not limited to, the following:

1. Section 27 0000 - Communications General Provisions

2. Section 26 3363 - Uninterruptible Power Supply (e-rate)

3. Section 27 0528 - Pathways for Communications Systems (e-rate)

4. Section 27 0800 - Commissioning of Communications (e-rate)

5. Section 27 1100 - Communications Equipment Rooms and Fittings (e-rate)

6. Section 27 1310 - Communications Backbone Cabling (e-rate)

7. Section 27 1513 - Communications Horizontal Cabling (e-rate)

8. Section 27 2000 – Data Communications (e-rate)

1.4 E-RATE PROPOSAL PACKAGE

A. Provide proposer's E-rate Service Provider Identification Number (SPIN) numbers required for proposal. Subcontracts are not required to have SPIN numbers unless they are proposing separately for a specification section.

B. The Proposer shall determine the eligibility of products, equipment, labor, and reoccurring maintenance costs; based on the USAC Schools and Libraries current eligibility list and supplemental documents. Contract should allow for renegotiation/cancelation of the portions of equipment and services if the Eligible Service list changes after the execution of the contract.

C. Provide total cost summary. Include proposed itemized reoccurring costs to the Owner for ongoing maintenance and support for each of the following itemized breakouts. In

each proposed cost, separate and itemize the portion that is eligible and non-eligible for possible e-rate reimbursement.

D. The following cost breakout numbers are required on the proposal. Attach proposal with the following breakouts:

1. Structured Cabling:

a. Provide a proposed materials and labor itemized cost breakout for Pathways for Communications Systems (270528), Commissioning of Communications (270800), Communications Equipment Rooms and Fittings (271100), Communications Backbone Cabling (271310), and Communications Horizontal Cabling (271513). In each cost, separate and itemize the portion that is eligible and non-eligible for possible e-rate reimbursement.

2. Switches and Wireless Access Points:

a. Provide a proposed itemized cost breakout for Data Communications (272000); grouped by each telecommunications room as laid out in the plans and specifications. Include proposed installation costs as a separate line item. In each proposed cost, separate and itemize the portion that is eligible and non-eligible for possible e-rate reimbursement.

3. Uninterruptible Power Supply:

a. Provide a proposed itemized cost breakout for Uninterruptible Power Supply (263363); as laid out in the plans and specifications. Include proposed installation costs as a separate line item. In each proposed cost, separate and itemize the portion that is eligible and non-eligible for possible e-rate reimbursement.

b. This proposed cost shall not include the line and load side connections including circuit(s) between UPS and maintenance bypass cabinet as part of the installation work. Start-up may be completed once these connections have been made. Line and load side connections and interconnections between UPS and maintenance bypass cabinet shall be made under Division 26. All other connections internal and external including communications, start-up, software shall be connected/installed by the proposer and shall be included in the cost of this proposal.

PART 2 PRODUCTS

2.1 GENERAL

A. Comply with the Products requirements of Section 27 0000.

2.2 SUBSTITUTIONS

A. District design standard listed manufacturer was used as a guideline for the basis of design and provides the minimum standards for features and functionality. Bids for any

other equivalent products must include an item-by-item comparison of features and functionality of their products and the requested products. This must be included as part of the Proposer's narrative response. Simply saying "see product description" is not adequate…

B. Proposer's equipment shall be compatible with existing network infrastructure.

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 0000.

END OF SECTION 27 20 00.1

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS (E-RATE)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.02 SUMMARY

A. The work under this section shall include the planning and coordination with General Contractor (and other trades) of telecommunications system building pathways, the furnishing of necessary materials, and the labor & associated services required to install pathways.

B. Section Includes: Telecommunications building pathways.

1. The Telecommunications Building Pathways consist of the following subsystems:

a. Innerduct, from MC to HCs, as shown on Drawings.

b. Primary Pathways: Cable Tray, including supports.

c. Secondary Pathways: Cable Hangers, including supports.

d. See section 27 0533 for additional raceway types for primary and secondary pathways provided under that section.

1.03 RELATED SECTIONS

1. Section 27 0000 - Communications General Provisions

2. Section 27 0000.1 - E-Rate supplemental instructions.

3. Section 27 0526 - Grounding and Bonding for Communications Systems

4. Section 27 0533 - Conduits and Backboxes for Communications Systems

5. Section 27 1100 - Communications Equipment Rooms and Fittings (E-Rate)

6. Section 27 1310 - Communications Backbone Cabling (E-Rate)

7. Section 27 1513 - Communications Horizontal Cabling (E-Rate)

1.04 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., list in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ASTM A 510 Specifications for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

2. ASTM B 633 Specifications for Electrodepositing Coatings of Zinc on Iron and Steel, Sections SC2 and SC3.

3. ASTM A 653 Specifications for Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process

4. ASTM A 591 Specifications for Electrodepositing Coatings of Zinc on steel wire or sheets.

5. ASTM A 123 Specifications for Zinc (Hot Galvanized) Coatings on Iron and Steel.

1.05 DEFINITIONS

A. Definitions as described in Section 27 00 00 shall apply to this section.

B. "Cable Hanger": A metal, most often steel, cable support device shaped (section view) similar to the letter J; alternately, a fabric strap. The device is available in different sizes supporting different quantities of cables, and is also available with different attachment hardware to be supported by different methods (e.g., wire support, beam flange clip, etc.).

C. "J-Hook": Another name for cable hangers.

1.06 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements at Start of Construction:

1. Product Data Submittal

2. Shop Drawings Submittal: Consisting of proposed changes to pathway route plans.

D. Submittal Requirements at Close Out:

1. Record Drawings Submittal (can be combined with shop drawings of Sections 27 27 1513).

E. Substitutions

1. Requests for substitutions shall conform to the requirements and procedure in Section 27 00 00.

1.07 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. NFPA Compliance: Comply with NFPA 70B, “Recommended Practice for Electrical Equipment Maintenance” pertaining to cable tray series of specifications.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.09 WARRANTY

A. Comply with Warranty requirements of Section 27 00 00.

PART 2 PRODUCTS

2.01 GENERAL

A. Comply with the Products requirements of Section 27 00 00.

2.02 SUBSTITUTIONS

A. Comply with the Products, Substitutions requirements of Section 27 00 00.1.

2.03 INSIDE PLANT INNERDUCT, RISER RATED

A. Application: Suitable for an indoor installation, typically within a riser system or backbone conduit, for the support of telecommunications fiber optic cables.

B. Description: Designed and manufactured as a continuously extruded corrugated pipe.

C. Material: Fabricated from Capron resin.

D. Manufacturers:

1. Carlon “Riser Guard” series innerduct

2. Endot “Endocor/RI” series innerduct

3. Pyramid “Fire Flex Riser Duct” series innerduct

2.04 INSIDE PLANT INNERDUCT, PLENUM RATED

A. Application: Suitable for an indoor installation, typically within a riser system or backbone conduit, and within plenum spaces, such as above ceiling or within an access floor, for the support of telecommunications fiber optic cables.

B. Description: Designed and manufactured as a continuously extruded corrugated pipe.

C. Material: Fabricated from PVDF resin.

D. Manufacturers:

1. Carlon “Plenum Guard” series innerduct

2. Endot “Endocor/PL” series innerduct

3. Pyramid “Fire Flex Plenum Duct” series innerduct

2.05 CABLE TRAY

A. Application: Suitable for indoor installation to support, store, and manage telecommunications cables, either overhead or mounted vertically on a wall.

B. Description: shall be constructed of welded wire mesh (high strength steel) with a continuous safety edge wire lip. Cable tray shall be complete will all materials and incidental and miscellaneous hardware required for a complete cable tray system.

C. Materials and Finishes: Material and finish specifications for each cable tray type pathway are as follows:

1. Finish: Electro-plated zinc galvanized finish, pre-galvanized finish, or black finish.

2. Depth: 2 inches (unless otherwise noted on drawings).

3. Mesh: 2 x 4 inches.

4. Wire Diameter: 0.177 inch, minimum, or 0.250 flat shade.

5. Fittings: Fittings shall be field fabricated from straight sections through use of manufacturer’s hardware and in accordance with manufacturer’s instructions.

6. Grounding/bonding: Cable tray shall be complete with manufacturer’s hardware for grounding/bonding.

7. Cable tray and all fittings and supports shall be manufactured by the same manufacturer.

8. Cable drop out: Provide manufacturer’s cable drop out or cable exit where required.

9. Slots/Sleeves: Provide slots/sleeves where required.

D. Refer to Drawings for widths and sizes.

E. Manufacturers:

1. CPI – OnTrac Shape Tray series

2. WBT – basket tray

3. Cablofil EZ-Tray series

2.06 CABLE HANGERS

A. Application: Suitable for indoor installation within ceiling space for the support of telecommunications cables.

B. Listings: UL 2043, for use in air handling spaces

C. Manufacturers (or variation per installation method):

1. B-Line #BCH12-W2; hanger for up to 16 cables

2. B-Line #BCH21-W2; hanger for up to 50 cables

3. B-Line #BCH32-W2; hanger for up to 80 cables

4. Erico #CAT12; hanger for up to 16 cables

5. Erico #CAT21; hanger for up to 50 cables

6. Erico #CAT32; hanger for up to 80 cables

7. Panduit #JMJH2-X20; hanger for up to 30 cables

8. Panduit #JMJH2W-X20; hanger for up to 30 cables, wall-mount type

2.07 DROP WIRE

A. Application: Suitable for indoor installation within ceiling space into structure above (e.g., slab and/or deck) for the support of telecommunications support devices.

B. Listings: UL 2043, for use in air handling spaces.

C. Assembly shall be equipped with ceiling clip, pre-mounted fastening pin, plastic washer, and pre-tied wire.

1. Fastening pin shall be 7/8”.

2. Wire shall be 12 gauge.

D. Manufacturer:

1. Hilti #CC27 X-AL-H22P8T xx ft PT; drop wire assembly, xx foot wire – where “xx” is the length

PART 3 EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.02 EXAMINATION

A. Examine and coordinate with the General Contractor the areas to receive overhead hanger/support system prior to the start of work within this section. Notify the General Contractor in writing of conditions that would adversely affect the installation or subsequent utilization of the system. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Installer is responsible for the integrity of the structures to which the system is attached, including their capability of safely accepting the loads imposed as evaluated by a qualified engineer.

3.03 INSTALLATION

A. Innerduct

1. Provide innerduct for routing of fiber optic cables. The innerduct shall be continuous from originating room to destination room. Truncate the innerduct in either room prior to slack storage.

2. When routing through corridors, place innerduct in the cable tray / primary pathway / dedicated supports. When routing vertically through telecommunications rooms, support innerduct on vertical cable support (such as ladder rack) and fasten using cable ties. When routing horizontally through telecommunications rooms, support innerduct on overhead cable support and fasten using cable ties. Install cable ties at 24-inch intervals.

3. Label innerducts at both ends. The label shall be visible to a technician standing at-ease.

B. Cable Tray

1. Install cable basket pathway system in accordance with manufacturer's instructions and recognized industry practices, and ensure that the installed system complies with requirements of the NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.

2. Install system at locations indicated on the drawings. Routes are diagrammatic in nature. Field verify route prior to installation.

3. Provide center-support hangers, trapeze hangers, or wall brackets to support/hang the cable basket pathway. If not shown in the Drawings, provide 3/8-inch diameter threaded rods for the trapeze hangers and/or center-support hangers. For wall

brackets, use approved fasteners depending on the mounting substrate. Support separation shall conform to applicable codes.

4. Splice straight sections using hardware specifically designed for the purpose.

5. Trapeze hanging cable tray supports shall be attached to the structural ceiling or walls with hardware or other installation and support aids specifically designed for the cable tray's weight and required cable weight and volume.

    a. Do not attach cable tray supports to ceiling support system or other mechanical support systems.

    b. Load span criteria: Install tray supports in accordance with the load criteria of Manufacturer's L/240 document.

    c. Trays shall be supported at a minimum of 5 foot intervals.

6. Maintain a clearance of 6 inches between top of cable tray and ceiling structure or other equipment or raceway.

7. Maintain a clearance of 6 inches between bottom of cable tray and ceiling grid or other equipment or raceway.

    a. Maintain minimum clearances listed under the Section 27 15 13; cable clearances from electromagnetic sources and this Section 3.03, part D.

8. Bends shall be long radius. Short radius bends and T-sections shall not be used unless specifically called out on the Drawings.

C. Cable Hangers

1. Install hangers in accordance with recognized industry practices, to ensure that the installed system complies with requirements of the NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.

2. Provide dedicated supports at sixty inches (60") separation, maximum, per a given route. Supports shall consist of #12 wire or ¼" threaded rod. Suspend wire or rod using components appropriate for the structure – e.g., powder-actuated clip fastener for wire, beam flange clip or angled flange clip for either wire or rod, or an embedded anchor for the threaded rod. Do not share support (wire/rod) with other trades. Do not support the hanger on ceiling grid support wires. Do not support the hanger from ductwork, piping, or other equipment hangers.

3. Install hangers between 6 inches and 12 inches above ceiling grid.

    a. Maintain minimum clearances listed under the Section 27 15 13; cable clearances from electromagnetic sources and this Section 3.03, part D.

D. Route pathways as follows:

1. Maintain a clearance of 4 foot from motors or transformers.

2. Maintain a clearance of 1 foot from conduit or cables used for electrical power distribution.

3. Maintain a clearance of 18 inch from fluorescent lighting.

4. Pathways shall cross perpendicular to fluorescent lighting and electrical power cables or conduits.

5. Slots/sleeves: Provide slots/sleeves where required. Provide roto-hammering, core drilling, saw cutting where required for installation. Seal and firestop (firestop only if fire rated barrier) between slot/sleeve and cable tray.

END OF SECTION 27 05 28

SECTION 270800 - COMMISSIONING OF COMMUNICATIONS (E-RATE)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions “Bid Package 4 (E-Rate)”, General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.02 SUMMARY

A. Section Includes: Commissioning and testing of communications Backbone and Horizontal Cabling subsystems.

1. Testing of a completed communications Cabling System, including:

a. Procedures Submittals

b. Equipment Submittals

2. Testing Requirements:

a. Fiber optic passive link segment(s):

Table 270800-1.1: Tests for Fiber Optic Passive Link Segments

Subsystem	Type	Test	Direction	Wavelength
Backbone	Singlemode	Characterization	Both	1310nm and 1550nm
Backbone	Singlemode	Passive Link Ins. Loss	One	1310nm and 1550nm

b. Multipair/UTP cabling:

Table 270800-1.2: Tests For Multipair/UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Horizontal	CAT6	Category 6	Permanent Link	Per TIA/EIA-568-B.2-1

c. Record Documents, including test reports.

1.03 RELATED SECTIONS

1. Section 27 0000 – Communications General Provisions

2. Section 27 0000.1 - E-Rate supplemental instructions

3. Section 27 1310 – Communications Backbone Cabling (E-Rate)

4. Section 27 1513 – Communications Horizontal Cabling (E-Rate)

1.04 REFERENCES

A. Comply with Section 27 00 00 References requirements.

B. Additional references to those listed in Section 27 00 00.

1. TIA/EIA-526-7 ("OFSTP-7") Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant

2. TIA/EIA-455-171 Attenuation By Substitution Measurement – For Short-Length Multimode Graded-Index and Single-Mode Optical Fiber Cable Assemblies (a.k.a., FOTP-171)

1.05 DEFINITIONS

A. Refer to Definitions of Sections 27 00 00, and other related Division 27 sections.

B. In addition, the following list of terms as used in this specification shall be defined as follows:

1. "Adapter" (associated with fiber connectivity): Shall mean a connecting device joining 2 fiber connectors, either like or unlike.

2. "Channel": Shall mean a testing configuration which includes the Permanent Link and the line cord (at the workstation), the equipment cord, and, if a full crossconnection is implemented, a patch cord and the crossconnect termination/connecting apparatus.

3. "Connect": Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.

4. "Cord": Shall mean a length of cordage having connectors at each end. The term "Cord" shall be synonymous with the term "Jumper". The cord may be:

a. Unshielded twisted pair

b. Fiber (singlemode), jacketed & buffered

5. "Launch Cord": Shall mean the cord certified for use in fiber optic characterization testing, as described in this section.

6. "OTDR": Shall mean Optical Time Domain Reflectometer.

7. "Passive Link Segment": Shall mean the cable, connectors, couplings, and splices between two fiber optic termination units.

8. "Permanent Link": Shall mean the 'permanent' portion of the Horizontal cabling to each outlet with the test cords de-embedded from the measurements; this includes cable, consolidation point (if used), termination/connecting apparatus in the IDF and the connector at the outlet.

9. "System Cord": Shall mean the cord used in the operating electrical or optical circuit.

10. "Test Cord": Shall mean the cord certified for use in testing, as described in this section.

1.06 SUBMITTALS

A. Refer to Submittals of to Section 27 00 00 for procedural, quantity, and format requirements.

B. Preconstruction Submittal Requirements:

1. Testing Procedures Submittal, describing step-by-step procedures used by the field technicians.

2. Product Submittal, including cut sheets of testing equipment to be used (note all software/firmware versions as applicable) and certificate of last calibration.

3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27 sections.

C. Submittal Requirements at Closeout:

1. Record Documents

D. Submittal Description: Record Documents

1. Test Reports: Record documents submittal shall include test reports showing the following information:

a. A title page which includes:

1) Client Name

2) Project Name

3) Project Address

4) General Contractor name / Telecommunications Installer name

5) Date of Submittal

b. Individual tabs which break down the test results by building, and then by telecommunications room.

c. Backbone Fiber Optic "Post Installation" Passive Link Attenuation test results and Fiber Optic OTDR test results.

d. Backbone UTP test results

e. Horizontal cable test results, per cable

2. Furnish test results on CD-ROM in their native data format and an exported Microsoft Excel compatible format.

a. Include necessary software to allow viewing and printing of individual test results. If license is required, provide a perpetual license to Owner with license documentation (Product Key, Activation Codes, etc.)

b. CD shall be labeled with the project name, General Contractor name, Telecommunications contractor name, and date of submission and any other digital usage rights token or identifier needed. The Owner shall be listed and registered as the Owner of these rights.

1.07 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 27 00 00.

B. Proposer Qualifications:

1. In addition to the Proposer Qualifications requirements of Section 27 00 00, the Proposer shall be/have:

a. At a minimum, one RCDD permanently on staff, and in management throughout the duration of the project. Provide evidence in the proposal submission of certification Programs. Evidence shall include a copy of the "Certification(s)" with the RCDD's name(s).

C. Manufacturer's Qualifications:

1. Manufacturer regularly engaged, for past 10 years, in manufacture of communications horizontal cabling of similar type to that specified

a. Preapproved manufactures and approved solutions

1) Leviton / Berktek

2) CommScope / Systimax

D. Installer's Qualifications:

1. The Installer must possess one of the following Certification Levels at a minimum:

a. Contractor to be a Certified Leviton Premier Network Installer Partner and a Berktek OASIS Connectivity Partners in good standing within the State of Washington at the time of bid, during, and through completion of the system installation. Contractor must be able to provide supporting documentation as part of the review process prior to contract award. Contractor will be held responsible for workmanship and installation practices in accordance with the Leviton Premier Network Installer Program.

b. Contractor to be a Certified CommScope Integrator Partner in good standing within the State of Washington at the time of bid, during, and

through completion of the system installation. Contractor must be able to provide supporting documentation as part of the review process prior to contract award. Contractor will be held Responsible for workmanship and installation practices in accordance with the CommScope Integrator Partner Program.

E. Contractor must be a licensed and bonded contractor holding a valid Washington State Contractor's License and possess a current EL06 Electrical Administrator's Certificate valid in the State of Washington. Contractor must be able to provide supporting documentation as part of the review process prior to contract award.

F. Contractor shall be thoroughly knowledgeable in TIA/EIA 568 standards of Category 6 and 6A installations. The requirements of these standards shall be met whether a particular item is specified or not. The specifications assume that the contractor shall provide all miscellaneous telecommunications components, hardware, etc., in a manner compliant with these standards.

1.01 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. Warrant the validity of the test results. Under no circumstances shall any cable's test results be substituted for another's. If a single instance of falsification is confirmed, the Contractor shall be liable for a complete retest of the cabling system at no additional cost to the Owner by an Owner-selected testing firm. This includes retaining the services of a neutral party to observe all retesting.

PART 2 PRODUCTS

2.01 GENERAL

A. Comply with the Products requirements of Section 27 00 00.

2.02 SUBSTITUTIONS

A. Comply with the Products, Substitutions requirements of Section 27 00 00.

B. The testing equipment manufacturer may change the product numbers listed in this Section at any time, as well as software and firmware versions. The direct replacement, as certified by the testing equipment manufacturer may be used if listed equipment is no longer practical. In the event this Section contains an invalid product number or conflicts with the written description or specifies an out-of-date software and/or firmware version, notify the Engineer in writing prior to issuing submittals or field testing. The latest stable release of the tester firmware and software at the time of the start of testing shall be used and maintained throughout all testing.

2.03 FIBER OPTIC LIGHT SOURCE

A. All connection interfaces shall be factory installed. No field-configurable adapters will be allowed at the light source.

B. Wavelengths output shall be continuous.

C. LASER-based light source for singlemode fiber testing shall have a:

1. Center wavelength of 1310n ± 20nm and 1550n ± 20nm.

2. Spectral width (FWHM) of ≤5nm at 1310nm and ≤5nm at 1550nm.

3. Minimum output power level of ≥3dBm.

D. The light sources may contain internal lenses, pigtails, and modal conditioners, provided they meet the launch conditions as described in "Post-Installation" Passive Link Attenuation Testing Procedures (ref. PART 3 - EXECUTION).

E. Equipment shall be factory-calibrated within 12 months of testing date.

F. Equipment:

1. Agilent Technologies' WireScope 350 test set

a. #450-2020 Fiber SmartProbe testing adapter, singlemode 1300nm.

b. ScopeData management software (version 5.20 or higher).

2. Corning Cable Systems

a. #OS-301 light source

b. #OS-302 light source

c. #OS-100D light source

3. Fluke Networks' DSP-4300 test set

a. #DSP-4300; "CableAnalyzer" test kit, loaded with firmware version 3.0.4.

b. #DSP-FTA430S; 'Singlemode' fiber testing adapter, LASER-based (1310nm, 1550nm).

c. #DSP-FTA440S; 'Gigabit' fiber testing adapter, VCSEL-based (multimode @ 850nm and singlemode @ 1310nm).

d. LinkWare; "LinkWare" management software (latest version).

4. Laser Precision #5150 test set

2.04 FIBER OPTIC POWER METER

A. The power meter for singlemode testing must be capable of measuring relative or absolute power and must be independent of modal distributions.

B. All power meters used must be calibrated and traceable to the National Bureau of Standards.

C. All power meters used shall have the following performance:

1. Dynamic range of 0dBm to -40dBm, minimum.

2. Accuracy of ±0.2dB.

D. Equipment shall be factory-calibrated within 12 months of testing date.

E. Equipment:

1. Agilent Technologies' WireScope 350 test set

a. #450-2020 Fiber SmartProbe testing adapter, singlemode 1310nm.

b. ScopeData management software (version 5.20).

2. Corning Cable Systems,

a. #OTS-210 power meter, with data storage capacity.

b. #OTS-310 power meter, with data storage capacity.

3. Laser Precision #5025 test set

2.05 FIBER OPTIC MANDREL

A. For jacketed (3.0 mm) fiber, mandrel diameter shall be 22 mm for 50/125 um fiber. For unjacketed buffered (0.9 mm) fiber, mandrel diameter shall be 25 mm for 50/125 um fiber.

B. Equipment: Fluke Networks

1. #NF-MANDREL-50; red mandrel for jacketed 50/125 um fiber

2.06 FIBER OPTIC OTDR

A. Singlemode Source Module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
1310nm	40dB	6.0mt	3.5mt	0.001dB	0.1mt
1550nm	28dB	12.0mt	3.5mt	0.001dB	0.1mt

B. Equipment, including main unit and source modules, shall be factory-calibrated within 12 months of testing date.

C. Equipment:

1. Agilent Technologies #8147, for multimode & singlemode systems

2. Corning Cable Systems,

a. 2001HR, for singlemode systems

b. 340 OTDR Plus Multitester II

c. MiniOTDR+, for singlemode systems

3. Tektronix,

a. TFP2A FiberMaster

b. TFS3031 TekRanger2

2.07 FIBER OPTIC TEST CORDS

A. Singlemode Fiber Optic Test Cord

1. The fiber of the singlemode test cord(s) shall have the mode field diameter nominally equal to that of the singlemode fiber optic passive link.

2. The length of test cords used for insertion loss testing shall be between 1m and 5m.

3. The connectors of the test cords shall be compatible with the connector types of the light source and the power meter.

a. The connector of the test cords shall be that which the light source accepts.

4. The connectors shall exhibit <= 0.5dB loss per connection @ both 1300nm and 1550nm, as measured per FOTP-171 D3.

5. All singlemode connectors shall inhibit Fresnel reflections (i.e., have a “PC” finish).

2.08 CATEGORY 6 HORIZONTAL CABLE TESTER

A. Equipment shall meet TIA/EIA-568B.2 Addendum 1 requirements for Level III accuracy.

B. Test Standards (minimum): TIA Category 6 (per TIA/EIA-568B.2 Addendum 1); ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-T, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5.

C. Areas of Test Measurement (minimum): Wire Map; Length; Insertion Loss; Near End Crosstalk (NEXT) loss, at both master unit and remote unit; Power Sum NEXT (PSNEXT) loss, at both master unit and remote unit; Equal Level Far End Crosstalk (ELFEXT), at

both master unit and remote unit; Power Sum ELFEXT, at both master unit and remote unit; Return Loss (RL), at both master unit and remote unit; Propagation Delay and Delay Skew; Attenuation-to-Crosstalk Ratio (ACR), at both master unit and remote unit; Power Sum ACR (PSACR), at both master unit and remote unit; Characteristic Impedance; DC Loop Resistance.

D. Equipment: Agilent Technologies

1. #N2600A-100; "WireScope 350" test kit (main unit, remote unit, CAT6 permanent link probe, CAT6 channel probe, accessories), loaded with firmware version 3.1.1.

2. "ScopeData Pro" reporting and documentation software latest version.

E. Equipment: Fluke Networks

1. #DTX-1200 or #DTX-1800; "DTX CableAnalyzer" test kit (main unit, remote unit, CAT6 permanent link adapters, CAT6 channel adapters, accessories), loaded with latest version of firmware.

2. #DSP-4300; "CableAnalyzer" test kit (main unit, remote unit, CAT6 permanent link adapters, CAT6 channel adapters, accessories), loaded with firmware version 3.0.4.

3. "LinkWare" reporting and documentation software (version 1.1, or higher)

PART 3 EXECUTION

3.01 SCHEDULING

A. Prepare a schedule for testing activities based on the schedule developed in Sections 27 15 13, 27 13 10. Update testing schedule when changes in the cabling construction schedule occur.

B. Schedule both the Engineer of Record and a representative of the test equipment manufacturer for a demonstration of testing methods. Execute a demonstration of testing methods with aforementioned parties prior to 'production' testing activities. Test reports and acceptance testing will not be accepted without proof of methods demonstration.

3.02 FIELD QUALITY CONTROL

A. Complete testing as delineated below prior to system acceptance.

B. Permanently record all test results and presented in a format acceptable to the Owner or Engineer before system acceptance.

C. Remove and replace with new, at no cost to the Owner, any cables or conductors (copper or glass) failing to meet the indicated standards. The Owner will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the Owner has approved any deviation from this requirement.

D. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.

3.03 "PRE-INSTALLATION" CONTINUITY TESTING PROCEDURES

A. Ensure fiber continuity of all fiber strands of all cables prior to installation.

B. Reports from "pre-installation" continuity testing are not required to be submitted at project close out.

3.04 BACKBONE FIBER OPTIC CHARACTERIZATION TESTING

A. Test fiber optic passive links per Part 1 of this Section.

B. Precautions

1. Adhere to the equipment manufacturer's instructions during testing activities.

2. Prior to any testing activity or any measurements taken, complete the following activities:

a. Ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for however long it takes to bring the test equipment to reach room temp).

b. Clean all launch cords and system cords (if applicable) connectors and all adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.

3. Do not power off OTDR's light source during testing activity.

4. Do not remove launch cord from the OTDR's light source at any time (unless the testing is complete or the equipment is being put away for the evening, or during trouble shooting).

5. Do not bend the launch cord smaller than 20 times the cord diameter during testing activities (this may induce loss into the cord reducing the accuracy of the measurement).

6. Fully charge power source before each day's testing activity, if applicable.

C. "Post-Installation" Characterization Testing Procedures

1. Equipment settings / measurement parameters:

a. Index of Refraction: match cable-under-test fiber parameters; default settings as follows:

Singlemode	SYSTIMAX	1.466 @ 1310nm	1.467 @ 1550nm
	Corning SMF-28	1.4675 @	1.4681 @ 1550nm

1310nm

b. Pulse Width: multimode: 20ns; singlemode: 50 ns.

Singlemode	10 ns for cable lengths up to 2,000 meters
	50 ns for cable lengths from 2,000 meters to 20 kilometers

c. Backscatter:

1) Singlemode: -74dB @ 1310nm and 1550nm

d. Event Threshold: 0.05dB for singlemode

e. Reflection Threshold:

1) Singlemode: -60dB

f. Fiber Break/End-Of-Fiber: 3dB for singlemode

2. Waveform: The waveform shall be real-time/normal density.

3. Obtain measurements using a 'launch' cord connected to the test instrument and the cable-under-test.

a. The fiber of the launch cord shall match the fiber of the cable-under-test in physical and performance parameters (such as type, core/cladding size, index of refraction, refractive profile). The fiber of the launch cord should match the fiber of the cable-under-test in manufacturer and product.

b. The length of the launch cord shall be between 25 meters and 100 meters.

4. Review the results of each test and bring to the attention of the Engineer all fibers that do not meet the manufacturer's allowed loss for splices and connectors, or fibers that do not meet the length of the overall cable length.

D. Record Documents:

1. Test reports shall match the cable and fiber IDs as labeled in the field – i.e., the ID on the cable label/fiber port label shall be the same as what is associated with the electronic and printed test record.

2. The units for distance measurements (i.e., the "X" axis of the graph) shown on the print of the test measurements shall be feet.

3. For the traces, the x- and y-axis scales of a given cabling link shall be identical. Preferably, all reports shall be printed with identical scales on both x- and y-axis.

4. The launch cord must be shown in the trace of the printed test report.

5. Measurements shall carry a precision through one significant decimal place (minimum) and at least 3 digits.

6. Each test report shall contain the following information (not necessarily in this order):

   a. Project name

   b. General Contractor name / Telecommunications Installer name

   c. Cable identifier, fiber number, and fiber type (e.g., “multimode”)

   d. Measurement direction

   e. Date measurement was obtained

   f. Operator (name and company)

   g. Test equipment model and serial number(s)

   h. Set up parameters (minimum - pulse width, refractive index, event threshold.)

   i. Wavelength

   j. OTDR trace

   k. Length of fiber

   l. Overall link loss

7. For each passive cabling link, include either a schematic graphic or narrative accurately describing the test set up as a preface to the test reports. In other words, show the launch cord with length, expected events with distances, etc. This information will eliminate many questions the Engineer will have while reviewing the reports.

3.05 BACKBONE FIBER OPTIC PASSIVE LINK INSERTION LOSS TESTING

A. Test fiber optic passive links per Part 1 of this Section.

B. Launch Conditions:

1. For passive link insertion loss testing for multimode fibers, the modal launch condition from the light source shall be characterized as Category 1 per OFSTP-14.

2. For passive link insertion loss testing of singlemode fibers:

   a. Use the launch conditions, as described in FOTP-78.

   b. Employ a method to remove high-order propagating modes, as described in FOTP-77.

C. Test Methods:

1. The passive link insertion loss testing of multimode fibers shall be performed according to “Test Method B: One Jumper Reference”, per OFSTP-14, for ‘permanent’ links, and shall be performed according to “Test Method C: Three Jumper Reference”, per OFSTP-14, for ‘channel’ links.

2. The passive link insertion loss testing of singlemode fibers shall be performed according to “Test Method A.1: One Jumper Measurement”, per OFSTP-7.

D. Precautions

1. Adhere to the equipment manufacturer’s instructions during testing activities.

2. Prior to any testing activity or any measurements taken:

   a. Ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for at least 15 minutes or for however long it takes to bring the test equipment to reach room temp).

   b. Power on the light source and power meter for at least 5 minutes.

   c. Clean all test cords & system cords (if applicable) connectors and all adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.

3. Do not power off light source or the power meter during testing activity.

4. Do not remove Test Cord #1 from the light source at any time (unless the testing is complete, or the equipment is being put away for the evening).

5. Do not bend the test cords smaller than 20 times the cord diameter (this may induce loss into the cord reducing the accuracy of the measurement).

6. Fully charge power sources before each day’s testing activity.

E. Passive Link Insertion Loss Testing Procedures

1. Test Equipment Set Up

   a. Follow the test equipment manufacturer’s initial adjustment and set up instructions.

   b. If the power meter has a Relative Power Measurement Mode, select this mode.

   c. If the meter can display power levels in dBm, select this unit of measurement to simplify subsequent calculations.

   d. Set the light source and power meter to the same wavelength.

2. Test Cord Performance Verification

   a. Connect Test Cord #1 between the light source and the power meter.

b. The value displayed on the power meter is the reference power (P_{ref}) measurement. If the power meter has a relative power measurement mode, enter this reference power measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} onto the record documents for future reference.

c. Disconnect Test Cord #1 from the power meter. Do not disconnect Test Cord #1 from the light source.

d. Connect the 'open' end of Test Cord #1 to an adapter (of matching connector type). Connect one end of Test Cord #2 to the adapter and the other end of Test Cord #2 to the power meter.

e. The value displayed on the power meter is the power measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the test cord #2 connection attenuation. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the connection attenuation:

1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc): Connection Attenuation (dB) = $\left| P_{sum} - P_{ref} \right|$

2) If P_{sum} and P_{ref} are in watts: Connection Attenuation (dB) = $\left| 10 \times \log_{10} [P_{sum}/P_{ref}] \right|$.

3) The measured connection attenuation must be less than or equal to the value found in Table 3 (below).

f. Flip the ends of Test Cord #2 so that the end connected to the power meter is now connected to the adapter, and the end connected to the adapter is now connected to the power meter.

g. The meter reading is the reversed Power Measurement (P_{sum}). Perform the proper calculations if not using Relative Power Measurement Mode.

h. Verify that both connection attenuation measurements are less than or equal to the value found in the following table:

	ST or SC Cord	Mini-Connector Cord
Singlemode	0.55 dB Max	0.30 dB Max

i. If both measurements are found to be less than or equal to the values found in Table 1, test cord #1 is acceptable for testing purposes. Unacceptable attenuation measurements may be attributable to test cord # or test cord #2. Examine each cord with a portable microscope and clean, polish, or replace if necessary.

j. Repeat this test procedure from the beginning reversing the test cords in order to verify the performance of test cord #2.

3. Determine the Launch Category of the Light Source

a. The launch category of a light source can be determined by measuring its Coupled Power Ratio (CPR). The CPR is a measurement of the modal power distribution launched into a multimode fiber. A light source that launches a higher percentage of its power into the higher order modes of a multimode fiber produces a more over-filled condition and is classified as a lower Category than a light source that launches more of its power into just the lower order modes producing an under-filled condition. Under-filled conditions result in lower link attenuation, while over-filled conditions produce higher attenuation. Therefore, adjusting the acceptable link attenuation to compensate for a light source's launch characteristics increases the accuracy of the test procedure.

b. Provide two test cords, one multimode (Test Cord #1) and one singlemode (Test Cord #2). Both cords shall be directly terminated on connectors that are compatible with the light source and power meter.

1) The fiber of the multimode test cord shall have the core diameter and numerical aperture nominally equal to those of the permanent link.

2) The fiber of the singlemode test cord shall contain Class IVa singlemode fiber, with a mode field diameter of 5.0□m ±0.5□m for 850nm tests and 9.0□m ±1.0□m for 1300nm tests.

c. Connect test cord #1 between the light source and the power meter. Avoid placing bends in the cord that are less than 4 inches in diameter.

d. The meter reading is the Reference Power Measurement (P_{ref}). If the power meter has a Relative Power Measurement Mode, enter the Reference Power Measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} for future reference.

e. Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.

f. Connect test cord #2 between the power meter and test cord #1, using an appropriate adapter between the test cords.

1) Test cord #2, the singlemode cord, shall include a high order mode filter. This can be accomplished by twice wrapping the cord around a 1.2" diameter (30-mm) mandrel.

g. The meter reading is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the CPR. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the CPR:

1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc): CPR (dB) = $\left| P_{sum} - P_{ref} \right|$

2) If P_{sum} and P_{ref} are in watts: CPR (dB) = $\left| 10 \times \log_{10} [P_{sum}/P_{ref}] \right|$

Coupled Power Ratio (CPR) in dB, for 50/125 m Fiber:

	Cat-1 Overfilled	**Cat-2**	**Cat-3**	**Cat-4**	**Cat-5 Underfilled**
850nm source	20 – 24	16 – 19.9	11 – 15.9	7 – 10.9	0 – 5.9
1300nm source	16 – 21	12 – 15.9	8 – 11.9	4 – 7.9	0 – 3.9

4. Multimode Insertion Loss Measurement

   a. After setting up the test equipment, verifying the performance of the test cords, and determining the light source's CPR, the insertion loss of the passive link segments can be measured.

   b. Connect test cord #1 between the light source and the power meter.

   c. The meter reading is the Reference Power Measurement (P_{ref}). If the power meter has a Relative Power Measurement Mode, enter the Reference Power Measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} for future reference and to be included in the Record Documents.

   d. Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.

   e. Connect test cord #1 to the passive link segment 'input'.

   f. At the opposite end of the passive link segment, connect test cord #2 to the link segment 'input' and the power meter.

   g. The meter reading is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the insertion loss. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the insertion loss:

      1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc): Link Segment Attenuation (dB) = $\left| P_{sum} - P_{ref} \right|$

      2) If P_{sum} and P_{ref} are in watts: Link Segment Attenuation (dB) = $\left| 10 \times \log_{10} [P_{sum}/P_{ref}] \right|$

   h. Record P_{sum} for inclusion into the Record Documents. Refer to Records (ref. PART 3: EXECUTION) for all of the information to record.

5. Singlemode Insertion Loss Measurement

   a. After setting up the test equipment and verifying the performance of the test cords, the insertion loss of the passive link segments can be measured.

   b. Connect test cord #1 between the light source and the power meter.

c. The meter reading is the Reference Power Measurement (P_{ref}). If the power meter has a Relative Power Measurement Mode, enter the Reference Power Measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} for future reference and to be included in the Record Documents.

d. Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.

e. Connect test cord #1 to the passive link segment 'input'.

f. At the opposite end of the passive link segment, connect test cord #2 to the link segment 'input' and the power meter.

g. The meter reading is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the insertion loss. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the insertion loss:

1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc): Link Segment Attenuation (dB) = $\left| P_{sum} - P_{ref} \right|$

2) If P_{sum} and P_{ref} are in watts: Link Segment Attenuation (dB) = $\left| 10 \times \log_{10} [P_{sum}/P_{ref}] \right|$

h. Record P_{sum} for inclusion into the Record Documents. Refer to Records (ref. PART 3: EXECUTION) for all of the information to record.

6. Acceptable Measurement Values

a. Any cabling links failing to meet the criteria described in this specification shall be removed and replaced, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.

b. The general insertion loss equation for any link segment is as follows:

1) Insertion loss = <cable loss> + <connection loss> + <splice loss> + <CPR adjustment>.

2) Note: A connection is defined as the joint made by two mating fibers terminated with remateable connectors (e.g., ST, SC, etc).

c. 50/125µm Multimode Insertion Loss Coefficients

1) Cable Loss = Cable Length (km) x (3.0 dB/km @ 850-nm or 1.0B/km @ 1300-nm).

2) Connection Loss (ST or SC Connectors) = (Connections x 0.4 dB) + 0.42 dB.

3) Connection Loss (Other mini-connectors) = (Connections x 0.2 dB) + 0.24 dB

4) Splice Loss = Splices x (0.05 dB for fusion or 0.10 dB for mechanical).

5) CPR Adjustment = See following table:

	Cat-1	**Cat-2**	**Cat-3**	**Cat-4**	**Cat-5**
Links with ST or SC Connectors	+0.50	0.00	-0.25	-0.50	-0.75
Links with mini-connectors	+0.25	0.00	-0.10	-0.20	-0.30

d. Singlemode Insertion Loss Coefficients

1) Cable Loss = Cable Length (km) x (0.50 dB/km @ 1310-nm or 0.50 dB/km @ 1550-nm)

2) Connection Loss (ST or SC Connectors) = (Connections x 0.44 dB) + 0.42 dB

3) Connection Loss (Other mini-connectors) = (Connections x 0.24 dB) + 0.24 dB

4) Splice Loss = Splices x (0.07 dB for fusion or 0.15 dB for mechanical)

5) CPR Adjustment = Not applicable for singlemode.

F. Record Documents:

1. All cable and fiber IDs of the test reports shall match the IDs as labeled in the field – i.e., the ID on the cable label/fiber port label shall be the same as what is entered into the stored test result in the power meter.

2. Measurements shall carry a precision through one significant decimal place (minimum) and a minimum of 3 digits.

3. Each test report shall contain the following information (not necessarily in this order):

a. Project name and address

b. General Contractor name / Telecommunications Installer name

c. Operator’s name(s)

d. Date of measurement

e. Test equipment - manufacturer, model, and serial number

f. Cable identifier, fiber and fiber type

g. Measurement direction

h. Wavelength

i. Measured loss values

3.06 HORIZONTAL CATEGORY 6 TESTING PROCEDURES

A. Precautions

1. Adhere to the equipment manufacturer's instructions during all testing.

2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).

3. Fully charge power sources before each day's testing activity

B. Test Equipment Set Up

1. Set up the tester to perform a full Category 6 test, as a Permanent Link configuration.

2. If the tester has the capability, set the cable type as product specific setting. If not, set as generic Category 6.

3. Set the tester to save the full test results (all test points, graphs, etc.).

4. Save the test results with the associated cable link identifier to match that as specified in Section 27 15 13.

5. Calibrate the test set per the manufacturers instructions.

C. Acceptable Test Result Measurements

1. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.

2. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.

3. Any cabling links failing to meet the criteria described in this specification shall be removed and replaced, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.

4. Minimum measurement requirements:

Wire Map	All pairs of the cabling link shall be continuous and terminated correctly at both ends. No exceptions shall be accepted.
Length	The maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration

	shall be 94 meters, including test cords.
Insertion Loss	The acceptable insertion loss measurements for any Category 6 cabling link shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss	The acceptable worst pair-to-pair NEXT loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Power Sum NEXT Loss	The acceptable power sum PS-NEXT loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Worst Pair-to-Pair ELFEXT and FEXT Loss	The acceptable worst pair-to-pair ELFEXT and loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Power Sum ELFEXT and FEXT Loss	The acceptable PS-ELFEXT and loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Return Loss	The acceptable return loss measurements for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Propagation Delay and Delay Skew	The acceptable propagation delay and delay skew measurements for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.

D. Record Documents

1. For each Horizontal Category 6 test measurement, record the following information:

   a. Project name and address

   b. General Contractor name / Telecommunications Installer name

   c. Operator’s name(s)

   d. Date of measurement

   e. Ambient temperature

   f. Test equipment - manufacturer, model, and serial number

   g. Cable identifier

   h. Overall test result

   i. Measured values of minimum requirements

END OF SECTION 27 08 00

SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOMS AND FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions "Bid Package 4 (E-Rate)", General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.02 SUMMARY

A. Section Includes: Build out of communications rooms and spaces.

B. Communications Rooms house the following functions:

1. Data backbone crossconnect field (fiber terminations)

2. Data system equipment (distributed switch)

3. Horizontal termination field – both voice and data – of cabling served from this room (refer to floor plans for area served)

4. Interconnection between the data system equipment and the horizontal termination field

C. Communications Room build out includes the following work:

1. Preconstruction Submittals

2. Plywood backboards

3. Rack bays (equipment racks or cabinets, vertical management sections, anchoring, and bracing)

4. Power strips

5. Cable, wire and patch cord management

6. Overhead cable support

7. Seismic bracing

8. Identification tags and labeling

9. Record Documents

10. Warranty

1.03 RELATED SECTIONS

A. Consult other Divisions, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.

B. Sections that are related to this Section include, but are not limited to, the following:

1. 27 0000 – Communications General Provisions

2. Section 27 0000.1 - E-Rate supplemental instructions

1.04 REFERENCES

A. Comply with the References requirements of Section 27 0000.

B. In additional to those codes, standards, etc., list in 27 0000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ANSI/EIA-310-D-1992 Racks, Panels and Associated Equipment.

1.05 DEFINITIONS

A. Refer to the Definitions requirements of Section 27 0000.

1.06 SUBMITTALS

A. Comply with the Submittals article of Section 27 0000 for procedural, quantity, and format requirements.

B. Pre-Construction Submittal Requirements: Submit the following prior to the start of construction.

1. Product Data Submittal: Submit product data on products listed in this section and products not listed in this section to be installed related to this section.

2. Sample Submittal: Submit sample of equipment rack label.

3. Seismic Calculations: Rack anchorage into concrete flooring with overall rack bracing.

4. Schedule Submittal: Submit proposed schedule of work (this schedule may be combined with the schedule developed for the Division 27 sections).

5. Shop Drawings Submittal: Consisting of proposed changes to room plans.

1.07 QUALITY ASSURANCE

A. Refer to Quality Assurance requirements of Section 27 0000.

B. Proposer Qualifications

1. In addition to the Proposer Qualifications requirements of Section 27 0000, the Proposer shall be/have:

a. Approved by the Manufacturer; certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the proposal submission.

b. At a minimum, one RCDD permanently on staff, and in management throughout the duration of the project. Provide evidence in the proposal submission of certification Programs. Evidence shall include a copy of the "Certification(s)" with the RCDD's name(s).

c. A minimum of 30% of the field installation Team shall be certified by the Manufacturer within the last two years to install cabling system.

d. Allow access by the Owner's Representative, which could be the Manufacturer, to inspect the work.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Refer to Product Delivery, Storage and Handling requirements of section 27 0000.

1.09 WARRANTY

A. Refer to Warranty requirements of section 27 0000.

PART 2 - PRODUCTS

2.01 GENERAL

A. Comply with the Products requirements of Section 27 0000.

2.02 SUBSTITUTIONS

A. Comply with the Products, Substitutions requirements of Section 27 0000.1.

2.03 VERTICAL EXHAUST DUCT (VED) SERVER CABINET, FLOOR-STANDING

A. Application: Suitable for common "active" communications equipment (i.e. servers, amplifiers, controllers, etc.), vertical cable routing and other similar equipment, installed onto floor.

B. Cabinet shall be:

1. 45RU (84.6") H, 700mm (27.6") W x 1100mm (43.3") D. Complete with air dam, 12-24 screws, and floor installation kit.

2. Two pair square-punched 19" EIA sliding rails.

3. Single perforated metal front door with locking swing handle.

4. Double solid metal rear door with locking swing handle.

5. Vertical Exhaust Duct system adjustable from 20”-34” H.

6. Two piece solid side panels.

7. Two vertical finger manager installed one each on right and left front corners of cabinet (39112-E14).

8. Glacier White.

C. Manufacturer: CPI Model #TS1023110

2.04 EQUIPMENT RACK, FLOOR-STANDING

A. Application: Suitable for cable routing and the support of cable termination devices, management devices, common communications equipment, and other similar equipment, installed onto floor.

B. Material: High strength, lightweight 6061-T6 aluminum, extrusion construction.

C. Channel:

1. Size: The mounting channels shall be 3” deep.

2. Mounting Holes: The hole pattern shall be industry standard spaced at 5/8” - 5/8” - 1/2”, compatible with ANSI/EIA-310-D (1992) standard. The mounting holes shall be pre-threaded as #12-24 rolled threading.

D. Assembled Rack: The rack shall come complete with base angles and top angles. The assembled rack shall be 7’-0” high (overall) by 19” mounting width (20.25” wide overall), and shall contain 45 EIA mounting spaces. Glacier White.

E. Include required accessories, such as floor installation kit, etc. for a complete installation.

F. Manufacturer: CPI #48353-E03.

2.05 VERTICAL MANAGEMENT SECTION, FOR FLOOR-STANDING RACK

A. Application: Suitable for cord slack storage (front) and cable route (back) vertically from the bottom of the rack to the top. The vertical management covers shall be reversible hinged.

B. Size & Capacity: 7’-0” high by 6” and 10” wide, with 23.6” deep cord storage capacity in front.

C. Mounting: The vertical management section shall have matching bolt holes for attachment to the rack.

D. Color: Glacier White (guides and cover)

E. Manufacturer: CPI #32620-E03 (6”) and CPI#32622-E03 (10”)

2.06 HORIZONTAL MANAGEMENT PANEL

A. Application: Suitable for installation into equipment rack for cord routing (front). The horizontal management panel shall match (and fully integrate with) the vertical management sections.

B. Size & Capacity: 1U/2U high, with hinged/removable cover and pass through capacity.

C. Color: black

D. Manufacturer:

1. CPI: 30530-719; 2U, multiple finger

2.07 CABLE RUNWAY

A. Cable Runway Straight Sections

1. Application: Suitable for the support & management of communications cables, either overhead or mounted vertically on a wall. Also overhead equipment racks bracing.

2. Material (both stringer and rung): Steel tube, rectangular, 1-1/2” by 3/8” by 0.65” wall thickness.

3. Rungs: 12” on center, welded to stringer.

4. Size: length: 9’ 11-1/2” (cut–to–fit); width: refer to Drawings.

5. Manufacturer: CPI

a. #10250-709, 9” wide universal cable runway, black.

b. #10250-712, 12”wide universal cable runway, black.

c. #10250-718, 18”wide universal cable runway, black.

d. #10250-724, 24”wide universal cable runway, black.

B. Cable Runway Sweep Fittings

1. Material (both stringer and rung): Steel tube, rectangular, 1-1/2” by 3/8” by 0.65” wall thickness.

2. Manufacturer: CPI

a. #10822-712, horizontal sweep fitting for 12” wide cable runway, black.

b. #10822-718, horizontal sweep fitting for 18” wide cable runway, black.

c. #10723-712, vertical outside sweep fitting for 12” wide cable runway, black.

d. #10723-718, vertical outside sweep fitting for 18” wide cable runway, black.

e. #10724-712, vertical inside sweep fitting for 12” wide cable runway, black.

f. #10724-718, vertical inside sweep fitting for 18” wide cable runway, black.

C. Cable Runway Installation Accessories

1. Refer to Drawings for additional information and instances for installation.

2. Manufacturer: CPI

a. #11301-001, butt splice kit.

b. #11313-001, 45-degree butt splice kit.

c. #11314-001, 90-degree butt splice kit.

d. #11302-001, junction splice (“T”) kit.

e. #10608-001, vertical wall bracket kit.

f. #10642-001, end caps.

g. #11421-712, wall angle support kit for 12” wide cable runway, black.

h. #11421-718, wall angle support kit for 18” wide cable runway, black.

i. #11421-724, wall angle support kit for 24” wide cable runway, black.

j. #11312-712, triangle support kit for 9” and 12” wide cable runway, black.

k. #11312-718, triangle support kit for 12” and 18” wide cable runway, black.

l. #11770-712, end closing kit for 12” wide cable runway, black.

m. #11770-718, end closing kit for 18” wide cable runway, black.

n. #11770-724, end closing kit for 24” wide cable runway, black.

o. #10595-712, rack-to-runway attachment kit, for 9” or 12” wide runway, black.

p. #10595-718, rack-to-runway attachment kit, for 18” wide runway, black.

2.08 RACK ACCESSORIES

A. Shelf; CPI #11231-X19.

B. Keyboard and Mouse; CPI #12193-X01.

C. 2RU Drawer; CPI #13082-X19.

D. 4RU Drawer; CPI #13084-X19.

2.09 VERTICAL POWER STRIPS

A. 20A Vertical power strips shall be metered PDU with one NEMA L21-20P input and (36) NEMA 5-20R.

1. Manufacturer shall be APC #AP8862. Provide total of quantities per plans.

B. 30A Vertical power strips shall be metered PDU with one NEMA L21-30P input and (36) C13 & (6) C19 & (2) 5-20.

1. Manufacturer shall be APC #AP8865. Provide quantities per plans.

2.10 LABEL PLATES, FOR EQUIPMENT RACKS

A. Application: Label plate shall be suitable to affix onto top angle of equipment rack.

B. Label plate shall be ‘engrave-able’ stock melamine plastic laminate substrate.

1. Size (minimum): 1/2 inch high by 6 inches long by 1/16-inch thick.

2. Color: Black.

C. Lettering shall be engraved, shall be 1/8” high, and shall be white.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the General Execution requirements of Section 27 0000.

3.02 INSTALLATION

A. Equipment Racks / Server Cabinets

1. Equipment Racks / Server Cabinets, Floor-Standing

a. Provide parts and accessories required to complete each rack/cabinet.

b. Anchor racks to the floor using methods (concrete anchors) approved by both structural engineer. Brace racks overhead to cable runway where shown on the Drawings.

2. Vertical Management Sections

a. Provide vertical management sections as shown on Drawings. If not shown, default shall be one vertical management section between each rack and at either end of the bay.

b. Bolt vertical management sections to the equipment racks at the points designed by the manufacturer and per the manufacturer's installation instructions.

c. Install support devices (e.g., brackets, threaded rod with strut, etc.) per the manufacturer's instructions and fastened to the wall or ceiling using appropriate fasteners.

3. Tolerances:

a. Equipment Rack / Server Cabinet, Floor-Standing: Field verify dimensions to establish proper clearances as follows:

1) Front: 42" min. clearance from channel's front face of rack / cabinet.

2) Back: 36" min. clearance from channel's back face of rack / cabinet.

b. Provide the correct amount of space between each rack for proper installation (according to manufacturer's written instructions) of the vertical management sections.

4. Accessories

a. Furnish two bags of 50 mounting screws and cage nuts per equipment rack / cabinet.

B. Overhead Cable Support

1. Provide overhead cable support as shown on the Drawings for use to support cables and store cable slack within telecommunications rooms between the exit sleeves/distribution conduits and the rack bay.

2. Provide parts required to complete the installation (e.g., trapeze, junction nuts, etc.).

C. Vertical Cable Support

1. Provide vertical cable support at the locations as shown on the Drawings for use to support cables routing vertically from conduits/sleeves to the overhead cable support.

2. Provide parts required to complete the installation (e.g., vertical mounting brackets, bolts, etc.).

3. If cable runway is used, install the runway such that the rungs are facing outward (the greater distance from the rung to the stringer edge is facing inward). If cable basket is used, install the basket with spacers such that the mesh is spaced 1/2" from the wall.

3.03 LABELING

A. General Requirements

1. Labeling and identifier assignment shall conform to TIA/EIA-606-A Administration Standard and as approved by Owner's Representative before installation.

2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Equipment Rack Label Requirements: Provide one label plate per rack. Permanently affix label plate and position the label plate centered on the rack's front top angle.

C. Identifier Assignment

1. Equipment Racks

a. Prefix: "RACK"

b. First field: the telecommunications room identity; for example: "MC-A".

c. Second field: the rack number; for example: "01".

d. Example; "RACK MC-A-01"

END OF SECTION

SECTION 271310 - COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions "Bid Package 4 (E-Rate)", General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.02 SUMMARY

A. Section Includes: Backbone (indoor) twisted pair cabling and fiber optic cabling.

1. In general, the base work for the proposal includes:

a. Preconstruction Submittals

b. Backbone (riser) twisted pair (copper) cables and terminations

c. Backbone fiber optic cables and terminations

d. Cable management

e. Crossconnects

f. Cable identification tags and system labeling

g. Record Documents

h. Warranty

1.03 RELATED SECTIONS

A. Sections that are related to this Section include, but are not limited to, the following:

1. Section 27 0000 - Communications General Provisions

2. Section 27 0000.1 - E-Rate supplemental instructions

3. Section 27 0528 - Pathways for Communications Systems

4. Section 27 0800 - Commissioning of Communications

5. Section 27 1100 - Communications Equipment Rooms and Fittings

1.04 REFERENCES

A. Comply with Section 27 00 00 References requirements.

1.05 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition, the following list of terms as used in this specification shall be defined as follows:

1. “CMP”: Communications Media Plenum [NEC plenum rating]

2. “CMR”: Communications Media Riser [NEC riser/non-plenum rating]

3. “ISP”: Inside Plant [cabling]

4. “MM”: Multimode [fiber type]

5. “PIC”: Plastic Insulated Conductor

6. “OFNP”: Optical Fiber Non-conductive Plenum, plenum rating

7. “OFNR”: Optical Fiber Non-conductive Riser, non-plenum riser rating

8. “OFN”: Optical Fiber Non-conductive, general purpose indoor rating

9. “PE”: Polyethylene

10. “PVC”: Polyvinyl Chloride

11. “SM”: Singlemode [fiber type]

1.06 SUBMITTALS

A. Comply with the Submittals article of Section 27 00 00 for procedural, quantity, and format requirements.

B. Preconstruction Submittal Requirements: Submit the following prior to the start of construction.

1. Product Data Submittal, indicating conformance with NFPA-70, UL, ETL, TIA/EIA listings, Manufacturer certifications, and specifications verified by an NRTL.

2. Labeling Submittal, consisting of proposed labeling scheme for backbone cables and backbone terminations.

3. Patch cord submittal, consisting of quantities of each length and color for each system.

4. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27 Sections.

5. Shop Drawings Submittal, consisting of proposed cable routing, or termination locations/configurations.

6. Provide required certifications of manufacturer, warrantee, and RCDD as described below.

C. Additional submittal requirements at closeout:

1. Cross-connection records/cut sheets.

1.07 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00

B. Proposer Qualifications:

1. In addition to the Proposer Qualifications requirements of Section 27 00 00, the Proposer shall be/have:

a. Approved by the Manufacturer; certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the proposal submission.

b. At a minimum, one RCDD permanently on staff, and in management throughout the duration of the project. Provide evidence in the proposal submission of certification Programs. Evidence shall include a copy of the "Certification(s)" with the RCDD's name(s).

c. A minimum of 30% of the field installation Team shall be certified by the Manufacturer within the last two years to install cabling system.

d. Allow access to the Owner's Representative, which could be the Manufacturer, to inspect the work.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.09 WARRANTY

A. Comply with Warranty requirements of Section 27 00 00.

B. Telecommunications cabling system, as specified in this section, shall carry a 20 year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the Life of the extended warranty. This extended warranty shall also cover electrical and optical above the minimum standards per ANSI/TIA/EIA-568-C performance criteria for backbone cabling.

C. Lifetime warranty shall offer Channel margin guarantees when cable and patch cords are from same Manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

A. Comply with the Products requirements of Section 27 00 00.

2.02 SUBSTITUTIONS

A. Comply with the Products, Substitutions requirements of Section 27 00 00.1.

2.03 FIBER OPTIC CABLES – NON-PLENUM

A. Application:

1. Cable shall be suitable for indoor installation, between floors in vertical riser system, under access flooring, and through overhead ceiling space (in cable tray, conduit, & hangers) and listed by UL 444 as Communication Cable.

2. Cable shall exhibit stable performance in a building environment. The optical transmission performance of the fiber shall not be significantly affected by environmental fluctuations, installation, or aging.

3. Materials used in the cable shall not emit hydrogen in quantities that will increase attenuation.

B. Singlemode fiber strands shall meet or exceed the following geometry criteria:

1. Core diameter = 9.2 μm, ±0.4 μm

2. Cladding diameter = 125 μm, ±0.7 μm

3. Minimum Tensile Strength = 100,000 psi

C. Singlemode fiber strands shall meet or exceed the following performance criteria:

1. Attenuation = 0.5 dB/km at 1310 nm and 0.5 dB/km at 1550 nm wavelengths, maximum.

2. Meet OS2 grade fiber (ANSI/TIA-568.3-D).

D. Buffering:

1. Each fiber shall be completely covered with a “primary coating” (acrylate material). This shall constitute the “fiber strand”.

2. Each fiber strand shall be fully covered with a flame-retardant thermoplastic material (material = PVC, or equivalent thermoplastic). This shall constitute the “buffered strand” (tight buffer type), and shall have a diameter of 0.9 mm.

3. Buffered Strands: Buffered strands shall be individually color coded to meet the requirements of ANSI/TIA/EIA-598-A-1995. (Also, ref. ANSI/ICEA S-87-640-1992).

E. Cable Sheath:

1. Strength Element: The cable shall have an internal strength element such as aramid yarn (e.g., Kevlar).

2. Tensile Strength: The cable shall have a 150-lb, minimum, rated load.

3. Outer Jacket: The cable shall have a seamless outer jacket (material = PVC, or equivalent) applied to and completely covering the internal components (fiber strands, strength element, other).

4. Flame Rating: The cable shall be NEC (Article 770) rated as OFNR, and listed UL 1666.

F. Manufacturer:

1. Berk-Tek series cables

2.04 TERMINATION EQUIPMENT

A. Fiber Optic Patch Panels

1. Passive fiber optic physical equipment and apparatus used in interconnecting and cross-connecting fiber optic cables shall possess a minimum fire-resistant rating of UL94V-2.

2. The equipment, apparatus, and material for fiber optic equipment an apparatus shall conform to existing OSHA Health and Safety Laws. The equipment and apparatus shall have provision for the application of safety labels such as laser identification or warning labels as required by system considerations.

3. Fiber optic patch panel shall be a fully assembled rack-mounted fiber optic enclosed housing for protecting, storing and organizing the termination of the fiber cable and all fiber strands at each end of the cable. The patch panel shall include an integrated patching facility.

4. “Fully assembled” shall include all required installation & mounting components, and include accessories such as connector panels, coupling adapters, etc. for a complete installation.

5. The fiber patch panel must:

a. Provide means of strain relief and support of the specified cables.

b. Contain slack storage facilities for fiber slack.

c. Provide patch cord management.

d. Provide means for splicing.

6. Manufacturer:

a. Leviton

1) 5R2UM-S06; 2U fiber shelf, accepts 6 adapter plates.

2) 5F100-2LL; adapter plate – 6 duplex LC singlemode adapters, aqua.

2.05 FIBER OPTIC CONNECTORS

A. Singlemode Fiber Optic Patch Cords

1. Materials:

a. Ferrule: ceramic (zirconia or alumina) with pre-radiused finish/face.

b. Connector housing: plastic.

2. Connector shall have an integral strain relief feature, including a bend limiting rear boot and be colored aqua.

3. Singlemode fiber optic patch cable: shall be Laser Optimized (Conditioning) OS2 grade multimode (Yellow Jacket) cable. Coordinate fiber termination styles to match network electronics and fiber optic patch panel. Lengths to be determined in field.

4. Connectors shall be installable via either epoxy or anaerobic method.

5. Patch cords shall be tested for Insertion Loss with test results provided with each patch cord.

6. Manufacturer: Leviton.

2.06 LABELS

A. Labels for Backbone Cables

1. General: Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer. Labels shall be adhesive backed and have a self-laminating feature.

2. Printable Area: 2” x 0.5”, minimum.

3. Color: White.

4. Manufacturer: Panduit

a. #LJSL7-Y3-1; laser/ink jet labels for cable diameters 0.16”-0.32”, white

b. #LJSL8-Y3-1; laser/ink jet labels for cable diameters 0.31”-0.69”, white

c. #LJSL19-Y3-1; laser/ink jet labels for cable diameters 0.31”-1.42”, white

PART 3 - EXECUTION

3.01 GENERAL

A. Comply General Execution requirements of Section 27 00 00.

3.02 EXAMINATION

A. Pathways: Prior to installation, verify pathways (cable trays, conduits, etc.) exist and are ‘ready’ to accept backbone cables.

B. Telecommunications Rooms: Prior to installation, verify equipment rooms are ‘ready’ to accept the backbone cables and terminations.

3.03 PREPARATION

A. The Proposer is solely responsible to verify that twisted pair cables and fiber optic cables are fully operational – both cable sheath and conductors (twisted pair and optical) – prior to installation.

B. Documentation of pre-installation testing is not a close out requirement and shall be the responsibility of the Proposer.

3.04 INSTALLATION – TWISTED PAIR CABLING

A. Backbone Cables

1. General

a. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.

2. Placement

a. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.

b. Maintain pulling tension within manufacturer's limits.

c. Protect cable during installation. Replace cable if damaged during installation.

d. Place cables with no kinks, twists, or impact damage to the sheath.

e. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.

3. Routing

a. Maximum cable length from the termination within the Entrance Facility to the termination in Telecommunications Room shall be 500 meters.

b. Install cables within designated pathways.

c. When routing horizontally within telecommunications rooms, utilize the overhead cable support. When routing vertically within telecommunications rooms, utilize the wall mounted vertical cable runway and support every 24 inches on center using cable ties.

d. Place and suspend cables in a manner to protect them from physical interference or damage.

e. Route cables in accordance with Pathways for communications specification.

f. Provide a 10 feet (minimum) sheathed cable slack loop at each end of the run. Place the slack in the overhead cable support.

4. Termination

a. Properly strain relieve cables at termination points per manufacturer's instructions.

b. Perform terminations in accordance with manufacturer's instructions and TIA/EIA-568-B standard installation practices.

c. Perform post-installation testing as described in the Telecommunication Testing specification.

B. Termination Apparatus

1. Provide accessories required for a complete installation.

2. Terminate twisted pair backbone cables to modular patch panels, terminating one pair to positions 4 and 5.

3. Install the patch panels as shown on the drawing. If not is shown, install patch panels at the top of the rack.

3.05 INSTALLATION – FIBER OPTIC CABLING

A. Backbone Cable

1. General

a. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.

b. Protect fibers during installation & termination. Fibers damaged beyond

repair during installation or termination shall result in replacement of the affected cable at no additional cost.

c. Place cables within innerduct the entire route.

2. Placement

a. Bend Radius: Maintain a minimum bend radius of 20 times the cable diameter during installation, and a minimum bend radius of 10 times the cable diameter after installation.

b. Pulling: Maintain pulling tension within manufacturer's limits.

c. Protection: Place and suspend cables in a manner to protect them from physical interference or damage. Replace cable if damaged during installation.

d. Place cables with no kinks, twists, or impact damage to the sheath.

e. Do not use cable-pulling compounds for indoor installations.

f. Provide 30 feet (minimum) sheathed cable slack loop at each end of the run within the Telecommunications Rooms; place the slack in the overhead cable support.

g. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.

3. Routing

a. Maximum cable length from the termination within the Entrance Facility to the termination in Telecommunications Room shall be 500 meters.

b. Route cables in innerduct between points of termination throughout entire length (except at the fiber take up reel).

c. Install cables within designated pathways.

d. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via tie wraps or Velcro-type straps.

e. When routing horizontally within telecom rooms, utilize the overhead cable support. When routing vertically within telecommunications rooms, utilize the wall mounted vertical cable runway and properly fasten. “Properly fasten” shall consist of cable ties in a ‘crossed’ configuration per cable or cable bundle (up to three cables or innerducts) every 24 inches on center.

f. Place and suspend cables in a manner to protect them from physical interference or damage.

g. Provide a 10 feet (minimum) sheathed cable slack loop at each end of the run. Store slack in slack storage ring mounted on the wall.

4. Termination

a. Properly strain relieve cables at termination points (at/within the fiber optic termination panels) per manufacturer's instructions.

b. Terminate/connectorize fiber strands at both ends using the specified fiber optic connectors appropriate for the mode type of the fiber. Perform terminations in accordance with manufacturer's instructions.

c. Provide required accessories and consumables for the complete termination of fiber strands.

d. Provide 3 feet of tight buffered fiber (unsheathed) slack at each end of the run within the patch panel/termination enclosure. Properly store fiber slack in rear of patch panel into the 'routing rings', per manufacturer's instructions.

B. Fiber Optic Cable Termination Panel

1. Provide the termination panel in designated equipment rack; locate per drawings (if not shown, locate at the top).

2. Provide accessories required for proper installation of each termination panel, including connector panels and adapters.

3.06 LABELING

A. General Requirements

1. Labeling and identifier assignment shall conform to the TIA/EIA-606-A Administration Standard and as approved by Owner's Representative before installation. Label colors shall conform to the TIA/EIA-606-A Administration Standard.

2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Label Formats

1. Cable Labels

a. Text Attributes: Black, 1/8" high, minimum, or 12pt font size.

b. Provide labels on both ends of cables. Install labels no more than 4" from the end of the cable jacket. Fully wrap label around the cable jacket. Install labels such that they are visible by a technician from a normal stance.

2. Termination Apparatus Labels

a. Use labels included in the product packaging. Request approval by the Engineer for substitutions.

b. Provide white label respective field type, per TIA/EIA-606-A.

c. Text Attributes: Black, 3/32" high, minimum, or 10pt font size.

C. Identifier Assignment

1. General: Separate label fields of the identifier with a hyphen.

2. Backbone Twisted Pair Cables

a. First field shall identify the originating termination room identifier as shown on the plans; for example, "B01-TDA".

b. Second field shall identify the ending termination room identifier as shown on the plans; for example, "B01-TDB".

c. Third field of the identifier shall be the campus pair count range; for example, "0401-0600"

d. Example: "B01-TDA–B01-TDB–0401-0600"

3. Termination Positions at the Patch Panels

a. Each port shall be labeled with the pair count of the campus infrastructure.

4. Backbone Fiber Optic Cables

a. First field shall identify the originating termination room identifier as shown on the plans; for example, "B01-TDA".

b. Second field shall identify the ending termination room identifier as shown on the plans; for example, "B01-TDB".

c. Third field shall identify the type and number of strands; for example, "Mxxx" where "M" stands for multimode or "S" for singlemode and xxx stands for the ending fiber strand sequential count.

d. Example: "B01-TDA– B01-TDB–M025-M036"

5. Termination Positions at the Termination Panels

a. First field of the identifier shall be the destination room; for example "TO B01-TDB".

b. Second field of the identifier shall be the strand count range; for example, "M025-M036"

c. Identifier Example: “TO B01-TDB M025-M048”.

3.07 FINAL INSPECTION

A. Inspect installed products and work in conjunction with the District or District’s Representative. Develop a punchlist for items needing correction.

B. Issue punchlist to Engineer for review prior to performing punchlist with the Engineer.

C. Repair defects prior to system acceptance.

D. Inspect installed products and work in conjunction with the Engineer for sign off.

END OF SECTION 27 13 10

SECTION 271513 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions "Bid Package 4 (E-Rate)", General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.02 SUMMARY

A. Section Includes: Horizontal Cabling (subsystem of Telecommunications Cabling Infrastructure).

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications Horizontal Cabling System installation described in these specifications.

B. In general, the work includes:

1. Preconstruction Submittals

2. Horizontal cables, terminations, and outlets

3. Cable management

4. Patch cords and cross-connects

5. Cable identification tags and system labeling

6. Record Documents

7. Warranty

1.03 RELATED SECTIONS

A. Sections that are related to this Section include, but are not limited to, the following:

1. Section 27 0000 - Communications General Provisions.

2. Section 27 0000.1 - E-Rate supplemental instructions.

3. Section 27 0528 - Pathways for Communications Systems.

4. Section 27 0533 - Conduits and Backboxes for Communications Systems.

5. Section 27 0800 - Commissioning of Communications.

6. Section 27 1100 - Communications Equipment Rooms and Fittings.

1.04 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

1.05 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition, the following list of terms as used in this specification shall be defined as follows:

1. “CAT6”: Category 6 [UTP]

2. “CAT6A”: Category 6A [UTP]

3. “Channel”: End to end transmission path; e.g., the entire portion of the horizontal cabling to each outlet consisting of the Permanent Link, line cord (at the workstation), patch cord, and, if a full cross-connection is implemented, the cross-connect termination/connecting apparatus and equipment cord.

4. “CMP”: Communications Media Plenum, plenum rating; synonymous with “MPP”

5. “CMR”: Communications Media Riser, riser rating; synonymous with “MPR”

6. “FEP”: Fluorinated Ethylene Propylene

7. “Permanent Link”: Test configuration for a horizontal cabling link excluding test cords, connections at the ends of the test cords, patch cords, equipment cords, line cords; e.g., the ‘permanent’ portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in the Telecommunications Room and the connector at the outlet.

8. “PVC”: PolyVinyl Chloride

9. “UTP”: Unshielded Twisted Pair

10. “NRTL”: Nationally Recognized Testing Laboratory

11. “NFPA”: National Fire Protection Agency

1.06 SUBMITTALS

A. Comply with the Submittals article of Section 27 00 00 for procedural, quantity, and format requirements.

B. Preconstruction Submittal Requirements:

1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.

2. Labeling Submittal, consisting of proposed labeling scheme for horizontal cables and terminations.

3. Patch cord submittal, consisting of quantities of each length and color for each system.

4. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27 Sections.

5. Shop Drawings Submittal, consisting of proposed cable routing, or termination locations/configurations.

6. Typical Outlet Sample, including faceplate, faceplate label, connectors/jacks, port labels, cables (about 12" sample), and cable label.

7. Provide required certifications of manufacturer, warrantee, and RCDD as described below.

C. Additional submittal requirements at closeout:

1. Cross-connection records/cut sheets.

1.07 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Proposer Qualifications:

1. In addition to the Proposer Qualifications requirements of Section 27 00 00, the Proposer shall be/have:

a. The Installer must possess one of the following Certification Levels at a minimum or equivalent by the manufacturer that is proposed on:

1) Contractor to be a Certified Leviton Partner and a BerkTek OASIS Connectivity Partners in good standing within the State of Washington at the time of bid, during, and through completion of the system installation. Contractor must be able to provide supporting documentation as part of the review process prior to contract award. Contractor will be held responsible for workmanship and installation practices in accordance with the Leviton Premier Network Installer Program.

2) OR be a Certified Integrator Partner of the substituted product(s) in good standing within the State of Washington at the time of bid, during, and through completion of the system installation. Contractor must be able to provide supporting documentation as part of the review process prior to contract award. Contractor will be held Responsible for workmanship and installation practices in accordance with the Integrator Partner Program.

b. At a minimum, one RCDD permanently on staff, and in management throughout the duration of the project. Provide evidence in the proposal

submission of certification Programs. Evidence shall include a copy of the "Certification(s)" with the RCDD's name(s).

c. A minimum of 30% of the field installation Team shall be certified by the Manufacturer within the last two years to install cabling system.

d. Allow access by the Owner's Representative, which could be the Manufacturer, to inspect the work.

C. Contractor must be a licensed and bonded contractor holding a valid Washington State Contractor's License and possess a current EL06 Electrical Administrator's Certificate valid in the State of Washington. Contractor must be able to provide supporting documentation as part of the review process prior to contract award.

1. Contractor shall be thoroughly knowledgeable in TIA/EIA 568 standards of Category 6 and 6A installations. The requirements of these standards shall be met whether a particular item is specified or not. The specifications assume that the contractor shall provide all miscellaneous telecommunications components, hardware, etc., in a manner compliant with these standards.

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with the Delivery, Storage and Handling requirements of Section 27 00 00.

1.09 WARRANTY

A. Comply with Warranty requirements of Section 27 00 00.

B. The telecommunications horizontal cabling system, as specified in this section, shall receive a Manufacturer system warranty that is the Channel partners advanced warranty (not basic). Each Manufacturer has a unique warranty system, provide description of warranty. This extended warranty shall cover parts and labor for the Life of the extended warranty. This extended warranty shall also cover electrical performance of cabling system above the minimum standards per ANSI/TIA/EIA-568-C performance criteria for Permanent Link.

C. Lifetime warranty shall offer Channel margin guarantees when cable and patch cords are from same Manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

A. Comply with the Products requirements of Section 27 00 00.

2.02 SUBSTITUTIONS

A. Comply with the Products, Substitutions requirements of Section 27 00 00.1.

2.03 HORIZONTAL CABLE

A. Application: Suitable for indoor installation and listed by UL 444 as Communication Cable.

B. Conductors:

1. Insulated Conductors: 23 AWG solid annealed copper, insulated with polyethylene (non-plenum) or insulated with FEP (plenum). Two insulated conductors twisted together to form a pair and four such pairs laid up with cross-filler to form the basic unit, jacketed with flame retardant PVC.

2. Twisted Pairs: Two insulated conductors twisted together to form a pair (twisted pair), and individually color-coded to industry standards (ANSI/ICEA Publication S-80-576-1994, and EIA-230).

C. Cable Sheath:

1. The cable shall be unshielded.

2. Outer jacket shall be seamless (material = LS-PVC, or similar) applied to and completely covering the internal components (four twisted pairs).

3. Flame Rating:

a. NFPA 262 Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Space.

b. IEC 60332-Part 1 Flame Propagation Test.

c. NEC (Article 800) rated as CMP, and UL listed as such.

d. UL 1666 Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts.

4. Cable sheath shall be round.

D. Electrical Performance:

1. Shall meet or exceed TIA/EIA-568-C and ISO/IEC 11801 requirements for CAT6, CAT6A and CAT6 (OSP) UTP Permanent Link and Channel cabling.

E. Packaging: Cable shall come as 1,000 or 1,500 foot put-ups packaged in a box, 5000 foot reel, or both.

F. Manufacturer:

1. Berk-Tek

a. LANmark-6 #10136339, CAT6 UTP CMR, Blue

b. LANmark-6 #10136226, CAT6 UTP CMP, Blue

c. LANmark-6 #10139885, CAT6 OSP UTP, Black

d. LANmark-10G2 #10137700, CAT6A UTP CMR, Blue (for WAP locations)

e. LANmark-10G2 #10130484, CAT6A UTP CMP, Blue (for WAP locations)

f. LANmark-XTP #11082064, CAT6A UTP CMR, Gray (for HDBase-T locations)

2.04 MODULAR PATCH CORDS

A. Application: Suitable for indoor installation and listed by UL 444 as Communication Cable within a telecommunications room or workstation environment. Cords shall be assembled from a single, continuous length of cordage, homogenous in nature, and shall be terminated at both ends via 8 position 8 conductor modular plugs. Splices are not permitted anywhere.

B. Cordage

1. Insulated Conductors: 24 AWG tinned stranded copper, fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).

2. Twisted Pairs: Two insulated conductors "twisted" into a "pair" (twisted pair), and individually color-coded.

3. Sheath shall be unshielded, flame-retardant polyvinyl chloride (PVC) jacketed.

4. Flame Rating: NFPA-70 CM (or higher) rated and UL listed 1685 as such.

C. Electrical Performance: Comply with TIA/EIA 568-C for CAT6 or CAT 6A UTP patch cords and Channel requirements (minimum).

D. Provide two patch cords for each terminated horizontal cable. One patch cord is for each field device, "workstation outlets", and one patch cord is for each terminated horizontal cable in the Telecommunications Room. (i.e. Voice/Data ports, Intercom, A/V, WAP's, Security, Access Control, Cameras, HVAC, Lighting, etc.)

1. Provide patch cables to next largest standard or stock cable length listed in product ordering guide with at least 12" of slack on the patch card.

2. Provide 7' patch cords with green cable jacket for rack mounted devices.

3. Provide 14' patch cords with gray cable jacket for field devices "workstation outlets".

4. Coordinate with Owner for lengths and colors.

E. Provide a minimum of 10% additional spare patch cables for each length and color combination, or 5 patch cables for each length and color combination, whichever quantity is more.

F. Modular cords shall have a lifetime application assurance warranty when used as part of manufacturer's structured cabling system.

G. Manufacturer shall be Leviton.

2.05 CROSSCONNECT WIRE

A. Application: Suitable for indoor installation within a 110-based crossconnect system. Each and every crossconnect wire shall be manufactured from a single, continuous length of insulated wire, homogenous in nature. Splices are not permitted anywhere.

B. Factory splices of insulated conductors are expressly prohibited.

C. Conductors:

1. Insulated Conductors: Conductors shall be 24 AWG solid copper. Conductors shall be fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).

2. Twisted Pairs: Two insulated conductors shall be “twisted” into a “pair” (twisted pair). Twisted pairs shall be individually color coded.

D. Colors

1. crossconnect wire, 1 pair, White-Red / Red-White

2. crossconnect wire, 1 pair, White-Blue / Blue-White

2.06 PATCH PANEL

A. Application: Patch panel shall be suitable for installation within a telecommunication room for the termination of the UTP 4-Pair Cable (specified herein), and shall be horizontally oriented for a rack-mounted configuration.

B. Patch panel shall have discrete ports, fully compatible with the connectors / modular jacks – refer to this section for connectors.

C. Patch panels shall be capable of supporting, organizing, labeling and patching/crossconnecting between the horizontal termination field and the equipment and/or the equipment termination field.

D. Manufacturer:

1. Leviton

a. 49255-H24; 1-RU 24 port QuickPort CAT 6 and CAT6A patch panel

b. 49255-H48; 1-RU 48 port QuickPort CAT 6 and CAT6A patch panel

2.07 WORKSTATION OUTLETS (FACEPLATES)

A. Faceplate for Flush Mount and Surface Mount Outlets

1. Refer to outlet schedule in the Drawings for port quantity per outlet type.

2. Faceplate shall include required accessories, such as icons, blank inserts, and labels. Faceplate shall be by the same manufacturer as the connectors.

3. Faceplate shall be quickport wallplates, color shall be determined by Architect.

4. Manufacturer:

a. Leviton

1) 42080-4IS, 4-port wallplate with ID window.

2) 41290-SMI, single-gang wallplate with ID window with a combination of; 41291-2QI, 2-port quickport module; 41297-2PI, pass-through module; 41291-1BI, blank module.

3) 41089-1IP, 1-port biscuit type jack with ID window (for Intrusion, Access Control, BAS, etc. locations).

4) 41089-2IP, 2-port biscuit type jack with ID window (for FACP, etc. locations).

5) 49223-CBC, QuickPort in-ceiling bracket with 41089-2WP, 2-port plenum surface-mount box (for WAP locations).

6) 49223-BA5, QuickPort in-wall bracket (for camera locations).

B. Faceplate for Wall Phone Outlets

1. Faceplate for wall phone outlets shall come equipped with 1 modular jack and two mounting studs.

2. Manufacturer:

a. Leviton

1) 4108W-OSP; Faceplate for wall phone, with modular jack.

2.08 RECESSED FLOOR BOX OUTLET DEVICE PLATES

A. Device Plates for Recessed Style Poke-Thru Devices:

1. Provide the following device plates for each of the Legrand Evolution 8AT Series Poke-Thru Devices:

a. 8MAAP – Device Plate

b. 8DEC – Decora Device Plate

c. AV9016BK – XLR Pane Mount Plate

2. Device plates shall include required accessories, such as icons, blank inserts, and labels. Device plates shall be by the same manufacturer as the Poke-Thru Devices.

B. Brackets for Recessed Floor Box Systems:

1. Provide the following brackets for each of the Legrand RFB6E Series Floor Boxes:

a. RFB6EXT – Internal Audio/Video Bracket

b. RFB6GFI – Internal GFI or Decora Style Receptacle Opening

c. AV9016BK – XLR Pane Mount Plate

d. AV9003BK – Blank Plate, Single

2. Brackets shall include required accessories, such as icons, blank inserts, and labels. Brackets shall be by the same manufacturer as the Floor Box Systems.

2.09 CONNECTORS / MODULAR JACKS

A. Connectors shall be 8-position 8-conductor modular type, shall be CAT6 rated, and shall be intended for the termination of 4-pair UTP cables. Connectors shall be by the same manufacturer as the faceplates.

B. Connectors shall be T568B wired.

C. Color shall match faceplate

D. Manufacturer:

1. Leviton

a. 61110-RI6, quickport Cat6 connector

b. 6AUJK-RI6, quickport CAT6A connector

2.10 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Horizontal Cable Labels

1. Labels shall be adhesive backed and have a self-laminating feature.

2. Labels shall wrap around the cable's jacket.

3. Printable Area: size: 2" x 0.5", minimum; color: white.

4. Manufacturer: Panduit.

a. #LJSL7-Y3-1; laser/ink jet labels for cable diameters 0.16"-0.32", white

C. Outlet Faceplate and Port Labels

1. Labels shall be adhesive backed.

2. Port labels shall fit above the port without overlap to the next port or to the port itself.

3. Manufacturer: Panduit.

a. #C125X030FJJ; “Equipment Room Identifier” label, for laser printer

b. #C061X030FJJ; “Unique Cable Number” label, for laser printer

D. Modular Patch Panels

1. Labels shall be adhesive backed.

2. Labels shall fit above the port without overlap to the next port or to the port itself.

3. Printable Area: size: 0.61” x 0.33”, minimum; color: white.

4. Manufacturer: Panduit.

a. #CPPLF-5; laser labels for modular patch panels, white

E. 110 Termination Block Labels

1. Color: Blue for horizontal termination field.

2. Manufacturer: Panduit

a. #DSL110-BU; label inserts, blue

2.11 MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties

1. Width: .75”.

2. Color: Velcro cable ties shall be black.

3. Manufacturer:

a. Leviton

1) 43115-075; Black, 15’ roll, cut to length.

B. All ties in plenum spaces shall be plenum rated.

1. Plenum tie wraps shall be Panduit.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

B. Install products, components, accessories, hardware, etc, according to the manufacturer's instructions.

3.02 EXAMINATION

A. Pathways: Prior to installation, verify pathways are complete and ready for cables.

B. Equipment Rooms: Prior to installation, verify equipment rooms are complete and ready for cables.

3.03 INSTALLATION

A. Horizontal Cable

1. General

a. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.

b. Maintain maximum cable length of 90 meters from the termination in the Telecommunications Room to the termination at the outlet.

c. A cable bundle shall contain no more than 24 individual cables.

2. Color:

a. Provide Blue cables for data links.

3. Installation

a. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.

b. Maintain pulling tension within manufacturer's limits.

c. Protect cable during installation. Replace cable if damaged during installation.

d. Place cables with no kinks, twists, or impact damage to the sheath.

e. Place and suspend cables in a manner to protect them from physical interference or damage.

4. Routing

a. When routing horizontally within Telecommunications Room, utilize the overhead cable support. When routing vertically within Telecommunications Room, fasten the cable bundles using approved cable ties to the wall-mounted vertical cable support every 24 inches on center.

b. Route cables a minimum of 12" away from power sources to reduce interference from EMI. Route cables at a 90-degree angle to the power sources.

c. Route cables a minimum of 18” from fluorescent light fixture. Route cables at a 90-degree angle to the light fixtures. When routing cables in areas without primary horizontal pathways, install cables onto secondary pathways or approved support devices, such as cable hangers.

d. Route cables at 90-degree angles, allowing for bending radius along corridors for ease of access. Do not route through an adjacent space if a corridor borders at least one wall of the room.

e. Provide a 10 feet (minimum) sheathed cable slack loop at each end of the run. In the Telecommunications Room, place the slack in the overhead cable support. At the workstation, place cable in ceiling space before the device conduit stub supported from a cable hanger.

f. Provide eight inches (minimum) of sheathed cable slack behind each workstation outlet faceplate. The slack cable shall be coiled inside the device box, the surface raceway, or within the wall, in accordance with the cabling manufacturer's installation standards.

g. At the equipment bay in the Telecommunications Room where floor-standing racks are used, divide horizontal cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. At the equipment bay in the Telecommunications Room where wall-mounted racks are used, route the horizontal cables down the hinged side of the equipment rack.

5. Termination

a. Properly (per manufacturer’s instructions and TIA/EIA-568-B standard installation practices) strain relieve cables at termination points.

b. Terminate pairs on the specified connecting hardware. Perform terminations in accordance with manufacturer’s instructions and TIA/EIA-568-B standard installation practices.

B. Patch Panels and Horizontal Management Panels

1. Provide discrete patch panels in a quantity to allow termination of data cables served from respective HC.

2. Install the discrete patch panels and horizontal management panels in the configuration as shown on the Drawings. Install panels level.

C. Outlet Faceplates

1. Install faceplates plumb, square, and at the same level as adjacent device faceplates.

2. Patch gaps around faceplates so that faceplate covers the entire opening.

D. Outlet Modular Connectors

1. Terminate pairs on the specified modular connector. Perform terminations in accordance with manufacturer's instructions and TIA/EIA-568-B standard installation practices.

2. Replace terminations and connectors not passing the required media test.

E. Cords and Crossconnects

1. Refer to Telecommunications Outlet Schedule of the Drawings for cord (workstation, Telecom Room, and other) patching and crossconnecting requirements.

2. Splices in patch cords and crossconnect wire are prohibited.

3. Record crossconnections in HCs for MC crossconnection purposes and for record documents.

4. Color:

a. For analog handsets, provide: White-Red / Red-White

3.04 LABELING

A. General Requirements

1. Labeling, identifier assignment, and label colors shall conform to TIA/EIA-606-A Administration Standard and as approved by Owner's Representative before installation.

2. Labels shall be permanent with machine-generated text; hand-written labels will not be accepted.

B. Label Formats

1. Horizontal Cable Labels

a. Text Attributes:

1) Black

2) 1/8” high, minimum, or 12pt font size.

3) Font: Verdana preferred, or SansSerif or Arial acceptable.

b. Install labels on both ends of cables no more than 4" from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

2. Modular Patch Panel Labels

a. Use modular patch panel labels included in the product packaging. (Approval by the Owner shall be required for other labels.)

b. Use a label color for the respective field type, per TIA/EIA-606.

c. Text Attributes: Black, 3/32” high, minimum, or 10pt font size.

3. Outlet Labels

a. Text Attributes: Black, 1/8” high, minimum, or 12pt font size.

b. Provide an “Equipment Room Identifier” label at the top of the faceplate with the serving telecommunication room’s identifier (refer to 27 11 00 for telecommunication room identifier assignment).

c. Provide a “Unique Cable Number” label above each port with the link’s unique cable number.

C. Identifier Assignment – Confirm each MDF/IDF room name prior to labeling, change if necessary.

1. Horizontal Cables / Cabling Link

a. Assign each cable a unique number, with Room-Rack-Patch Panel-Jack#. (e.g. MCA-3-3-42). Jack numbers should be 1-48.

2. Outlet Ports

a. The outlet ports shall be identical to the unique cable number. Label all jacks in the top window from left to right, top to bottom. (i.e. A-3-3-1,2,3,4). The bottom window shall include the Room number in which the port resides and a Box (backbox) number. (i.e. Classroom 117, Box 3). These should be reflected on the as-built documents submitted to the Engineer at the end of the project.

3. Modular Patch Panel Ports

a. The modular patch panel ports shall be identical to the unique cable number. Utilize the jack factory numbering of 1-48. Include Room # and box # in the port window or labeling location (i.e. 117,3). This should match the port in the field.

3.05 FINAL INSPECTION

A. Inspect installed products and work in conjunction with the Owner. Develop a punchlist for items needing correction.

B. Issue punchlist to the Owner for review prior to performing punchlist walk.

C. Repair defects prior to system acceptance.

D. Inspect installed products and work in conjunction with the Owner for sign off.

END OF SECTION 27 15 13

SECTION 272000 – DATA COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this Section applies to the Drawings, Specifications, and as provisions of the Contract. The RFP Instructions "Bid Package 4 (E-Rate)", General Conditions, Supplementary General Conditions, Special Conditions, and other Division 0 and 1 Specification Sections apply to the work of this Section.

1.2 SUMMARY

A. The general intent of this section is to provide a complete proposal of materials and labor itemized with a cost breakdown for wireless service and supporting network infrastructure. System shall be a complete and satisfactorily operating wireless data network; consisting of wireless access points, PoE switches, SFP connectivity, installation, VLAN setup, licensing, support and maintenance agreements.

1.3 RELATED SECTIONS

A. Sections that are related to this Section include, but are not limited to, the following:

1. Section 27 0000 - Communications General Provisions.

2. Section 27 0000.1 - E-Rate supplemental instructions.

1.4 REFERENCES

A. Comply with the References requirements of Section 27 0000.

B. In additional to those codes, standards, etc., list in Section 27 0000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. IEEE 802.1 Network architecture and subset standards.

2. IEEE 802.3 Ethernet communications and subset standards

3. IEEE 802.11 Wireless local area network and subset standards.

1.5 DEFINITIONS

A. Definitions as described in Section 27 0 00 shall apply to this section.

B. In addition to those Definitions of Division 0, the following list of terms as used in this Section and Division 27 sections shall be defined as follows:

1. "AVVID" Architecture for voice, video and integrated data.

2. “DHCP” Dynamic Host Configuration Protocol.

3. “DNS” Domain name system.

4. “DTP” Dynamic trunking protocol.

5. “LACP” Link aggregation control protocol.

6. “LAN” Local area network.

7. “NTP” Network timing protocol.

8. “RPS” Redundant power systems.

9. “RSPAN” Remote switch port analyzer.

10. “RSTP” Rapid spanning tree protocol.

11. “SNMP” Simple network management protocol.

12. “TFTP” Trivial file transfer protocol.

13. “VLAN” Virtual LAN.

14. “WAN” Wide area network.

15. “WLAN” Wireless local area network.

1.6 SUBMITTALS

A. Comply with the Submittals article of Section 27 0000 for procedural, quantity, and format requirements.

B. Preconstruction Submittal Requirements:

1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.

2. Labeling Submittal, consisting of:

a. Proposed IP and VLAN scheme that conforms to the Owner’s standards. This submittal will be for review by the Owner only.

b. Labeling of each piece of equipment.

3. Schedule Submittal, consisting of proposed schedule of work, and network availability to each sub contractor’s requirements. This schedule may be combined with the schedule developed for Division 27 Sections.

4. Shop Drawings Submittal, consisting of proposed equipment and the connectivity between them (e.g. fiber/copper, to/from, port count, and type of termination).

5. Provide required certifications of manufacturer, warrantee, and CCIE & RCDD as described below.

C. Additional submittal requirements at closeout:

1. Cross-connection records/cut sheets.

2. IP and VLAN of each piece of equipment listed under this section as well as a range of IPs for end user connectivity and IP reservation lists.

1.7 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 0000.

1. In addition to the Proposer Qualifications requirements of Section 27 0000, the Proposer shall be/have:

a. Approved by the Manufacturer; certified to install the proposed and submitted equipment to provide a warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the proposal submission.

b. At a minimum, one RCDD permanently on staff, and in management throughout the duration of the project. Provide evidence in the proposal submission of certification Programs. Evidence shall include a copy of the "Certification(s)" with the RCDD's name(s).

c. At a minimum, one Certified Cisco Internetworking Engineer (CCIE) or the substituted manufacturer's certifications. The CCIE(s) shall be regular full-time employees of the contractor. Temporary or contract employees are not acceptable. Provide evidence in the proposal submission.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 0000.

B. Network equipment shall not be delivered to site until telecommunications room is deemed "clean" and free of construction debris. TR shall be sealed and sealed from future construction debris.

1.9 WARRANTY

A. Comply with Warranty requirements of Section 27 0000.

B. Include manufacturer's "base" warranty for a minimum of three years bundled in the purchase price.

PART 2 - PRODUCTS

2.1 GENERAL

A. Comply with the Products, General requirements of Section 27 0000.

2.2 SUBSTITUTIONS

A. Comply with the Products, Substitutions requirements of Section 27 0000.1.

2.3 COPPER DISTRIBUTION UPOE NETWORK SWITCHES

A. Switches shall be cloud-managed capable. Shall be capable of 176Gbps backplane switching speed with an 80Gbps stacking capability with dual stacking ports. 4 x 10G SPF+ uplinks, PoE+ minimum of 740W on L2 models and 1765W on L3 models. 6 configurable QoS queues, Ports shall be auto-negotiating and support IEEE 802.3 and IEEE 802.3af and IEEE 802.3at (Power over Ethernet plus) standards. UPoE powered devices shall be able to connect at 1 Gigabit speed.

B. Switches shall have IEEE 802.1X, MAB and Hybrid authentication for wired access control with RADIUS server monitoring. ACL support (IPv4 & IPv6) and MAC whitelisting, Single-Host/Multi-Domain/Multi-Host/Multi Authentication, Change of Authorization (CoA) and RADIUS accounting support, DHCP snooping to protect against rogue DHCP servers on the network,• Dynamic ARP Inspection to prevent man-in-the-middle attacks, Rapid Spanning Tree, BPDU guard, root guard, loop guard, and other safeguards to help prevent misconfigurations and reduce convergence time, Per port VLAN configuration, Multiple administrative roles with sophisticated security policy management.

C. District access UPoE and PoE+ switches shall be Cisco Meraki series 48 port with stacking.

1. Cloud-managed stackable switching 48 Port top of stack UPoE switches shall be: Cisco Meraki MS250-48FP-HW; Provide 1 per IDF in Buildings 2,3,4,5 and 7. Provide the following per switch:

a. Provide 5-year license; Cisco Meraki LIC-MS250-48FP -5YR.

b. Provide 2 stacking cables, 1-meter Cisco Meraki MA-CBL-40G-1M.

c. Provide 1 additional 1025W Power supply Cisco Meraki MA-PWR-1025WAC.

2. Cloud-managed stackable switching 48 Port PoE+ switches shall be: Cisco Meraki MS225-48FP L2 STCK; Provide as remainder of switches. Quantity in each MDF/IDF as shown on plans, remainder to go to be coordinated with Owner for replacement of existing switches. For the purposes of this RFP the total quantity is (45) forty-five. Provide the following per switch:

a. Provide 5-year license; Cisco Meraki LIC-MS225-48FP -5YR.

b. Provide 2 stacking cables, 0.5-meter Cisco Meraki MA-CBL-40G-50CM.

D. 10 GbE SFP+ long range fiber transceivers shall be: Cisco Meraki SFB-10GB-LR-S. Provide 2 per MDF/IDF. Total of (36) thirty-six.

E. Provide necessary licenses, warranties, startup, configuration, service and maintenance contracts in the proposal breakout.

2.4 WIRELESS ACCESS POINTS

A. Provide cloud-managed wireless design based upon existing school surveys and building plans to provide wireless service within all covered buildings sufficient for voice over IP service utilizing the wireless access points.

1. Wireless design and control shall allow for quality of service queues and network bandwidth allocation.

2. Design shall integrate with other network services.

3. Design shall allow device-based access and VLAN assignments based upon IEEE 802.11x based credentials.

B. Provide NCS management licenses sufficient for all devices provided in this contract for full functionality. Provide proposal for perpetual licenses if available. Otherwise, license upgrade assurance for a term of no less than one year from completion of entire project.

C. Wireless AP's shall be cloud-managed with Wi-Fi 6 AP with security scanning radio and BLE included. With 1 × 2.4 Ghz 802.11b/g/n/ax 1 × 5 GHz 802.11a/n/ac/ax 1 × WIDS/WIPS 1 × Bluetooth 3.5 Gbit/sec max rate and a minimum of 4×4:4 MU-MIMO with beamforming. Includes an 802,3af PoE power adapter.

D. For general classroom and office spaces, provide 802.11 b/g/n/ax – 802.11a/n/ac/ax cloud-management access points with clean air internal antenna.

1. Cisco Meraki MR46-HW; provide quantity as needed per plans. Provide the following per AP:

a. Provide 5-year license; Cisco Meraki LIC-ENT-5YR.

E. For congested high-density locations, provide 802.11 b/g/n/ax – 802.11a/n/ac/ax, with 5.9 Gbit/sec max rate 8×8:8 MU-MIMO with beamforming, cloud-management access points with clean air internal antenna.

1. Cisco Meraki MR56-HW; provide quantity as needed per plans. Provide the following per AP:

a. Provide 5-year license; Cisco Meraki LIC-ENT-5YR.

F. For exterior/outdoor spaces, provide 802.11 b/g/n/ax – 802.11a/n/ac/ax, with 1.7 Gbit/sec max rate 2×2:2 MU-MIMO with beamforming, cloud-management access points with external antennas as required for the location.

1. Cisco Meraki MR76-HW; provide quantity as needed per plans. Include Antennas O, S, P + Mounting equipment kits. Provide the following per AP:

    a. Provide 5-year license; Cisco Meraki LIC-ENT-5YR.

G. For exterior/outdoor high-density locations, provide 802.11 b/g/n/ax – 802.11a/n/ac/ax, with 3.5 Gbit/sec max rate 4×4:4 MU-MIMO with beamforming, cloud-management access points with external antennas as required for the location.

1. Cisco Meraki MR86-HW; provide quantity as needed per plans. Include Antennas O, S, P + Mounting equipment kits. Provide the following per AP:

    a. Provide 5-year license; Cisco Meraki LIC-ENT-5YR.

H. For the purposes of this RFP, provide (110) One hundred and ten internal low-density APs, (50) fifty internal high-density APs, (20) twenty external low-density APs with MA-ANT-20 type antennas, and (20) twenty external high-density APs with MA-ANT-27 antennas. Coordinate with Owner post wireless survey to confirm each AP and external antenna type required.

I. Provide necessary licenses, warranties, startup, configuration, and maintenance contracts in the proposal breakout.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 0000.

3.2 NETWORK SWITCHES

A. Install switches as indicated in specification Tables, Plans, and Elevations.

B. Install power and redundancy connections for each Ethernet switch.

C. Install communications connections from Distribution and Access Ethernet switches. Use singlemode fiber launches for switches located in physically separate buildings and multimode fiber launches if located within same building, unless indicated otherwise in the specifications, tables, plans, or elevations.

D. Where possible, install servers and appliances included in this contract with dual Ethernet ports to multiple Distribution Ethernet switches. Configure to the greatest extent possible that services remain available but with less capacity in the event of single component or switch failure.

E. Coordinate with owner for district wide network design. Configure virtual local area networks (VLANs) to simplify assigning service priorities to various protocols based upon VLAN assignment. Provide inter VLAN routing at each distribution Ethernet switch. Program switches to prevent unauthorized access per Owner’s requests, best practices, or industry standards. Coordinate with Owner for allowed Provide at least the following VLANs at every Core, Distribution, and Access Ethernet switch:

1. Access (for unassigned and unsecured Ethernet devices)

2. Guest Data

3. Owner/Facility Data

4. Voice

5. Integrated Bell, Paging, Intercom, and Alert System

6. Wireless Guest

7. Wireless Owner/Facility

8. Television and Video Distribution Services

9. Building Information Services (HVAC control, Lighting Control, etc.)

10. Security, Surveillance, Door Access, Intrusion Alarm systems

11. Storage Area Network

12. District Data Server Network

F. Security setting shall prevent unauthorized access. Upon detection of a security violation, the minimum number of affected ports shall be administratively disabled, but voice services shall remain available if possible.

3.3 WIRELESS CONTROL AND ACCESS SYSTEM

A. Install Wireless Services expansion modules, if necessary, in District core switches, (located at District office) per manufacturer's instructions and recommendations. Configure wireless controller to allow for consistent wireless connection procedures and user interfaces across Owner's wireless network.

1. Adjust quality of service, virtual local area network, IEEE 802.3x authentication to allow for following services over wireless connection:

a. Voice over IP via wireless connection. Optimize this connection to provide best transport for voice data services.

b. Provide secured access for Owner's wireless computers or other authorized computers. Successful 802.3x authentication should be sufficient to not require log in credentials.

c. Guest access shall at very least direct users to a login screen, similar to a Hotel welcome screen. If a user successfully authenticates and is allowed to connect, they can be transferred to the secured access. Otherwise, the users will be restricted to only accessing publicly available servers hosted by the Owner.

B. The media server shall be able to store other digital content and broadcast on demand to any authorized user.

END OF SECTION 27 2000