NOTICE TO ALL CONTRACTORS

You are hereby notified of the following changes, clarifications and/or modifications to the original Contract Documents, Project Manual, Drawings, Specifications and/or previous Addenda. This Addendum shall supersede the original Contract Documents and previous Addenda wherein it contradicts the same, and shall take precedence over anything to the contrary therein. All other conditions remain unchanged.

This Addendum forms a part of the Contract Documents and modifies the original Contract Documents dated 10/17/18, and/or Addendum #1 dated 11/20/18, and/or Addendum #2 dated 12/6/18, and/or Addendum #3 dated 12/27/18. Acknowledge receipt of this Addendum in space provided on the Bid Proposal Form. Failure to acknowledge may subject Bidder to disqualification.

A. DELETIONS, ADDITIONS, CHANGES, REVISIONS

SPECIFICATIONS

1. Item: SECTION 00100 NOTICE INVITING BIDS, IMPORTANT INFORMATION
   
   Change From: BIDS DUE no later than: January 8, 2019, 2:00 PM
   
   Change To: BIDS DUE no later than: January 15, 2019, 2:00 PM

2. Item: SECTION 27 00 00 BASIC COMMUNICATIONS REQUIREMENTS
   
   Delete: Delete existing SECTION 27 00 00 BASIC COMMUNICATIONS REQUIREMENTS, in its entirety, and Replace with the attached SECTION 27 00 00 BASIC COMMUNICATIONS REQUIREMENTS, in its entirety.

3. Item: SECTION 27 05 43 COMMUNICATIONS OUTSIDE PLANT PATHWAYS
   
   Delete: Delete existing SECTION 27 05 43 COMMUNICATIONS OUTSIDE PLANT PATHWAYS, in its entirety, and Replace with the attached SECTION 27 05 43 COMMUNICATIONS OUTSIDE PLANT PATHWAYS, in its entirety.
ADDENDUM #4

DRAWINGS

1. Item: Sheet C1.00, Existing Conditions Plan
   Revisions: Removed existing stockpile from the plan
2. Item: Sheet C3.00, Rough Grading Plan
   Revisions: Revised note 12 and details 1A, 1B, and 2 on sheet C3.00

B. Bid Requests for Information (RFIs)
   Bid RFIs and applicable responses are attached.

C. For questions regarding this Addendum, please contact:
   Ron Johnson, Critical Solutions, Inc. - Email: bids@csipm.com
   
   NOTE:
   • Copy “C-4016 New Science Building – Increment 1, Site Work” into email SUBJECT line.
   • Questions (RFIs) must be submitted within the body of your email. Do not include attachments.

All other terms and conditions of BID are to remain the same.

ATTACHMENTS

SECTION 27 00 00 BASIC COMMUNICATIONS REQUIREMENTS
SECTION 27 05 43 COMMUNICATIONS OUTSIDE PLANT PATHWAYS
C1.00 EXISTING SITE PLAN
C3.00 ROUGH GRADING PLAN
BID RFIs & Responses

SmithGroupJJR
301 Battery Street, 7th Floor
San Francisco, CA 94111

Division of the State Architect
1515 Clay Street, Suite 1201
Oakland, CA 94612

END OF ADDENDUM #4
SECTION 27 00 00 BASIC COMMUNICATIONS REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general administrative and procedural requirements for Division 27, and is intended to supplement, not supersede, the general requirements specified in Division 00.

B. The requirements described herein include the following:
   1. References
   2. Definitions
   3. Submittals
   4. Quality Assurance
   5. Delivery, Storage, and Handling
   6. Scheduling
   7. Warranty
   8. Product Substitutions
   9. Project Management and Coordination Services
   10. Permits and Inspections
   11. Field Quality Control
   12. Project Closeout and Record Documents

C. Related Items
   1. General and Supplementary Conditions: General provisions of the Prime Contract and Divisions 00 and 01 apply to Division 27.
   2. Consult other Divisions and Sections, determine the extent and character of related work, and coordinate Work of Division 27 with that specified elsewhere to produce a complete and operable installation.
   3. Section 27 05 43, “Communication Outside Plant Pathways”

1.2 REFERENCES

A. General
   1. Codes, standards, and industry manuals/guidelines listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Consider such codes and/or standards a part of this specification as though fully repeated herein.
   2. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
   3. 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 bid unless otherwise specifically stated.

B. Codes: Perform work and furnish materials and equipment under Division 27 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. California Code of Regulations (CCR):
      a. Title 8, “Industrial Relations”
1) Chapter 3.22, “California Occupational Safety and Health Regulations (CAL/OSHA)”
   b. Title 24, “California Building Standards Code”
      2) Part 2, “California Building Code” (CBC)
      3) Part 3, “California Electrical Code” (CEC)
      4) Part 11, “California Green Building Standards Code” (CALGeen)”

2. National Fire Protection Agency (NFPA)
   a. NFPA 70, “National Electrical Code” (NEC)
   b. NFPA 75, “Protection of Information Technology Equipment”

3. United States Department of Labor (DOL) Occupational Safety and Health Administration (OSHA) Regulations (Standards - 29 CFR)
   a. Part 1910, “Occupational Safety and Health Standards”
   b. Part 1926, “Safety and Health Regulations for Construction”

   b. Part 27, “Miscellaneous Wireless Communications Services”
   c. Part 68, “Connection of Terminal Equipment to the Telephone Network”
   d. Part 90, “Private Land Mobile Radio Services”

5. Other applicable national, state, and local binding building and fire codes

C. Standards: Perform work and furnish materials and equipment under Division 27 in accordance with the latest editions of the following standards as applicable:

1. Building Industry Consulting Services International (BICSI):
   a. Telecommunications Distribution Methods Manual (TDMM)
   c. Wireless Design Reference Manual (WDRM)

2. EIA testing standards

3. National Electrical Contractors Association (NECA):

4. Telecommunications Industry Association (TIA):
   a. ANSI/TIA-568-C.0, “Generic Telecommunications Cabling for Customer Premises”
   b. ANSI/TIA-568-C.1, “Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements”
   c. ANSI/TIA-568-C.2, “Balanced Twisted Pair Telecommunications Cabling and Components”
   e. ANSI/TIA-569-B, “Commercial Building Standard for Telecommunications Pathways and Spaces”
   f. ANSI/TIA/EIA-598-B, “Optical Fiber Cable Color Coding”
   g. ANSI/TIA-606-B, “Administration Standard for Telecommunications Infrastructure”
   h. ANSI/TIA-607-B, “Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises”
   i. ANSI/TIA-758-A, “Customer-Owned Outside Plant Telecommunications Infrastructure Standard”
1.3 DEFINITIONS

A. The definitions of Divisions 00 and 01 shall apply to Division 27 sections.

B. In addition to those definitions of Divisions 00 and 01, the following list of terms as used in this specification defined as follows:

1. “AFF” : Above Finished Floor
2. “As directed” : As directed or instructed by the Owner, or their authorized representative
3. “AHJ” : Authority Having Jurisdiction
4. “Cabling” : installed media ready for electronic or optical signal circuit use; a complete media connection comprised of cables, termination apparatus (patch panels, blocks, connectors), outlets, connecting media (path cord, crossconnects), labeling
5. “CBC” : California Building Code (CCR Title 24 Part 2)
6. “CCR” : California Code of Regulations
7. “CEC” : California Electrical Code (CCR Title 24 Part 3)
8. “Connect” : To install patch cords, equipment cords, crossconnect wire, etc. to complete an electronic or optical signal circuit
9. “Cord” : a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”
10. “Engineer” : TEECOM
11. “Furnish” : To purchase, procure, acquire, and deliver complete with related accessories
12. “General Contractor” : successful bidder
13. “Identifier” : A unique code assigned to an element of the Telecommunications infrastructure that links it to its corresponding record
14. “Install” : To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, parts, items, or equipment supplied by contractor or others. Make installation complete and ready for regular operation
15. “IOR” : Inspector Of Record
16. “ISP” : Inside Plant
17. “LED” : Light Emitting Diode
18. “MSDS” : Material Safety Data Sheets
20. “NEMA” : National Electrical Manufacturers Association
22. “NIC” : Not In Contract (work or equipment)
23. “OFCl” : Owner-furnished contractor-installed; coordinate the integration of components furnished by the Owner; provide mounting hardware, cable, connectors, etc. to ensure proper integration of OFCl equipment
24. “OFE” : Owner Furnished Equipment
25. “OSP” : Outside Plant
26. “Owner” : Contra Costa College
27. “Owner’s Representative” : Critical Solutions Inc.
29. “Pigtail” : a length of cordage having connectors at one end
30. “Provide” : To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation

j. ANSI/TIA-1005, “Telecommunications Infrastructure Standard for Industrial Premises”
31. “UL”: Underwriters Laboratories

1.4 SYSTEM DESCRIPTION AND PROJECT CONDITIONS

A. In circumstances where the Specifications and Drawings conflict, the Drawings shall govern quantity and the Specifications shall govern quality.

1.5 SUBMITTALS

A. Submit required submittals to the General Contractor in the quantities and formats as required under the general contract. In the absence of requirements, provide as described in the following with reference to quantity and format.

B. Failure to comply with requirements in part or whole shall constitute grounds for rejection.

C. Resubmittals: For resubmittals, provide a cover letter with the resubmittal that lists the action taken and revisions made to each product in response to the Engineer’s submittal review comments. Lack of this actions-taken cover letter shall constitute grounds for non-review and/or rejection of resubmittal packages.

D. Submittal Description: Product Data

1. Obtain written approval from the Engineer for the product data submittal prior to materials and equipment purchase order and prior to installation.

2. Quantity and Media: Submit product data as described in Division 01. In the absence of requirements given, submit product data submittal as directed in writing either as an electronic submittal (preferred) via approved means (e.g., email, e-transmit) or as four printed submittals (not preferred).

3. Format and Organization – Electronic Submittal:

   a. File format shall be PDF, either as a single compiled PDF file or as a PDF portfolio. PDF files should be produced from original electronic media, not scans of printed media. If scans from prints are the only option, annotate electronically, not on the prints prior to scanning.

   b. Pages should be letter size (8.5” x 11”)

   c. Organize the Content in the following order:

      1) Cover
      2) Table of Contents (TOC)
      3) Statement of compliance
      4) Product information
      5) Seismic calculations (as required)

   d. Clearly and precisely indicate the submitted product and accessories by part number using an electronic annotation (arrow, rectangle, oval, etc.). Where the product data presents “part number builds”, list the exact part number of the submitted products and accessories.

   e. Add page numbers in numerical order with no gaps to each page that correctly correspond to the TOC.

4. Format and Organization – Printed Submittal:

   a. Paper shall be letter size (8.5” x 11”).

   b. Package printed submittal using a 3-ring binder, clear-front report cover, or similar.
1) For 3-ring binders, clearly label the cover and spine of each binder with the required “Cover” information (e.g., insert the cover in the front and spine transparent pockets):

c. Organize the content in the following order:
   1) Cover
   2) Table of Contents (TOC)
   3) Statement of compliance
   4) Product information
   5) Seismic calculations (as required)

d. Include tabbed separators for improved navigation through the submittal.

e. Clearly, precisely, and permanently indicate the submitted product and accessories by part number using an arrow stamp or other permanent indicator. Where the product data presents “part number builds”, indicate the exact part number of the submitted products and accessories.

5. Content:

   a. Cover: Include a cover that clearly displays the following information:
      1) Owner name
      2) Project name and address
      3) Submittal name (e.g., “Product Data Submittal for Telecommunications Equipment Rooms”)
      4) Project submittal number
      5) Contractor’s submittal number (discretionary)
      6) Submittal date; format: Month Day, Year (e.g., “January 1, 2019”)
      7) Specification section numbers included in the submittal (e.g., “Section 271100”)
      8) Contractor name and contact information

   b. Table of Contents (TOC): Include a TOC that lists materials by section number, article and paragraph number. Add a brief product description (what it is, size or color or other optional features), manufacturer and part number. List the submittal page number per product. Example heading for TOC:

      | Section | Article | Paragraph | Description | Manufacturer | Part # | Page # |

   c. Statement of Compliance: Include a “Statement of Compliance” letter or memorandum on the submitter’s company letterhead from the highest-ranking employee assigned to this project stating the submittal has been reviewed (quality control check) and is in full compliance with the requirements of the contract documents, and listing the submittal’s contents. Wet sign (and stamped, if applicable) the letter.
d. **Product Information:** Include manufacturer’s technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary) that clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color and finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Include products listed in the specifications, at a minimum. Include relevant products that will be installed, which are not listed in the specifications.

E. **Submittal Description: Shop Drawings**
   1. Prior to the start of work, submit shop drawings and obtain written approval from the Engineer for the shop drawings submittal.
   2. **Quantity and Media:** Submit shop drawings as described in Division 01. In the absence of requirements given, submit shop drawings as directed in writing either an electronic submittal (preferred) via approved means (email, e-transmit, FTP upload) or four printed and bound sets on bond.
   3. **Format:**
      a. Use the same sheet size as the contract drawings.
      b. Use the same title block as the contract drawings, modified to include contractor information.
      c. Text: 3/32” - 1/8” high when plotted at full size.
      d. Use identical symbols as those in the contract drawings.
      e. Screen background information.
      f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
      g. **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”=1’-0”
         4) Scale rack elevations at 1”=1’-0”

F. **Submittal Description: As-Built Drawings**
   1. **Quantity and Media:** Submit as-built drawings as described in Division 01. In the absence of requirements given, submit as-built drawings as directed in writing as electronic files via approved media (or four printed and bound sets on bond, if approved).
   2. **Format:**
      a. Use the same sheet size as the contract drawings.
      b. Use the same title block as the contract drawings, modified to include contractor information.
      c. Text: 3/32” - 1/8” high when plotted at full size.
      d. Use symbols identical to the symbols shown on the contract drawings.
      e. Screen background information.
      f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
g. Electronic files shall be native format and plotted PDF files. The file names shall include the sheet number.

3. Content:
   a. Submit as-built drawings that fully represent actual installed conditions and that incorporate modifications made during the course of construction.
   b. Symbols List
   c. Diagrams, such as (but not limited to) point-to-point diagrams, block diagrams, riser diagrams, line diagrams, and other diagrams that conceptually describe the system
   d. Floor Plans and Reflected Ceiling Plans: Scale plans at 1/8”=1′-0″. Plans shall show:
      1) Locations and identifiers of telecommunications outlets
      2) Routes, types, sizes, and quantities of pathways (such as cable trays, conduits, hangers, and other pathways)
   e. Enlarged Rooms Layouts: Applicable rooms: Server Room, Network Patching Facility, PBX Equipment Room, Entrance facilities, MTR, TRs, MDF, BDFs, IDF. Room drawings shall show:
      1) Floor layouts – scaled at either 1/4′ =1′-0″ or 1/2′=1′-0″, showing dimensioned placement of equipment cabinets/frames, rack bays, etc.
      2) Overhead layouts – scaled at either 1/4′=1′-0″ or 1/2′=1′-0″, showing dimensioned placement of overhead cable support (e.g., cable tray, cable runway, conduit sleeves, etc.)
      3) Rack elevations – scaled at 1″=1′-0″, showing placement of termination apparatus and other equipment installed onto rack bays
      4) Wall Elevations – scaled at 1″=1′-0″, showing dimensioned placement of termination apparatus (e.g., termination/crossconnect blocks)

G. Submittal Description: Operation and Maintenance (O&M) Manual
   1. Quantity and Media: Submit O&M Manual as described in Division 01. In the absence of requirements given, submit one packaged O&M Manual set.
   2. Format and Organization:
      a. Include contents in a 3-ring binder with front cover and spine clear pockets for insertion of the cover information.
      b. Cover shall include the following information:
         1) Owner name
         2) Project name and address
         3) Manual name (e.g., “Operation and Maintenance Manual for Telecommunications Cabling System”)
         4) Date; format: Month Day, Year (e.g., “January 1, 2014”)
         5) Contractor name and contact information
      c. Include a ToC at the beginning that lists the contents.
      d. Include tabbed separators for improved navigation through the manual.
   3. Content:
      a. Instructions on making a warranty claim during the warranty period
      b. Contact information during the warranty period
      c. Contact information beyond the warranty period for maintenance and related service
      d. As-built drawings, as described above, printed on tabloid size (17”x11”) paper and as electronic files – both native files and plotted PDF files
e. Product catalog/technical information sheets for each component provided under applicable section (typically, this is the {or similar to} the accepted product data submittal), printed on letter size (8.5” x 11”) paper and as electronic files in PDF format

f. Warranty certificate from the manufacturer and the contractor, printed on letter size (8.5” x 11”) paper, wet signed as applicable

g. Manufacturer’s instructions for system or component use

h. Instructions and requirements for proper maintenance (according to the manufacturer) and as to maintain warranty

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications

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

2. Manufacturer(s) of products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that the specifications are met. Include in the program, at a minimum, provisions for:
   a. Incoming inspection of raw materials
   b. In-process inspection and final inspection of the cable product
   c. Calibration procedures of 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. Conform to government standards on quality assurance for applications within these specifications.

B. Contractor Qualifications:

1. A current, active, and valid and C7 or C10 California State Contractors License

2. Five, minimum, continuous years of experience

3. Five, minimum, completed projects similar to scope and cost

4. Evidence of technicians qualified for the work

C. Materials

1. Materials, support hardware, equipment, parts comprising units, etc., shall be new, unused, without defects and of current manufacturer, materials

2. Use specified products and applications, unless otherwise submitted and 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. Work under Division 27 shall confirm to the most stringent of the applicable codes.

2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The contract documents address the minimum requirements for construction.

E. Drawings

1. Follow the general layout shown on the drawings except where other work may conflict with the drawings.
2. 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. Drawings indicate the general route for pathways and cables, and show general locations of outlets. The drawings might not expressly show every conduit, sleeve, hanger, etc., but a complete system is required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery
1. Do not deliver products to the site until protected storage space is available.
2. Coordinate materials delivery with installation schedule to minimize 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. Immediately replace equipment damaged during shipping at no cost to the Owner, so as not to impact the construction schedule.

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 storage requirements for each product. Comply with recommended procedures, precautions or remedies as described in the 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 materials and equipment in accordance with manufacturer's written instructions. Handle with care to prevent damage, breakage, denting, and scoring.
2. Do not install damaged materials and equipment. Replace damaged equipment at no cost to the Owner.

1.8 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Sections within Division 27 may be combined into a single, overall schedule.

B. Do not proceed without written approval from the Owner or Owner’s Representative for schedule of this Work.

1.9 PROJECT MANAGEMENT AND COORDINATION

A. 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 include, but are not 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 work.
b. Thoroughly review other trades’ shop drawings to confirm compliance with the service requirements contained in the Division 27 contract documents. Document discrepancies or deviations as follows:
   1) Prepare memo summarizing the discrepancy
   2) Submit 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 the review
   3) Name of the individual performing the review
   4) Indication if follow-up coordination is required

3. Should existing conditions prohibit construction progress as submitted and approved, coordinate the adjusted installed locations with the other contractors (AV, electrical, etc).

B. Concurrent Installation
   1. The network will be installed concurrent with the work of Division 27. Coordinate your work with the Owner’s/network integrator’s work. For example, coordinate scope and dates for rack and cabling (terminations) readiness to allow the network integrator to plan and schedule installation of the network equipment (for example, access switches).

C. Role of the Engineer
   1. The Owner has retained the Engineer’s services through construction. During construction, the Engineer will work with and assist the Contractor as follows (in general):
      a. Review product data and shop drawings submittals for general compliance with the contract drawings and specifications.
      b. Provide interpretation and clarification of project contract documents
      c. Reply to (and ‘process’) relevant Requests for Information (RFIs)
      d. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
      e. Interpret field problems for Owner, and translate between Owner and Construction Team.
      f. Review the testing procedures to confirm compliance with industry-accepted practices.
      g. Observe the work for general compliance with the contract documents and to ensure that the installation meets the design intent of the system, and report progress to the Owner.

D. Use of Electronic Drawing Files
   1. Should the Contractor require the Engineer’s electronic files to produce shop drawings and/or as-built drawings, the Engineer will require the Contractor sign a file release agreement.

1.10 WARRANTY

A. As a minimum, warrant products and labor provided will, under normal use and service, be free from defects and faulty workmanship for period of 1 year from the date of acceptance. During the warranty period the entire system shall be kept in operating condition at no additional material or labor costs to the Owner. Also refer to specific sections for additional warranty requirements that supersedes the project’s minimum warranty.
B. Render service within 24 hours of system failure notification. Note deviations or improvements to this service at the time of bid and obtain written acceptance from the Owner, or Owner’s Representative.

C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. Provide complete replacement parts within 24 hours during the warranty period.

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

1.11 MAINTENANCE

PART 2 - PRODUCTS

2.1 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 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 Engineer in writing prior to ordering the material and performing installation work.

2.2 SUBSTITUTIONS

A. Conform to the substitutions requirements and procedures outlined in Division 00

B. Only one substitution for each product specified will be considered.

C. Where products are noted as "or equal", a product of equivalent design, manufacture, and performance will be considered. Submit product data (product information, catalog cuts, pertinent test data, etc.) to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc), 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.

D. 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 Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when “or equal” follows the manufacturers' names or model number(s).

E. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.
F. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.

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

3.1 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.

B. Furnish materials and execute workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.

D. Arrange and pay for review/inspection from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

3.2 EXAMINATION

A. Verify existing conditions, stated under other sections, are acceptable for installation in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman to supervise the crew performing the work and who is present at the job site at times work is being performed.

B. Construction Meetings: Participate in construction coordination meetings throughout the course of construction to review the progress and to resolve issues and conflicts. Prepare and distribute meeting agenda for telecommunication issues prior to, and meeting notes after meetings, in a format acceptable to the Owner. Publish meeting notes within 3 business days following the meeting.

C. Scheduling: Perform the work within the approved construction schedule. Keep the construction schedule current, based on the results of the construction meetings. At minimum, schedule shall document critical due dates, tasks, and milestones. Submit revised schedules for approval within 3 business days whenever there are modifications.

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

3.4 INSTALLATION

A. Complete work in a neat, high-quality manner, relative to common industry practices, and in accordance to NECA “Standard of Installation”.
B. Complete work in conformance to applicable federal, state and local codes, and telephone standards.

C. Coordinate the entire installation throughout the construction team (general contractor and subcontractors).

D. Manufacturer's Instructions: Comply with manufacturer’s published installation instructions, product data, product technical bulletins, product catalog, and other instructions for installation. Maintain a file on the jobsite of MSDSs for each product delivered to jobsite packaged with an MSDS.

E. Adjusting: Make changes and revisions to systems to optimize operation for final use. Make changes to systems such that defects in workmanship are corrected and completed systems pass the minimum test requirements.

F. Protection: Protect installed products and finish surfaces from damage during construction.

G. Repair/Restoration: Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement. Repair defects prior to system acceptance.

3.5 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over 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. Legally dispose of debris.

E. Clean installed products in accordance with manufacturer's instructions prior to Owner's, or Owner’s Representative’s, punch walk.

3.6 PUNCH WALKS AND PUNCH LISTS

A. Punching the Work of individual Sections of Division 27 may be combined when noted so.

B. Execute a punch walk with the Engineer and the Owner or Owner’s Representative to observe Work.

C. Develop a punch list for items needing correction. Issue this punch list to Engineer.

D. Correct the Work as noted on punch list.

E. Execute follow up punch walk with the Engineer and the Owner or Owner’s Representative to verify punch list items have been corrected.

3.7 SYSTEM ACCEPTANCE

A. Complete corrections (punch list items) prior to submitting acceptance certificate.

B. On completion of the acceptance test, submit system acceptance certificate to the Owner or Owner’s Representative requesting their signature and return of the certificate. Issue copies of the signed certificate back to the Owner or Owner’s Representative with copy to the Engineer.
3.8 TRAINING

A. After acceptance, schedule a time convenient with the Owner, or Owner's Representative, for instruction in the configuration, operation, and maintenance of the system.

B. Refer to individual sections within Division 27 for additional training requirements.

END OF SECTION
SECTION 27 05 43 - COMMUNICATIONS OUTSIDE PLANT PATHWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Outside plant underground pathways for communications (and other low voltage systems)

1.2 BASE BID WORK

A. General

1. The work of this section includes the planning of and coordination with other trades for outside plant pathways, furnishing necessary materials, and the labor and associated services required to install pathways and structures. Work of this section includes the tools and equipment necessary to provide a complete and working underground pathways system.

2. The drawings are diagrammatic in nature, and require shop drawings to complete the detailed design of the underground pathways system and coordination with other underground utilities and services.

3. In general, OSP pathways consist of the following subsystems:
   a. Surveying and determining existing underground infrastructure
   b. Laying out the routes
   c. Submittals
   d. Obtaining permit for digging and underground construction work
   e. Excavation, trenching, and shoring (as necessary)
   f. Underground duct banks (conduits) and precast concrete structures (vaults, maintenance holes, and/or hand holes)
   g. Backfill and patching
   h. Identification tags and system labeling
   i. Close Out Documents
   j. Warranty

B. Design-Bid-Build Scope of Work

1. Investigation
   a. Coordinate with utilities to locate and mark existing underground utilities infrastructure.
   b. Coordinate with property owner and others as needed to locate and mark existing underground infrastructure.

2. Submittals
   a. Initial Shop Drawings, showing the following:
      1) Duct routes with duct quantities and sizes per segment
      2) Vault, pull box, and handhole locations
   b. Initial Product Data, including the following:
      1) Conduits, vaults
   c. Final Shop Drawings, showing the following:
      1) Duct routes with duct quantities and sizes per segment and elevations/depths
      2) Vault, pull box, and handhole locations and details – type, interior dimensions, lid details, etc (V/MH/PB/HH schedule) with elevations
      3) Utilities and other underground facilities
4) Trench sections and details
d. Final Product Data, including the following:
   1) Conduits, fittings, vaults, accessories

3. Pre-Construction Coordination
   a. Field Layout – Based on the approved shop drawings, mark duct bank routes and precast structure locations.
   b. Utilities Notifications – As needed, notify utilities of site work to satisfy each utility’s requirements.

4. Final Design
   a. Confirm duct quantities and/or duct bank routes
   b. Confirm vault and/or pull box locations

5. Coordination
   a. Prior to the start of excavation work
   b. Coordinate elevations of ducts and duct-bank entrances into vaults and pull boxes with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit field conditions and to ensure duct runs drain to vaults and pull boxes.

C. Underground Duct Banks
   1. Provide complete duct banks, including construction materials needed during construction (such as spacers, etc.), that meet or exceed the requirements herein. Refer to the associated drawings for quantities, sizes, types, routes, and additional installation requirements.
   2. Provide 4-inch trade size ducts or as noted herein or shown on the drawings.

3. Concrete Encasement
   a. Provide steel-reinforced, concrete-encasement at turns 45 degrees or greater with less than a 24.4 m (80’) radius. Encasement shall prevent pulling stress on conduit bends in both horizontal and vertical directions.
   b. Encasement shall result in 51 mm (2”) of top cover, 25 mm (1”) at the sides and 25 mm (1”) beneath the duct bank, minimum.

D. Precast Concrete Structure – Maintenance Holes
   1. Provide vaults and/or pull boxes within 30 m (100’) of any 90-degree duct bank turn and at intervals not exceeding 152 m (500’). Adjust spacing to avoid paved areas and traveled roadways.
   2. Vaults and pull boxes shall be precast units that conform to USDA Rural Utilities Service (RUS) specifications.
   3. For branch duct runs, provide pull boxes approximately 1.5 m (5’-0”) long by 0.9 m (3’-0”) wide by 0.9 m (3’-0”) deep (internal dimension) or as shown on the drawings. Branch runs are those serving a single facility and contain four or fewer ducts.

E. Earthwork
   1. Excavation, shoring, and backfill shall comply with applicable codes, regulations, and standards and with Division 31, where explicitly called out or not.
   2. Excavation: Excavate to the depth and width required for the duct banks and encasement using means and methods approved for this project.
   3. Shoring: As required for this project and per applicable safety guidelines, shore excavation to prevent collapse.
   4. Backfill: Backfill trenches using soil the same as or similar to the surrounding soil to 90 percent
compaction.

F. Duct Bank Marking/Warning
   1. Provide marking/warning tape per duct bank.

G. Subducting / Innerduct
   1. Provide two 3-cell fabric subducts into the ducts designated for fiber optic cabling, or as noted on drawings. The subduct within a given duct shall be uniquely colored or have an identification marker/colored stripe.

H. Duct Plugs
   1. Provide duct plugs at each duct end and each innerduct end – duct plug type (blank, quadport, etc.) and size shall match application. In unused ducts, provide blank duct plugs. In ducts containing innerducts, provide triport and/or quadport duct plugs to seal around the innerduct within the duct.
   2. In unused corrugated innerducts, provide blank plugs. In innerducts containing a cable, provide simplex plugs to seal around cables within the innerducts.
   3. Expanding foam as a duct plug method is not permitted.

I. Related Sections
   1. Comply with the Related Sections paragraph of section 27 00 00.
   2. Division 26, “Electrical” (related conduit work)

1.3 REFERENCES

A. Comply with the References requirements of section 27 00 00.
   1. In additional to those codes, standards, etc., listed in 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified.
   2. American Association of State Highway and Transportation Officials (AASHTO):
      a. LRFD Highway Bridge Design Specifications
      b. AASHTO T280-06-UL, “Standard Method of Test for Concrete Pipe, Manhole Sections, or Tile”
   3. American Concrete Institute (ACI):
      a. SP-66, “ACI Detailing Manual”
      b. ACI 212.3R, “Report on Chemical Admixtures for Concrete”
      c. ACI 301, “Structural Concrete for Buildings”
      d. ACI 304R, “Guide for Measuring, Mixing, Transporting, and Placing Concrete”
      e. ACI 305R, “Hot Weather Concreting”
      f. ACI 306R, “Cold Weather Concreting”
      g. ACI 318, “Building Code Requirements for Structural Concrete”
   4. American National Standards Institute, Inc. (ANSI):
      a. ANSI C80.1, “Rigid Steel Conduit, Zinc-Coated”
      a. ASTM C33, “Concrete Aggregates”
      b. ASTM C39, “Compressive Strength Cylinder Specimens”
      c. ASTM C94, “Ready-Mixed Concrete”
      e. ASTM C150, “Portland Cement”
f. ASTM C173, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method"
g. ASTM C231, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method”
h. ASTM C260, “Air Entraining Admixtures for Concrete”
i. ASTM C309, “Standard Specifications for Liquid Membrane Forming Compound for Curing Concrete”
j. ASTM C478, “Precast Reinforced Concrete Manhole Sections”
k. ASTM C494, “Chemical Admixtures for Concrete”
l. ASTM C497, “Testing of Manhole Sections”
m. ASTM C615, “Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement”
n. ASTM C706, “Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement”
r. ASTM C1037, “Standard Practice for Inspection of Underground Precast Concrete Utility Structures”
s. ASTM C1064, “Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete”
t. ASTM C1244, “Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test”
u. ASTM F2176, “Standard Specification For Mechanical Couplings Used On Polyethylene Conduit, Duct And Innerduct”

6. Building Industry Consulting Services International (BICSI)
   a. “Customer-Owned Outside Plant” manual

7. Concrete Reinforcement:
   a. ANSI/ASTM A82, “Cold Drawn Steel Wire for Concrete Reinforcement”
   d. ASTM A615, “Deformed and Plain Billet Steel Bars for Concrete Reinforcement”
   e. AWS D12, “Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction”

   a. CFR 29 Part 1910.146; “Permit-Required Confined Spaces Standard”

9. National Electrical Manufacturers Association (NEMA):
   a. NEMA TC 2, “Electrical Polyvinyl Chloride (PVC) Conduit”
   b. NEMA TC 3, “Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing”
   c. NEMA TC 7, “Smooth-Wall Coilable Electrical Polyethylene Conduit”
d. NEMA RN1, “Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

10. Telecommunications Industry Association (TIA):

11. Underwriter’s Laboratories (UL):
   a. UL 6, “Rigid Metal Conduit”
   b. UL 514B, “Conduit, Tubing, and Cable Fittings”
   c. UL 651, “Schedule 40 and 80 Rigid PVC Conduit”
   d. UL 797, “Electrical Metallic Tubing – Steel”

12. California Public Utilities Commission (CPUC)
   a. relevant documents/standards

1.4 DEFINITIONS

A. Definitions as described in section 27 00 00 shall apply to this section.

B. In addition, define the following list of terms as used in this specification as follows:
   1. “CPUC”: California Public Utility Commission
   2. “Duct”: Conduit and other raceway, either metallic or nonmetallic, used underground embedded in earth or concrete
   3. “Duct Bank”: Two or more ducts installed underground in same trench or concrete encasement
   4. “Handhole”: An underground pathway structure providing above-grade hand access into the ducts/duct banks for cable placement
   5. “HDPE”: high-density polyethylene
   6. “IOR”: Inspector Of Record
   7. “Maintenance Hole”: An underground pathway structure providing above-grade person access (large enough for a person to stand within) into the ducts/duct banks for cable placement, splicing apparatus
   8. “Manhole”: an access point to a sewer system; for telecommunications, see “Vault”
   9. “NEC”: National Electrical Code, NFPA 70
  10. “OSP”: Outside Plant
  11. “PVC”: Polyvinyl Chloride
  12. “Pull Box”: see maintenance hole
  13. “Vault”: An underground pathway system structure providing above-grade person access (large enough for a person to fully enter) into the ducts/duct banks for cable placement, splicing apparatus, wiring, and equipment

1.5 SYSTEM DESCRIPTION

A. The installation shall comply with the CEC.

B. Electric wiring is not permissible to be installed within telecommunications OSP pathways.

C. Underground Duct Banks
   1. Allowable Conduit Types:
      a. Underground Conduit in Grade (direct burial):
         1) Straight runs: NEMA TC 2 EPC-40
         2) Bends and turns: NEMA TC 2 EPC-80
3) When entering buildings: transition to GRS conduit approximately 3 to 6 m (10 to 20 feet) from building

b. Underground Conduit Encased in Concrete:
   1) Straight runs: NEMA TC 2 EPC-40
   2) Bends and turns: NEMA TC 2 EPC-40
   3) When entering buildings: transition to GRS conduit approximately 3 to 6 m (10 to 20 feet) from building

c. Beneath Building Floor Slab:
   1) Straight runs: NEMA TC 2 EPC-40
   2) Bends and turns: NEMA TC 2 EPC-80
   3) Penetrations through the slab: PVC-coated GRS

2. Disallowed Conduit Types – The following duct types are not allowed:
   a. Encased burial Type EB-20 and Type EB-35 power and communications (P&C) duct
   b. Direct burial Type DB-60, Type DB-100, and Type DB-120 utility duct
   c. Type C telephone duct

3. Burial depth (cover requirement) of ducts not encased in concrete: 600 mm (24”), minimum.

D. Above-Ground Duct Banks
   1. Allowable Conduit Types:
      a. Straight runs: NEMA TC 2 EPC-40, EPC-80, or GRS
      b. Bends and turns: NEMA TC 2 EPC-80 or GRS
      c. Penetrations through the building envelope: GRS
   2. Disallowed Conduit Types – The following duct types are not allowed:
      a. Encased burial Type EB-20 and Type EB-35 power and communications (P&C) duct
      b. Direct burial Type DB-60, Type DB-100, and Type DB-120 utility duct
      c. Type C telephone duct

E. Separation Requirements:
   1. The installation shall meet separation requirements of the CEC, BICSI’s “Outside Plan Design Reference Manual”, and, where applicable, CPUC regulations.
   2. Communications duct systems and electrical ducts: not less than 76 mm (3”) concrete or 304 mm (12”) earth
   3. Communications duct systems and gas, water, or other pipe systems: not less than 76 mm (3”) concrete or 304 mm (12”) earth
   4. Communications duct systems and warning tape: not less than 300 mm (12”) earth

1.6 SUBMITTALS

A. Submit required submittals to the General Contractor in the quantities and formats as required under the general contract. In the absence of requirements comply with the Submittals article of section 27 00 00 for procedural, quantity, and format requirements.

B. Submittal Requirements Prior to Construction
   1. Bill of Materials and Product Data Submittal
      a. Product data submittals shall include datasheets/cutsheets/catalog pages for each product, structure, and component required for a complete system and shall cover the components specified herein. Clearly mark on each page the specific item(s) being submitted and the proposed application.
b. Product data submittals shall list physical and electrical characteristics and ratings, shall indicate conformance with NEC, UL, NEMA, ASTM, and other listings, certifications and specifications, and shall include manufacturer’s certification(s) that products meet the required ASTM and other specifications. As needed, include inspection report(s) for factory inspections, according to ASTM C1037, and compliance reports for concrete and steel used in precast concrete utility structures, according to ASTM C858.

c. Product data submittals shall include drawings for precast concrete units produced by the precast concrete manufacturer showing details of steel reinforcing size and placement and shall demonstrate that the design loads and standards have been met.

d. For custom-made precast concrete units, in addition to the requirements above, drawings shall show locations and dimensions to all penetrations and special embed items, product dimensions and cast thicknesses.

2. Shop Drawings Submittal
   a. Shop drawings shall be drawn to accurate scale, where scaling applies.
   b. Shop drawings shall consist of site plans that show the following:
      1) Duct bank routes and maintenance hole locations. Duct bank routes shall be tagged with duct quantities and sizes and with burial depths per section. Maintenance hole locations shall be scheduled or tagged with type, dimensions/configuration, and other pertinent information.
      2) Trench sections, showing trench profiles and coordination with other utilities and trades
      3) Maintenance hole details, showing products, components, accessories, etc., included
      4) Other drawings that clearly illustrate a fully coordinated (with other trades, utilities, and underground structures) layout

c. Shop drawings shall include details and design calculations for precast telecommunications vaults, including steel reinforcement.

d. Shop drawings shall show existing utilities and site infrastructure – at least to the extent of adjacency to the work of this section and that which requires modification and/or relocation.

C. Submittal Requirements at Close Out
   1. As-Built Drawings
      a. As-built drawings shall show installed duct banks and underground structures, including:
         1) Dimensioned duct bank routes in plan, duct bank configurations and depths
         2) Dimensioned underground structure locations and types (such as vaults, maintenance holes and/or pull boxes), and include ‘butterfly’ diagrams (explicitly showing the structures’ configurations).

2. Warranty statement and instructions

D. Substitutions: Requests for substitutions shall conform to the general requirements and procedure outlined in section 27 00 00.

1.7 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.
B. Precast Concrete Products Manufacturer Requirements
   1. Precast concrete product manufacturers shall have been regularly and continuously engaged
      in the manufacture of precast concrete units similar to that indicated in the project
      specifications or drawings for at least 10 years.
   2. Precast concrete product manufacturer’s plant shall comply with the standards set forth in the
      National Precast Concrete Association Quality Control Manual as applicable to the products
      and plant type. The precast concrete manufacturer’s processes, procedures, and practices
      shall meet the standard practices of ASTM C1037, including the inspection of underground
      precast concrete utility structures designed and manufactured in accordance with Practice
      C857 and Specification C858.
   3. Precast concrete product manufacturers shall maintain a permanent quality control
      department or retain an independent testing agency on a continuing basis. The agency shall
      issue a report, certified by a licensed engineer, detailing the ability of the precast concrete
      producer to produce quality products consistent with industry standards.

C. Contractor Requirements
   1. The Contractor shall be experienced in all aspects of this work and shall demonstrate direct
      experience on recent projects of similar scope and size.
   2. The Contractor shall have personnel who are adequately trained and experienced in the use
      of the tools and equipment necessary for successful installation and testing of underground
      pathways systems.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with delivery, storage and handling requirements of section 27 00 00.

B. Handling
   1. Ship, unload, handle, and store products in a manner to minimize damage.
   2. For precast concrete structures, lift using appropriate crane (or similar) equipment connected
      to precast holes or inserts consistent with industry standards. Lift with methods, or devices,
      intended for this purpose.

C. Acceptance at Site
   1. Inspect precast concrete products upon arrival at the jobsite. Reject damaged and/or cracked
      precast products.
   2. Notify Owner/Owner’s Representative of delivery of precast products for inspection at their
      discretion.

1.9 WARRANTY

A. Warrant products and labor provided will, under normal use and service, be free from defects and
   faulty workmanship for period of not less than 5 years from the date of acceptance. During the
   warranty period the entire system shall be kept in operating condition at no additional material or
   labor costs to the Owner.

B. Render service within 24 hours of system failure notification. Note deviations or improvements to
   this service at the time of bid and obtain written acceptance from the Owner, or Owner’s
   Representative.
C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. Provide complete replacement parts within a 24-hour period during the warranty period.

PART 2 - PRODUCTS

2.1 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 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 Engineer in writing prior to ordering the material and performing installation work.

2.2 RIGID NONMETALLIC CONDUIT (RNC) AND FITTINGS / ELECTRICAL PVC CONDUIT (EPC) / SCHEDULE 40 AND SCHEDULE 80

A. Application: products and assembled system shall be suitable for underground direct burial or encased applications, in accordance with the NEC, Article 352.

B. Conduit and fittings shall be homogeneous polyvinylchloride (PVC) material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar cables.

C. Conduit, fittings, and accessories shall be UL Listed, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent.

D. Conduit, fittings, and accessories shall be from a single manufacturer to assure system integrity.

E. Conduit:
   1. Conduit shall comply with UL 651 and NEMA TC 2 types EPC-40 (schedule 40) or EPC-80 (schedule 80).
   2. Conduit shall include an integral bell fitting at one end.

F. Fittings:
   1. Fittings (and couplings, adaptors, transition fittings, etc.) shall comply with UL 514B and NEMA TC 3.
   2. Fittings, couplings, adaptors, transition fittings, etc., shall be slip-on type and solvent weld type.
   3. Factory fittings and bends bend radius shall be 1.2 m (48"), minimum.

G. Duct Spacers/Supports: Duct spacers shall provide minimum duct spacing and shall support ducts during backfill and/or concrete pour (encasement).

H. End Caps: Pre-manufactured water-tight end caps

I. PVC Solvent Cement
   1. Application: For use in outdoor and underground installations to permanently join PVC sections (conduit ends, couplers, etc.).
   2. Cement shall withstand temperature of 300 degrees F without slump.
3. Cement shall be safe for human skin contact and not deleterious to cable sheathing, metallic conduits, conduit coatings, concrete, etc.
4. Workable temperatures range: from 40 to 100 degrees F

J. Duct Supports / Spacers: to provide minimum duct spacing and to support ducts during backfill.

K. Manufacturers, or equal:
1. Allied Tube & Conduit
2. Carlon
3. JM Eagle
4. Ridgeline Pipe Manufacturing

2.3 GALVANIZED RIGID STEEL (GRS) CONDUIT / ELECTRICAL RIGID STEEL CONDUIT (ERSC)

A. Application: products and assembled system shall be suitable for underground exposed/direct burial applications, in accordance with the NEC, Article 347.

B. Conduit:
1. Conduit shall be rigid conduit fabricated from high-strength high-quality prime steel, hot dip galvanized inside and out, precision-rolled, with a clean homogeneous weld structured for a smooth, burr-free interior surface
2. Conduit shall be UL Listed to UL 6, and shall conform to ANSI C80.1 as Electrical Rigid Steel Conduit (ERSC).
3. Conduit shall be recognized as an equipment grounding conductor by NEC Article 250.

C. Fittings:
1. Fittings (factory-manufactured) shall be UL Listed to UL 6, and shall conform to ANSI C80.1 as Electrical Rigid Steel Conduit (ERSC).
2. Fittings, couplings, and adaptors shall be recognized as an equipment grounding conductor by NEC Article 250.
3. Factory elbows shall have 48-inch radius.
4. Factory-cut threads shall be hot dipped galvanized.

D. Duct Supports / Spacers: to provide minimum duct spacing and to support ducts during backfill.

E. Manufacturers, or equal:
1. Allied Tube & Conduit
2. Republic Conduit
3. Western Tube & Conduit

2.4 PRECAST CONCRETE STRUCTURES – MAINTENANCE HOLES

A. Maintenance hole shall be a rectangular precast structure designed to be buried with the top flush to the finished grade and fully exposed. Maintenance hole shall be large enough for a technician to stand within but not deep enough to fully enclose the technician. Maintenance hole shall be suitable for small, medium, and large cables, and shall be suitable for storing cable splicing apparatus. Maintenance hole shall have ports for ducts on two opposing ends.

B. Fabrication
1. Pull boxes and extensions shall be cast formed using concrete mix and reinforcing in accordance with ACI 318.
   a. Concrete: 5000 psi compressive strength at 28 days
b. Rebar: ASTM A615 Grade 60 or ASTM A706 Grade 60

c. Mesh: ASTM A1064 Grade 70

2. Joints: Joints (e.g., between base and extension) shall be tongue-and-groove type, shall firmly interlock adjoining components, and shall be waterproof.

3. Duct Ports and Knock-Out Panels: Pull boxes shall include duct ports (Oldcastle “Term-A-Duct”, M.A. Industries, or similar) or knock-out panels for conduit connections.

4. Lifting Anchors: Pull boxes shall have lifting irons cast into the top and/or each section for proper handling and lifting. Lifting anchors shall be bent steel rod, hot dipped galvanized.

5. Pulling Irons: Pull boxes shall have 1 pulling iron per end cast into the interior at the floor-wall chamfer or in the wall. Pulling irons shall be bent steel rod, hot dipped galvanized, with an exposed triangular opening, stress relieved after forming, and fastened to reinforced rod. Ultimate yield strength: 40,000 pounds shear and 60,000 pounds tension.

6. Provide maintenance holes cast in a PCI Certified Plant.

C. Size: As shown on the drawings

D. Cover:
   1. Cover shall be split (2-piece) slip resistant galvanized steel, with torsion-assist opening.
   2. Cover shall be H20 traffic rated.
   3. Covers shall include “TELEPHONE”, “COMMUNICATIONS”, or other appropriate identification, on the upper side. Letters shall be no less than 2 inches high.

E. Racking
   1. Rack Stanchions: Pull boxes shall come equipped with rack stanchions either attached onto or cast into the interior side of each long wall, spaced at no greater than 457 mm (18") apart. Stanchions shall be hot-rolled, hot-dipped, galvanized "T" section steel, 57 mm (2.25") size, punched with 14 holes on 38 mm (1.5") centers for cable arm attachment. Stanchions may also be non-metallic.
   2. Refer to “Concrete Anchors” in this section for fasteners used for attachment to concrete (e.g., rack stanchions) after casting.
   3. Cable Support Arms: Pull boxes shall come equipped with cable support arms attached to rack stanchions at 762 (30") intervals. Cable arm supports shall be hot-rolled, hot-dipped, galvanized sheet steel, 4.7 mm (3/16") thick pressed to channel shape, 304 to 355 mm (12 to 14") long. Cable support arms may also be non-metallic.

F. Manufacturers, or equal:
   1. Oldcastle Precast

2.5 PRECAST CONCRETE STRUCTURES – HANDHOLES

A. Handholes shall be precast rectangular concrete monolithic structures with lift-off covers designed for in-grade applications with the top flush to the finished grade and the cover fully exposed and may or may not have a manufactured bottom. Handholes are intended for smaller or ‘drop’ cables and other tertiary routes and to not house splice apparatus.

B. Handholes shall meet (or exceed) ASTM D1693.

C. Fabrication
   1. Handholes and extensions shall be cast formed using concrete mix and reinforcing in accordance with ACI 318.
2.6 JOINT SEALANT – FOR PREFORMED CONCRETE STRUCTURES

A. Application: Sealant applied to joints in sectional vaults, intercept boxes, risers, extensions, collars, and other joints of preformed concrete for the purpose of waterproofing.

B. Sealant shall meet ASSHTO M-198 and ASTM C990.

C. Sealant shall provide excellent strength and adhesion.

D. Sealant should be cold-applied.

E. Manufacturers, or equal:
   1. Henry Company #BN109; Butyl-Nek® joint sealant

2.7 CONCRETE ANCHOR

A. Application: Anchors for attachment to precast concrete structures (after concrete is cast).

B. Description: Expansion wedge type anchor, zinc-plated carbon steel with stainless-steel expander cup

C. Size: 12.7 mm (1/2") bolt size

D. Strength: 5000 pound (minimum) rated pull-out strength, and 6,800 pound rated shear strength minimum.

E. Manufacturers, or equal:
   1. Hilti
      a. KWIK Bolt TZ (ICC ESR-1917)

2.8 MORTAR

A. Application: Mortar to fill interstitial spaces of precast concrete structures and seal conduit entrance into maintenance hole through knock-out ports.

B. For applications less than 2.0 cubic ft, mortar shall conform to ASTM C270, Type M; for applications larger than 2.0 cubic ft, mortar shall conform to ASTM C387, Type M.

2.9 MARKING / WARNING TAPE
A. Application: Suitable for direct burial placed above a duct bank to mark the duct bank’s existence below (marking/protection during future digs/trenching/etc.).

B. Material: 5 mil thick tape, 0.35 solid aluminum foil, 0.8 mil print tape (laminated to foil), 3.75 mil clear outer film.

C. Width, according to the following table:

<table>
<thead>
<tr>
<th>Burial Depth</th>
<th>Tape Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>6” to 12”</td>
<td>2”</td>
</tr>
<tr>
<td>12” to 24”</td>
<td>3”</td>
</tr>
<tr>
<td>24” to 30”</td>
<td>6”</td>
</tr>
</tbody>
</table>

D. Color: orange.

E. Tape shall be detectable above finish grade using a locator.

F. Manufacturers, or equal:
   1. Carlon
      a. #MAT3T61; detectable underground marking tape, 3” W x 1000’, orange, print: “CAUTION TELEPHONE CABLE BURIED BELOW”
      b. #MAT6T61; detectable underground marking tape, 6” W x 1000’, orange, print: “CAUTION TELEPHONE CABLE BURIED BELOW”
      c. #MAT3O61; detectable underground marking tape, 3” W x 1000’, orange, print: “CAUTION FIBER OPTIC CABLE BURIED BELOW”
      d. #MAT6O61; detectable underground marking tape, 6” W x 1000’, orange, print: “CAUTION FIBER OPTIC CABLE BURIED BELOW”
      e. #MAT3T21; standard underground marking tape, 3” W x 1000’, orange, print: “CAUTION TELEPHONE CABLE BURIED BELOW”
      f. #MAT3O21; standard underground marking tape, 3” W x 1000’, orange, print: “CAUTION FIBER OPTIC CABLE BURIED BELOW”
      g. #MAT6O21; standard underground marking tape, 6” W x 1000’, orange, print: “CAUTION FIBER OPTIC CABLE BURIED BELOW”
      h. #MAT3O51; extra strength underground marking tape, 3” W x 1000’, orange, print: “CAUTION FIBER OPTIC CABLE BURIED BELOW”

   2. Presco Marking Products
      a. #D2105051-457; detectable underground marking tape, 2” W x 1000’, orange, print: “CAUTION BURIED FIBER OPTIC LINE BELOW”
      b. #D3105051-457; detectable underground marking tape, 3” W x 1000’, orange, print: “CAUTION BURIED FIBER OPTIC LINE BELOW”
      c. #D6105051-457; detectable underground marking tape, 6” W x 1000’, orange, print: “CAUTION BURIED FIBER OPTIC LINE BELOW”

   3. Rhino Marking and Protection Systems

2.10 PULL TAPE / PULL ROPE

A. Application: Suitable for short-term and long-term placement into an underground duct for pulling cables into duct; pull rope/tape shall not degrade or weaken if left in underground duct over several years.
B. Material: Pull Tape: low-stretch double-braided polyester or aramid yarn; Pull tape: woven polyester or aramid yarn, pre-lubricated, printed with sequential length markings

C. Break strength: 1,000 lb, minimum.

D. Manufacturers of pull tape, or equal:
   1. Carlon #TL14505; 1/2" woven polyester prelubricated tape, 1250 lbs
   2. Carlon #TL38203; 5/8" woven polyester prelubricated tape, 1800 lbs
   3. Condux
   4. Neptco

E. Manufacturers of pull rope, or equal:
   1. Carlon #SB14105; white diamond braid (polyethylene-over-polyester) rope
   2. Condux
   3. Greenlee
   4. Neptco

2.11 SUBDUCT – “FABRIC”

A. Application: Subduct suitable for an outdoor installation within an underground pathways system (conduits, maintenance holes, etc.) for the purpose of sub-ducting the pathways to support communications cables (primarily fiber optic cables).

B. Material: Flexible, multi-cell design, textile innerduct, with pull tape in each cell; factory lubricated

C. Finish: Packs shall be color-coded by printing and stitching; Cells shall be colored by pull tape stitching

D. Subduct shall contain a copper conductor within the wall of the duct for toning/locating.

E. Subduct should contain a pulling tape or rope; meeting the requirements of this specification. At a minimum, each subduct cell shall contain a pull string to place a pull rope/tape.

F. Manufacturers, or equal:
   1. TVC Communications’ “MaxCell”
      a. #MXE 86383 BL xxxx; 3" 3-cell textile Innerduct, blue
      b. #MXC1K31; Install kit for MaxCell innerduct (includes four swivels and one 3-way chain harness)

2.12 DUCT PLUGS

A. Application: Duct plugs suitable for installation into duct ends within underground structures (vaults, maintenance holes, pull boxes) for sealing ducts against water ingress and for securing innerducts and cables against recoil.

B. Manufacturers, or equal:
   1. Carlon
      a. #MAEPG7; blank plug for 4-inch duct (3.94”-4.33”)
   2. Tyco
      a. #377850 (JM-BLA-40D402U); blank plug for 4-inch duct (3.94”-4.17”)
   3. Condux International, Inc
PART 3 - EXECUTION

3.1 GENERAL

A. Comply with section 27 00 00 Execution requirements.
B. Codes and Standards: Complete work in conformance to applicable federal, state and local codes, and telephone standards.
C. Manufacturer's Instructions: Complete work in conformance to manufacturer's installation instructions, product data, technical bulletins, and packaging instructions.
D. Use only listed products.
E. Maintain proper access to the site for facilitate hauling, storage, and proper handling of the precast concrete products.
F. Maintain access to call boxes, fire hydrants, etc., throughout work. Maintain access to public premises, street crossings, sidewalks and other points to prevent interruption of travel.
G. Provide barricades surrounding open work, trenching, or open maintenance holes to prevent potential injury from non-crew persons.
H. Coordinate with the local Fire Department when trenching close to or temporarily blocking a roadway or fire access pathway. Review with the local Fire Department on a daily basis, planned road/pathway closures and alternate access roads/pathways in the event of an emergency.
I. If boring, cutting, or coring to existing structures is required, obtain prior approval from the Owner’s Representative. Conform to approval requirements.
J. Protection
   1. Protect existing utilities and structures during underground work activities.
   2. Protect installed products and finish surfaces from damage during construction.
K. Replace or repair work completed by others that you deface or destroy.

3.2 EXAMINATION AND PREPARATION

A. Prior to preparation of shop drawings:
   1. Obtain and review drawings showing underground utility facilities and other underground infrastructure at and around the site.
   2. Thoroughly survey the installation area and access to the area to thoroughly determine and understand the work, and to determine the location of existing underground utilities, facilities and structures such as gas, water, sewer, power, telephone cables, etc., in the vicinity of the proposed trenching and excavation work. Study the soil structure to determine proper shoring, sloping, and/or other measures are properly planned.
   3. The shop drawings shall be based on the contract documents and the results of this survey, and shall show existing utilities and facilities (at least to the extent related to or affected by the work of this section).
B. Prior to the start of work:
   1. Commence installation only after satisfactory conditions are met.
   2. Verify the site, the area, and access to the area is ready for excavation and duct and
maintenance hole installation.

3. Verify utilities and other owners have placed markings that locate underground utilities, facilities and structures such as gas, water, sewer, power, telephone cables, etc. Notify utilities and owners if markings appear incomplete.

4. Verify no obstacles will interfere with crane operations and precast concrete maintenance hole installation, or will create a safety hazard, such as overhead wires, building structures, work progress, etc.

5. Mark the proposed routing of trenches and maintenance holes using chalk or other approved means for review and approval by inspector.

### 3.3 EARTHWORK

A. Trenching, excavation, and backfill shall conform to Division 31, “Earthwork”.

B. Make every effort to avoid damage to the facilities of others. If any damage occurs, immediately notify the owner of the damaged facility.

C. Excavation and Trenching Coordination

1. Conform to elevations and dimensions where shown on drawings.

2. Tolerances: Excavate to within 1.5 inches, plus a sufficient distance to permit placing and removal of concrete formwork, installation or services, other construction, and for inspection.

3. Within drip-line of large trees, excavate areas by hand. Protect the root system from damage and dry-out. Wrap burlap over exposed roots to maintain moist conditions for root system. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint.

4. Where a new duct bank or conduit run must cross an existing utility, excavate by hand to expose the specific utility line prior to employing mechanical excavation equipment.

5. Excavate by hand to final depth just before concrete reinforcement is placed.

6. Minimize disruption to the bottom of excavations.

7. Avoid overloading. Keep surcharge sufficient distance back from edge of excavation to prevent slides or caving. Maintain and trim excavated materials in such a manner to be as little inconvenience as possible to public.

D. Trenching (Excavation and Trench Prep) for Duct Banks

1. Excavate trenches to uniform depth and width, sized for the duct back to be placed into the trench and with sufficient working room – 6 to 9 inches – on both sides of ducts and equipment.

2. Pitch the trench uniformly towards manholes or both ways from high points between manholes for the required duct line drainage. Avoid pitching the ducts toward building wherever possible.


4. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.

5. Where the route crosses an existing utility, excavate by hand to expose the specific utility line prior to employing mechanical excavation equipment.

6. Where rock is encountered, excavate a minimum of 6 inches below required elevation. Backfill to minimum depth with a layer of crushed stone or gravel prior to installation of duct banks.

7. Where the underlying material appears to be wet or soft or where it deflects under wheel loads, employ excavation and work techniques that do not worsen the subgrade condition.
E. Pit Excavation for Vaults, Maintenance Holes, Pull Boxes, and/or Handholes
   1. Excavate earth at approved locations to create pits for precast concrete structures sized as required by the manufacturer for the size and type of structure and to meet this specification’s requirements.
   2. Tolerances: Plus or minus 0.10 foot, plus a sufficient distance to permit placing and removal of concrete formwork, installation or services, other construction, and for inspection.
   3. Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.
   4. Excavate pit to required depth, width, and length, and with sufficient space for working and backfill (6 to 9-inch clearance, minimum, on all sides of precast structures).
   5. Shoring: Shore compliant to federal, state, and local regulations.
   6. Provide a bed of gravel or crushed stone to a level and evenly distributed 6- to 12-inch thickness compacted to 95% of ASTM D558 density.

3.4 DUCT BANK (CONDUIT) INSTALLATION AND ENCASEMENT
A. Prior to the start on duct bank installation, verify trenches and excavations conform to manufacturer and specification tolerances.
B. Slope duct banks to drain towards vaults, and away from buildings and equipment room entrances. Pitch not less than 4-inches per 100 feet.
C. Where duct bank route changes direction, sweep ducts using a minimum radius of 25 feet. The use of factory bends is limited to building entrances and equipment stub-ups.
D. Installation of Ducts into Trench
   1. Install spacers at 1- to 5-foot intervals for conduits to securely support the duct bank assembly, to maintain uniform duct-to-duct spacing, and to maintain a 3-inch, minimum, clearance above bottom of trench during backfill. Tie together using non-ferrous tie wires to prevent displacement.
   2. Make joints in ducts and fittings watertight according to manufacturer's instructions. Stagger joints so those of adjacent ducts do not lie in the same cross-sectional plane.
E. Interface with Buildings and with Vaults and Maintenance Holes
   1. Transition to GRS conduit and factory bends to within 20 feet of buildings.
   2. Slope ducts away from buildings and equipment room entrances with a pitch not less than 4 inches per 100 feet. Slope ducts towards vaults and maintenance holes with a pitch not less than 4 inches per 100 feet.
   3. Complete transition of duct trench spacing to box-connection spacing approximately 10 feet from vaults and maintenance holes without reducing duct slope and without forming a trap in the duct.
   4. Terminate ducts at vaults and maintenance holes into the manufactured termination ports. Grout the conduits into ports from both sides to provide watertight entrance.
   5. Arrange ducts to enter and exit vaults and maintenance holes on directly opposite ends (to facilitate for straight-through cable pulls).
   6. When arranging ducts in vaults and maintenance holes, use the lower ports first, starting with the bottommost port and working upward. Ensure that the pattern of ducts (i.e., 1, 2, 3, 4, etc.) remains the same on both ends of a duct run. For example, on a north-south duct run, the lowest duct on the east side leaving one vault would also be the lowest duct on the east...
7. Existing Buildings: Do not core-drill existing perimeter walls to enter a building without written permission from the Owner or Owner’s Representative.

8. Existing Vaults and/or Maintenance Holes: Do not core-drill existing vaults or utilize a knock-out/conduit terminator without written permission from the Owner or Owner’s Representative.

F. Marking / Warning Tape
   1. Install continuous warning tape 12 inches above duct banks.

G. Backfilling and Compaction
   1. After setting the ducts in place backfill the trench to grade with earth. While backfilling, exercise care to avoid displacing ducts and joints either horizontally or vertically and to avoid damaging ducts.
   2. Do not water flush for consolidation.
   3. Place soil materials in layers to required sub-grade elevations for each area classification, using materials and methods specified in Division 31 “Earthwork”. Grade backfill as necessary to provide a uniform pavement thickness.
   4. Hand or pneumatic tamp backfill around and over pipe in lifts not exceeding 8 in. loose thickness.
   5. Compact backfill to a minimum of 95 percent of the surrounding soil. Perform compaction testing in accordance with either Cal TM 216 and 231 or ASTM D-1557, D-2922 and D-3017. Remove segregated loose material.
   6. Prepare top of backfill for the type of grade finish/paving (i.e., concrete, asphalt, vegetation, pavers) to be installed.
      a. Under building slabs, use drainage fill materials.
      b. Under concrete and/or asphalt paving, provide aggregate base material.

H. Duct Cleaning: Upon completing the system (ducts, pull boxes, handholes, etc.) installation and prior to placing pull tapes/ropes, pull a brush mandrel through full length of ducts as a means to clean debris from the inside of the ducts. The brush mandrel shall be round bristle type with a diameter approximately 1/2-inch greater than internal diameter of duct.

I. Integrity Verification: After duct cleaning and prior to placing pull ropes/ropes and/or cables, pull a hard mandrel through ducts. Mandrel shall be 1/2-inch trade size smaller than duct’s trade size. Where mandrelling indicates obstructions in ducts, remove the obstructions and retest

J. Pull Tape/Rope
   1. After integrity verification, place a pull tape/rope within each duct.
   2. Leave approximately 36 inches of tape/rope slack coiled at each end. Tie to blank duct plug or other item to prevent the rope/tape from recoiling back into the duct.

K. Restore surfaces to match the surrounding areas, including sodding and seeding

3.5 MAINTENANCE HOLE INSTALLATION

A. Do not place maintenance holes directly at a 90-degree change of direction in the duct bank without written approval to do so.

B. Do not add duct openings where no duct ports exist without written approval to do so (doing so complicates cable racking and splice case placement on larger cable sizes).
C. Install maintenance hole level and such that the top is flush with finished grade or surface.

D. Install hardware and accessories, including pulling eyes, rack stanchions, cable arms, and insulators, as required for installation and support of cable and conductors and as indicated.

E. Do not drill deeper than 3-7/8 inches for anchor bolts installed in the field. Use a minimum of 2 anchors for each rack stanchion.

F. Seal duct penetrations through walls such that they are watertight.

G. Labeling
   1. Label each conduit terminated into each maintenance hole. Attach labels using recommended pin shot with powder actuated tool; do not attach labels to vault wall using adhesive.
   2. Stencil inside of the vault neck with vault name as indicated on the Drawings.

3.6 HANDHOLE INSTALLATION

A. Coordinate orientation of handhole in advance and arranged to minimize connecting duct bends and deflections.

B. Install handhole on a level 6-inch bed of well-tamped gravel or crushed stone.

C. Install handhole level and such that the top is flush with finished grade or surface.

D. Clean internal surfaces of handholes. Remove foreign material.

3.7 POST-INSTALLATION TESTING

A. Duct Testing:
   1. Pressure test conduits per ASTM F1417-92. Conduits shall hold air at 3.5 psi for 3 minutes and 45 seconds.
   2. Test Performance Requirements of Mechanical Couplings for Conduit
      a. The conduit coupling/joint shall not leak when subjected to sustained internal pressure testing as noted in ASTM F 2176.
      b. The conduit coupling/joint shall not leak when subjected to sustained external pressure testing as noted in ASTM F 2176.
      c. The conduit coupling/joint assemblies tested shall comply with tensile loading requirements as specified in ASTM F 2176.
      d. The conduit coupling/joint shall not separate when loaded to axial tensile load requirements as specified in ASTM F 2176.
      e. The conduit coupling/joint shall not fail when conditioned at low temperature condition of 10° F and tested by an impact with a force of 20 ft-lbf using Tup “B” as described in Test Method ASTM D 2444, as specified in ASTM F 2176.
   3. Duct Integrity: Rod ducts with a mandrel 1/4-inch smaller in diameter than internal diameter of ducts. Where rodding indicates obstructions in ducts, remove the obstructions and retest.

B. Vault Testing:
   1. Vacuum Testing: Prior to backfilling, test vaults using the vacuum test method in accordance with ASTM C1244 guidelines to demonstrate the integrity of the installed materials and the construction procedures. Plug all lift holes and temporarily plug and securely brace pipes entering the vault prior to testing. The vault is acceptable if the measured time (for a 10 inch vacuum of mercury to drop from 10” Hg to 9” Hg) meets or exceeds the values presented in
Table 1 of ASTM C1244.

2. Hydrostatic Testing: After backfilling, fill vaults to the normal water level, let stand for 24 hours. Refill to the original water line and measure the water level change over a 24 hour period. Leak shall not exceed 5% of volume.

3. Grounding: Test vault grounding to ensure electrical continuity of bonding and grounding connections. Measure ground resistance at each ground rod and report results.

3.8 SUBDUCTING / INNERDUCT

A. Place subducting/innerducts per duct simultaneously (all at the same time).

B. Place subducting/innerducts using a pulling harness with a pulling swivel.

C. Leave approximately 24 inches of subducting/innerducts slack at each end.

3.9 FINAL INSPECTION AND SYSTEM ACCEPTANCE

A. Cleaning. Prior to punch walk:
   1. Clean installed products in accordance with manufacturer's instructions.
   2. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over products, debris, spills, or other excess materials. Remove installation equipment.
   3. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.
   4. Legally dispose of debris.

B. Prior to punch walk, repair defective work and replace damaged installed products.

C. Execute a punch walk with the Engineer and the Owner/Owner’s Representative to observe Work. Develop a punch list for items needing correction. Issue this punch list to Engineer.

D. Repair defects and correct punch list items prior to system acceptance.

E. Execute follow up punch walk with the Engineer and the Owner/Owner’s Representative to verify punch list items have been corrected.

F. On successful punch walk completion, submit system acceptance certificate to the Owner/Owner’s Representative requesting their signature and return of the certificate. Issue copies of the signed certificate back to the Owner/Owner’s Representative with copy to the Engineer.

END OF SECTION
EXISTING NATIVE SOIL, IF ANY VEGETATION AND/OR LOOSE/SOFT SOILS ARE PRESENT, THE UPPER 6-INCHES BY THE DISTRICT. CONTRACTOR SHALL SUBMIT TO THE DISTRICT A DETAILED TEMPORARY EXCAVATION SPECIFICATION SECTION 31 23 00 AND GEOTECHNICAL REPORT FOR COMPACTION 1" = 20'-0".
REQUESTS FOR INFORMATION

C-4016 NEW SCIENCE BUILDING – INCREMENT 1, SITE WORK
Contra Costa College, 2600 Mission Bell Dr, San Pablo, CA 94806

1) Question: Addendum #3 provided a new specification #31 23 00:

a. Subsection 3.4.C states that the limits of the excavation are as noted on the plans; however, all details and plan limits are indeterminate or “Not to Scale”. Please provide depth of removals and/or a contoured grading drawing that indicates all pre-existing soil elevations prior to the placement of unsuitable materials.

Response: Limit of excavation is shown on the Addendum 3 and 4 Civil plans.

b. Subsection 3.4.H states that final excavation depths are to be determined in the field. Please provide a method of payment for additional excavation beyond the limits referenced above.

Response: Final excavation depths are shown on the Addendum 3 and 4 Civil plans. If Scope goes beyond the original contract documents, payment will be in accordance with Division 0, section 00700 (Change Order).

c. Subsection 3.4.i states that footings are to be keyed into at least one foot of non-expansive soils; however, the footing limits and limits of non-expansive soils around footings are not details on the drawings. Please provide this information.

Response: The last sentence of this Subsection is not applicable to Increment 1. All footings are installed in Increment 2.

d. Subsection 3.6.B still references non-expansive soils beneath site flatwork; however, flatwork limits are not shown. Please delete this requirement.

Response: This Subsection is not applicable to Increment 1. All flatwork is installed in Increment 2.

e. Subsection 3.7.B states that if lime treatment is used beneath improvements appropriate corrosion protection shall be provided; however, no limits of work, types of items to be protected, nor methods of protection are specified. Please provide details and limits for any protections required or alternatively remove these requirements from this contract and defer them to the follow on project(s).

Response: Bidders are to assume that lime treatment is not required within improvements associated with new utilities installed under Increment 1.

f. Subsection 3.11.A states that soil sterilization is required; however, neither limits nor specified requirements are provided. Please provide same.
Response: Soil sterilization is not required in Increment 1.

2) Question: Addendum #3 provided a new specification #31 50 00:

a. This specification includes the requirement for a contractor designed shoring system; however, no bid date extension has been provided. Thus, we are unable to prepare a thorough analysis of a cost effective shoring system prior to bid. Therefore, we respectfully request that you extend the bid date for another three to four weeks following issuance of the next addendum.

Response: Bid date will be extended one week, from January 8, 2019 to January 15, 2019 (See Addendum #4, page 1).

b. Subsection 1.1.B.3 states that the shoring system shall not impact existing facilities; however, no vertical nor horizontal limits for shoring, tie-backs, or other components are indicated. Please provide maximum limits for the temporary shoring system.

Response: Approximate limits for temporary shoring systems are shown in Addendum 3 and 4 Civil plans. Type of shoring systems to be considered are noted in Subsection 3.2 and 3.3. The extent of the temporary shoring system shall be determined by the Bidder’s means and methods to comply with the Contract Documents.

c. Subsection 1.5 states that shoring shall be coordinated with waterproofing; however, no requirements are detailed. Please confirm that there are no shoring dimensional nor detail configurations that are prohibited for this work.

Response: Subsection 1.5.A.1.g, where it pertains to waterproofing is not applicable to Increment 1.

d. Subsection 1.6.C.1 states that if movement occurs that the contractor shall notify the Architect; however, no remedial methods are detailed. Therefore, please provide a method of payment for any remedial work.

Response: District is not responsible for movements caused by the work of the Contractor. The type of remedial work will depend on the nature and extent of the movement.

e. Subsection 2.2.A references LEED requirements; however, none are detailed. Please provide a listing of documents required, types of acceptable documents, and a list of which specific LEED requirement(s) are to be satisfied.

Response: Contractor is responsible to prepare SWPPP and obtain approval from the State. Once approved by the State, Contractor to supply the District with the approved SWPPP, which will satisfy LEED requirement.

f. Subsection 3.5.A references removal of the temporary shoring in stages which will necessitate additional move-in(s). Please provide a staging plan, schedule of removals, and access plan for equipment to conduct removals.
Response: Temporary shoring installed by the Inc.1 Contractor will remain in place for use by the Inc.2 Contractor, unless portions of the shoring need to be removed to install other contract work (e.g. utilities). Contractor is responsible for the means and methods to sequence shoring work with other contract work.

g. Subsection 3.5.A.1 states that the shoring shall be removed to the limits as shown on the plans; however, no removal limits are shown on the plans. Please provide a new updated plan that shows the removal limits for each possible type of shoring system.

Response: Temporary shoring installed by the Inc.1 Contractor will remain in place for use by the Inc.2 Contractor, unless portions of the shoring need to be removed to install other contract work (e.g. utilities). Contractor is responsible for the means and methods to sequence shoring work with other contract work.

3) Question: Addendum #3 included significant additional contractor requirements; however, the engineer’s estimate (EE) has not been revised. Would you please clarify the current EE for this bid package as well as the allowable upper percentage of overrun beyond the EE under which this project will still be awarded for the current bid solicitation.

Response: Bidders are to provide the bid based on their review of the Contract Documents. The District has not established the allowable upper percentage of overrun beyond the EE to make the determination. The District will make an award determination after the bid opening.

4) Question: Two or more utilities are indicated to be in conflict with the temporary shoring. Please provide a design and specification for all utility relocation’s.

Response: Utilities as shown on drawing C3.01 may or may not conflict with the temporary shoring. Bidders shall assume means and methods to modify shoring around the existing utilities; protect utilities in place; or match existing utility materials to relocate as needed.

5) Question: Please provide a material specification and application rate for the required erosion control hydroseeding.

Response: Material specification and application rate shall meet the minimum CALTRANS standard specification section 21.

6) Question: Due to the extent of the requests above, we respectfully request that you extend the bid date for another three to four weeks following issuance of the next addendum.

Response: Bid date will be extended one week, from January 8, 2019 to January 15, 2019 (See Addendum #4, page 1).