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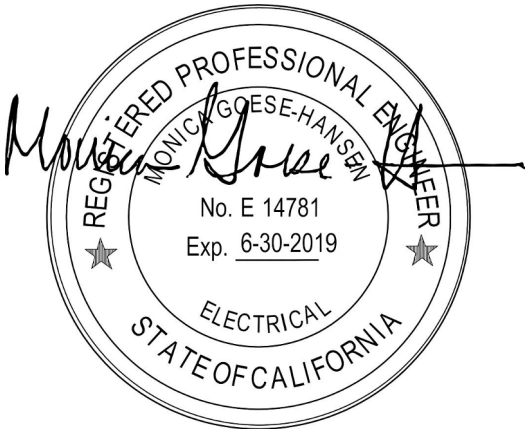
PROJECT MANUAL

Murrieta Valley Unified School District

Murrieta Valley HS Infrastructure Upgrades

April 26, 2018



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MURRIETA VALLEY HS INFRASTRUCTURE UPGRADES

MURRIETA VALLEY UNIFIED SCHOOL DISTRICT

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ELECTRICAL GENERAL PROVISIONS

ARTICLE 1 SUMMARY

1.1 This Division of the specification outlines the provisions of the contract work to be performed under this Division.

1.2 This Section applies to and forms a part of each section of specifications in Division 26 and Division 27 and all work performed under the electrical and communications contracts.

1.3 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under general requirements.

1.4 These specifications contain statements which may be more definitive or more restrictive than those contained in the General Conditions. Where these statements occur, they shall take precedence over the General Conditions.

1.5 Where the words 'provide' or 'provision' are used, it shall be definitely interpreted as 'furnishing and installing complete in operating condition'. Where the words 'as indicated' or 'as shown' are used, it shall mean as shown on contract drawings.

1.6 Where items are specified in the singular, this Division shall provide the quantity as shown on drawings plus any spares or extras mentioned on drawings or specifications. All specified and supplied equipment shall be new.

ARTICLE 2 CONTRACTOR QUALIFICATIONS

2.1 The Contractor shall have a current California C-10 Electrical Contractor’s license and all individuals working on this project shall have passed the Department of Industrial Relations Division of apprenticeship Standards – “Electrician Certification Program.”

ARTICLE 3 CODES, PERMITS AND FEES

3.1 Comply with all applicable laws, ordinances, rules, regulations, codes, or rulings of governmental units having jurisdiction as well as standards of NFPA, and serving utility requirements.

3.2 Obtain permits, fees, inspections, meter and the like, associated with work in each section of this Division.

3.3 Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA).

ARTICLE 4 EXAMINATION OF PREMISES

4.1 Examine the construction drawings and premises prior to bidding. No allowances will be made for not being knowledgeable of existing conditions.

ARTICLE 5 STANDARDS

5.1 The following standard publications of the latest editions enforced and supplements thereto shall form a part of these specifications. All electrical work must, as a minimum, be in accordance with these standards.

5.1.1 2016 California Electrical Code (CEC), Part 3 Title 24 CCR.
5.1.2 National Fire Protection Association.
5.1.3 Underwriters' Laboratories, Inc. (UL).
5.1.4 Certified Ballast Manufacturers' Association (CBM).
5.1.5 National Electrical Manufacturers' Association (NEMA).
5.1.6 Institution of Electrical & Electronics Engineers (IEEE).
5.1.7 American Society for Testing & Materials (ASTM).
5.1.8 National Board of Fire Underwriters (NBFU).
5.1.9 National Board of Standards (NBS).
5.1.10 American National Standards Institute (ANSI).
5.1.11 Insulated Power Cable Engineers Association (IPECS).
5.1.12 Electrical Testing Laboratories (ETL).
5.1.13 National Electrical Safety Code (NESC).
5.1.14 2016 California Building Code (CBC), Part 2, Title 24 CCR.
5.1.15 2016 California Fire Code (CFC), Part 9, Title 24, CCR.
5.1.16 2016 NFPA 72 with California State Amendments
5.1.17 National Electrical Testing Association (NETA), 2010 or most current

ARTICLE 6 DEFINITIONS

6.1 Concealed: Hidden from sight, as in trenches, chases, hollow construction, or above furred spaces, hung ceilings - acoustical or plastic type, or exposed to view only in tunnels, attics, shafts, crawl spaces, unfinished spaces, or other areas solely for maintenance and repair.

6.2 Exposed, Non-Concealed, Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel, a room noted on the 'finish schedule' with exposed and unpainted construction for walls, floors, or ceilings or specifically mentioned as 'unfinished'.

6.3 Finish Space: Any space ordinarily visible, including exterior areas.

ARTICLE 7 WORK AND MATERIALS

7.1 Unless otherwise specified, all materials must be new and of the best quality. Materials previously incorporated into other projects, salvaged, or refurbished are not considered new. Perform all labor in a thorough and workmanlike manner.

7.2 All materials provided under the contract must bear the UL label where normally available. Note that this requirement may be repeated under equipment specifications. In general, such devices as will void the label should be provided in separate enclosures and wired to the labeled unit in proper manner.

ARTICLE 8 SHOP DRAWINGS AND SUBMITTALS

8.1 Submit shop drawings and all data in accordance with Division 1 of these specifications and as noted below for all equipment provided under this Division.

8.2 Shop drawings submittals demonstrate to the Architect that the Contractor understands the design concept. The Contractor demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods of material and equipment he intends to use. If deviations, discrepancies, or conflicts between submittals and specifications are discovered either prior to or after submittals are processed, notify the Architect immediately.

8.3 Manufacturer's data and dimension sheets shall be submitted giving all pertinent physical and engineering data including weights, cross sections and maintenance instructions. Standard items of equipment such as receptacles, switches, plates, etc., which are cataloged items, shall be listed by manufacturer.

8.4 Index all submittals and reference them to these specifications. All submittal items shall be assembled and submitted, one for each specification section. (Multiple specification sections may be grouped together in one common submittal binder, as long as each individual section is clearly identified.) Partial or incomplete submittal sections will not be reviewed.

ARTICLE 9 EQUIPMENT PURCHASES

9.1 Arrange for purchase and delivery of all materials and equipment within 20 days after approval of submittals. All materials and equipment must be ordered in ample quantities for delivery at the proper time. If items are not on the project in time to expedite completion, the Owner may purchase said equipment and materials and deduct the cost from the contract sum.

9.2 Provide all materials of similar class or service by one manufacturer.

ARTICLE 10 COOPERATIVE WORK

10.1 Correct without charge any work requiring alteration due to lack of proper supervision or failure to make proper provision in time. Correct without charge any damage to adjacent work caused by the alteration.

10.2 Cooperative work includes: General supervision and responsibility for proper location and size of work related to this Division, but provided under the other sections of these specifications, and installation of sleeves, inserts, and anchor bolts for work under each section in this Division.

ARTICLE 11 VERIFICATION OF DIMENSIONS

11.1 Scaled and figured dimensions are approximate only. Before proceeding with work, carefully check and verify dimensions, etc., and be responsible for properly fitting equipment and materials together and to the structure in spaces provided.

11.2 Drawings are essentially diagrammatic, and many offsets, bends, pull boxes, special fittings, and exact locations are not indicated. Carefully study drawings and premises in order to determine best methods, exact location, routes, building obstructions, etc. and install apparatus and equipment in manner and locations to avoid obstructions, preserve headroom, keep openings and passageways clear, and maintain proper clearances.

ARTICLE 12 CUTTING AND PATCHING

12.1 All cutting and patching shall be in accordance with Division 1 of these specifications and as noted below.

12.2 Cut existing work and patch as necessary to properly install new work. As the work progresses, leave necessary openings, holes, chases, etc., in their correct location. If the required openings, holes, chases, etc., are not in their correct locations, make the necessary corrections at no cost to the Owner. Avoid excessive cutting and do not cut structural members including wall framing without the consent of the Architect.

ARTICLE 13 CLOSING-IN OF UNINSPECTED WORK

13.1 Cover no work until inspected, tested, and approved by the Architect. Where work is covered before inspection and test, uncover it and when inspected, tested, and approved, restore all work to original proper condition at no additional cost to Owner.

ARTICLE 14 EXCAVATION AND BACKFILL

14.1 All excavation and backfill shall be in accordance with Division 1 of these specifications and as noted below.

14.2 Perform all necessary excavation, shoring, and backfilling required for the proper laying of all conduits inside the building and premises, and outside as may be necessary.

14.3 Excavate all trenches open cut, keep trench banks as nearly vertical as practicable, and sheet and brace trenches where required for stability and safety. Excavate trenches true to line and make bottoms no wider than necessary to provide ample work room. Grade trench bottoms accurately. Machine grade only to the top line of the conduits, doing the remainder by hand. Do not cut any trench near or under footings without first consulting the Architect. All trenches shall be done in accordance with OSHA standards and regulations.

14.4 Backfilling shall be done with each layer compacted before another layer is added. No stones or coarse lumps shall be laid directly on a conduit or conduits.

14.5 Trenches shall be filled with the specified material. Sod, if any, shall be removed in cut sections and replaced in same manners.

14.6 Provide pumps and drainage of all open trenches for purposes of installing electrical duct and wiring.

14.7 Perform all backfilling in accordance with the requirements of and under the direction of the Geotechnical Engineer.

14.8 Where new underground trenching is required on sites or in any area where existing underground utilities exist, the Contractor shall provide an independent professional utility locating service to locate exact vertical and horizontal locations of all existing utilities. Where existing utilities are found the Contractor shall hand dig those areas to avoid disruption. The Contractor shall be responsible for immediate repairs to existing underground utilities damaged during construction. The Contractor shall repair all existing asphalt, concrete and landscape surfaces damaged or removed during construction to match their original conditions. Where trenching extends through public streets or roadways, the Contractor shall notify underground service alert in addition to the independent locating service 48 hours before start of construction to determine location of existing utilities by calling (800) 422-4133.

ARTICLE 15 CONCRETE

15.1 Where used for structures to be provided under the contract such as bases, etc., concrete work, and associated reinforcing shall be as specified under Division 3 of these specifications.

15.2 See other sections for additional requirements for underground vaults, cable ducts, etc.

ARTICLE 16 ACCESSIBILITY

16.1 Install all control devices or other specialties requiring reading, adjustment, inspection, repairs, removal, or replacement conveniently and accessibly throughout the finished building.

16.2 All required access doors or panels in walls and ceilings are to be furnished and installed as part of the work under this Section. Refer to Division 1 of these specifications and as noted below.

16.3 Where located in fire rated assemblies, provide doors which match the rating of the assembly and are approved by the jurisdictional authority.

16.4 Refer to 'finish schedule' for types of walls and ceilings in each area and the architectural drawings for rated wall construction.

16.5 Coordinate work of the various sections to locate specialties requiring accessibility with others to avoid unnecessary duplication of access doors.

ARTICLE 17 FLASHING

17.1 Flash and counter flash all conduits penetrating roofing membrane as shown on Architectural drawings. All work shall be in accordance with Division 7 of these specifications.

ARTICLE 18 IDENTIFICATION OF EQUIPMENT

18.1 All electrical equipment shall be labeled, tagged, stamped, or otherwise identified in accordance with the following schedules:

18.1.1 General:

18.1.1.1 In general, the installed laminated nameplates as hereinafter called for shall also clearly indicate its use, areas served, circuit identification, voltage and any other useful data.

18.1.1.2 All auxiliary systems, including communications, shall be labeled to indicate function.

18.1.2 Lighting and Local Panelboards:

18.1.2.1 Panel identification shall be with white and black micarta nameplates. Letters shall be no less than 3/8" high.

18.1.2.2 Circuit directory shall be two column typewritten card set under glass or glass equivalent. Each circuit shall be identified by the room number and/or number of unit and other pertinent data as required.

18.1.3 Distribution Switchboards and Feeders Sections:

18.1.3.1 Identification shall be with 1" x 4" laminated white micarta nameplates with black lettering on each major component, each with name and/or number of unit and other pertinent data as required. Letters shall be no less than 3/8" high.

18.1.3.2 Circuit breakers and switches shall be identified by number and name with 3/8" x 1-1/2" laminated micarta nameplates with 3/16" high letters mounted adjacent to or on circuit breaker or switch.

18.1.4 Disconnect Switches, Motor Starters and Transformers:

18.1.4.1 Identification shall be with white micarta laminated labels and 3/8" high black lettering.

18.1.5 All communication system terminal boxes including T.V., telephone/intercom, security, fire alarm, clock, and computer networking shall be provided with white micarta laminated labels and 3/8" high black lettering.

ARTICLE 19 CONSTRUCTION FACILITIES

19.1 Furnish and maintain from the beginning to the completion all lawful and necessary guards, railings, fences, canopies, lights, warning signs, etc. Take all necessary precautions required by City, State Laws, and OSHA to avoid injury or damage to any persons and property.

19.2 Temporary power and lighting for construction purposes shall be provided under this Section. All work shall be in accordance with Division 1 of these specifications.

ARTICLE 20 GUARANTEE

20.1 Guarantee all material, equipment and workmanship for all sections under this Division in writing to be free from defect of material and workmanship for one year from date of final acceptance, as outlined in the general conditions. Replace without charge any material or equipment proven defective during this period. The guarantee shall include performance of equipment under all site conditions, conditions of load, installing any additional items of control and/or protective devices, as required.

ARTICLE 21 PATENTS

21.1 Refer to the General Conditions for Contractor's responsibilities regarding patents.

ARTICLE 22 EQUIPMENT ROUGH-IN

22.1 Rough-in all equipment, fixtures, etc. as designed on the drawings and as specified herein. The drawings indicate only the approximate location of rough-ins. Mounting heights of all switches, receptacles, wall mounted fixtures and such equipment must be coordinated with the Architectural Designs. The Contractor shall obtain all rough-in information before progressing with any work for rough-in connections. Minor changes in the contract drawings shall be anticipated and provided for under this Division of the specifications to comply with rough-in requirements.

ARTICLE 23 OWNER FURNISHED AND OTHER EQUIPMENT

23.1 Rough-in and make final connections to all Owner furnished equipment shown on the drawings and specified, and all equipment furnished under other sections of the specifications.

ARTICLE 24 EQUIPMENT FINAL CONNECTIONS

24.1 Provide all final connections for the following:

24.1.1 All equipment furnished under this Division.

24.1.2 Electrical equipment furnished under other sections of the specification.

24.1.3 Owner furnished equipment as specified under this Division.

ARTICLE 25 INSERTS, ANCHORS, AND MOUNTING SLEEVES

25.1 Inserts and anchors must be:

25.1.1 Furnished and installed for support of work under this Division.

25.1.2 Mounting of equipment that is of such size as to be free standing and that equipment which cannot conveniently be located on walls, such as motor starters, etc., shall be rigidly supported on a framework of galvanized steel angle of Unistrut or B-line systems with all unfinished edges painted.

25.1.3 Furnish and install all sleeves as required for the installation of all work under all Sections of this Division and for all communication systems including any communication systems described in this Section which are bid to the General Contractor. Sleeves through floors, roof, and walls shall be as described in “Conduit and Fittings” Section 26 05 33.

ARTICLE 26 SEISMIC ANCHORING

26.1 All switchgear and other free standing electrical equipment or enclosures shall be anchored to the floor and braced at the top of the equipment to the structure. Where details have not been provided on the drawings, anchorage shall comply with CBC Section 1616A.1.12. The Contractor shall submit drawings signed by the Contractors registered structural Engineer indicating method of compliance prior installation.

26.2 All sound systems, communication, signal or data networking equipment or enclosures shall be anchored to the structure. Where details have not been provided on the drawings, anchorage shall comply with CBC Section 1616A.1.12. The Contractor shall submit drawings signed by the Contractors registered Structural Engineer indicating method of compliance prior to installation.

ARTICLE 27 RUST PROOFING

27.1 Rust proofing must be applied to all ferrous metals and shall be in accordance with Section 05500 of these specifications and as noted below.

27.1.1 Hot-dipped galvanized shall be applied and after forming of angle-iron, bolts, anchors, etc.

27.1.2 Hot-dipped galvanized coating shall be applied after fabrication for junction boxes and pull boxes cast in concrete.

ARTICLE 28 GENERAL WIRING

28.1 Where located adjacent in walls, outlet boxes shall not be placed back to back, nor shall extension rings be used in place of double boxes, all to limit sound transmission between rooms. Provide short horizontal nipple between adjacent outlet boxes, which shall have depth sufficient to maintain wall coverage in rear by masonry wall.

28.2 In those instances where outlet boxes, recessed terminal boxes, or recessed equipment enclosures are installed in a fire rated assembly, provide "Flamesafe FSD 1077" fire stopping pads or approved equal, over the outlet or box.

28.3 Complete rough-in requirements of all equipment to be wired under the contract are not indicated. Coordinate with respective trades furnishing equipment or with the Architect as the case may be for complete and accurate requirements to result in a neat, workmanlike installation.

ARTICLE 29 SEPARATE CONDUIT SYSTEMS

29.1 Each electrical and signal system shall be contained in a separate conduit system as shown on the drawings and as specified herein. This includes each power system, each lighting system, each signal system of whatever nature, telephone, standby system, sound system, control system, fire alarm system, etc.

29.2 Further, each item of building equipment must have its own run of power wiring. Control wiring may be included in properly sized conduit for equipment feeders of #6 AWG and smaller, having separate conduit for larger sizes.

ARTICLE 30 CLEANUP

30.1 In addition to cleanup specified under other sections, thoroughly clean all parts of the equipment. Where exposed parts are to be painted, thoroughly clean off any spattered construction materials and remove all oil and grease spots. Wipe the surface carefully and scrape out all cracks and corners.

30.2 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.

30.3 During the progress of the work, keep the premises clean and free of debris.

ARTICLE 31 PAINTING

31.1 Paint all unfinished metal as required in accordance with Division 1 of these specifications. (Galvanized and factory painted equipment shall be considered as having a sub-base finish.)

ARTICLE 32 GENERAL DEMOLITION REQUIREMENTS

32.1 Remove existing work and items which are required to be removed in such manner that minimum damage and disturbance is caused to adjacent and connection work scheduled to remain. Repair or replace existing work schedule.

32.2 Include preparation of existing areas to receive new materials and removal of materials and equipment to alter or repair the existing building as indicated and as specified.

32.3 Perform demolition exercising proper care to prevent injury to the public, workmen and adjoining property.

32.4 Perform the removal, cutting, drilling of existing work with extreme care and use small tools in order not to jeopardize the structural integrity of the building.

32.5 Rebuild to existing condition or better, existing work which has to be removed to allow the installation of new work as required.

32.6 Remove, protect and reinstall existing items as indicated. Replace materials scheduled for reuse which are damaged by the Contractor to the extent that they cannot be reused, with equal quality material, and installation.

32.7 Do not reuse in this project materials and items removed from existing site or building, except with specific written approval by the Architect in each case, unless such removed material or item is specifically indicated or specified to be reused.

32.8 Remove materials and equipment indicated to be salvaged for reinstallation and store to prevent damage, and reinstall as the work progresses. Do not reuse in this project, other materials and equipment removed from existing site or building, except with specific written approval by the Architect in each case.

32.9 Patch areas requiring patching, including damage caused by removing, relocating or adding fixtures and equipment, damages caused by demolition at adjacent materials.

32.10 Do not stockpile debris in the existing building, without the approval of the Architect. Remove debris as it accumulates from removal operations to a legal disposal area.

32.11 Contractor to assume existing oil filled and dry transformers, oil switches, ballasts, lamps, wooden poles, cross arms, computers, computer monitors, and conductor insulation containing materials considered hazardous. Comply with local, state and federal regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution. Contractor shall be responsible for removal of the above hazardous materials where encountered. Include all costs for such removal as part of this contract.

32.12 All fluorescent, compact fluorescent, high intensity discharge, metal halide, mercury vapor, high and low pressure sodium, and neon lamps are to be disposed of as required by the California Waste Rule Regulations as described in the California Code of Regulations, Title 22, Division 4.5 and Chapter 23.

32.13 **Communication System:** Where new communication systems, (including telephone, intercom, clock, security, fire alarm, data, multimedia, CATV or lighting controls) are installed to replace existing systems, unless where otherwise directed the existing systems shall remain fully operational until the new system has been installed and tested. Demolition of the existing systems shall include removal of all equipment and associated wiring and exposed conduits and providing new blank covers for all abandoned device locations.

32.14 **Salvage Power Equipment:** The Contractor shall carefully remove all existing switchboards, panelboards, transformers, and confirm in writing which items the Owner

wishes to keep. These items shall be transported to the Owner's maintenance facilities by the Contractor. All remaining items shall be disposed of by the Contractor.

32.15 **Salvage Lighting Equipment:** The Contractor shall confirm in writing which items the Owner wishes to keep. These items shall be transported to the Owner's maintenance facilities by the Contractor. All remaining items shall be disposed of by the Contractor.

32.16 **Salvage Communication Equipment:** The Contractor shall carefully remove all communication devices (telephone, intercom, clock, security, fire alarm, data, multimedia, CATV or lighting controls) and box each type of devices separately. The Contractor shall deliver all items to the Owner's maintenance facility.

ARTICLE 33 PROJECT CLOSEOUT

33.1 Prior to completion of project, compile a complete equipment maintenance manual for all equipment supplied under sections of this Division, in accordance with Division 1 of these specifications and as described below.

33.2 Equipment Lists and Maintenance Manuals:

33.2.1 Prior to completion of job, Contractor shall compile a complete equipment list and maintenance manuals. The equipment list shall include the following items for every piece of material equipment supplied under this Section of the specifications:

33.2.1.1 Name, model, and manufacturer.

33.2.1.2 Complete parts drawings and lists.

33.2.1.3 Local supply for parts and replacement and telephone number.

33.2.1.4 All tags, inspection slips, instruction packages, etc., removed from equipment as shipped from the factory, properly identified as to the piece of equipment it was taken from.

33.3 Maintenance manuals shall be furnished for each applicable section of the specifications and shall be suitably bound with hard covers and shall include all available manufacturers' operating and maintenance instructions, together with "as-built" drawings to properly operate and maintain the equipment. The equipment lists and maintenance manuals shall be submitted in duplicate to the Architect for approval not less than 10 days prior to the completion of the job. The maintenance manuals shall also include the name, address, and phone numbers of all subcontractors involved in any of the work specified herein. Four copies of the maintenance manuals bound in single volumes shall be provided.

ARTICLE 34 RECORD DRAWINGS

34.1 The Division 26 Contractor shall maintain record drawings as specified in accordance with Division 1 of these specifications, and as noted below.

34.2 Drawings shall show locations of all concealed underground conduit runs, giving the number and size of conduit and wires. Underground ducts shall be shown with cross section elevations and shall be dimensioned in relation to permanent structures to indicate their exact location. Drawing changes shall not be identified only with

referencing CORs and RFIs, the drawings shall reflect all of the actual additions or changes made. All as-built drawing information shall be prepared by the contractor in AutoCAD, updating the contract computer files as needed to reflect actual installed conditions for all site plans, lighting, power, communication, networking, audio visual, security or fire alarms systems included in the scope of work for this project.

34.3 One set of these record drawings shall be delivered to the Architect. The engineer will review documents for completeness, and will not be responsible for editing contractor computer files.

ARTICLE 35 CHANGES AND EXTRA WORK

35.1 When **changes** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:

35.1.1 The material Costs shall **not exceed** the latest edition of the “Trade Service“ end column “C” price list. The materials prices may be higher only where the Contractor can produce invoices to substantiate higher material costs. The Contractor shall submit a print out copy of the trade service sheets with the change order to substantiate these values.

35.1.2 The labor Costs shall **not exceed** the latest edition of the “NECA Manual of Labor Units” **normal column**.

35.2 When **credits** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:

35.2.1 The Material Costs shall **not be less than 80% of** the latest edition of the “Trade Service“ end column price list. The materials prices may be lower only where the Contractor can produce invoices to substantiate lower material costs. Restocking fees may also be included in this amount where applicable.

35.2.2 The Labor Costs shall **not be less than 80% of** the latest edition of the “NECA Manual of Labor Units” **normal column**.

35.3 Conduit pricing for conduits of all types sized 3" or smaller.

When changes in the scope of work require the Contractor to estimate conduit Installations, they shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for conduit installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.

35.3.1 Couplings.

35.3.2 Set Screw or Compression Fittings, locknuts, Bushings and washers.

35.3.3 Conduit straps and associated screws or nails.

35.3.4 LB fittings or other specialty fittings or specialty mounting hardware may be included where needed.

35.4 Wire pricing for all types and sizes.

When changes in the scope of work require the Contractor to estimate wire installations they shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for wire installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.

35.4.1 Locknuts, Bushings, tape, wire markers.

35.5 When changes in the scope of work require other equipment installations such as lighting fixtures, panelboards, switchboards, wiring devices, communications equipment etc. the Contractor shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for these equipment items represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.

35.5.1 Associated screws, nails, bolts, anchors or supports.

35.5.2 Locknuts, washers, tape.

35.6 The total labor hours for extra work will be required to be calculated as follows:

35.6.1 Change orders with 1 to 30 total labor hours

General Laborer	10%	of total labor hours
Journeyman	10%	of total labor hours
Foreman	80%	of total labor hours

35.6.2 Change orders with 31 to 100 total labor hours

General Laborer	20%	of total labor hours
Journeyman	40%	of total labor hours
Foreman	40%	of total labor hours

35.6.3 Change orders with over 100 total labor hours

General Laborer	30%	of total labor hours
Journeyman	50%	of total labor hours
Foreman	20%	of total labor hours

35.7 When change orders are issued which allow the work to be completed in the normal sequence of construction, the labor rates shall be based on the most current “Prevailing Wage” – straight time total hourly rate. When change orders require the Contractor to work out of sequence the “Prevailing Wage“ – daily overtime hourly rate shall apply. Special condition situations shall be reviewed on an individual basis for alternate hourly rate schedules.

35.8 Costs **will not** be permitted for additional supervision on site or office time for processing any change order other than the 10% overhead allowance as described in Division 1. Cost for special equipment required to install items for an individual change order are permitted and must be individually identified. Lump Sum cost for small tools or any other cost not specifically required for the change order are not permitted.

35.9 Contractor estimates shall be formatted to clearly identify each of the following:

35.9.1 Line item description of each type of material or labor item.

35.9.2 Description of quantity for each item.

35.9.3 Description of (material cost per / quantity).

35.9.4 Description of (labor cost per / quantity).

35.9.5 Description of total labor hour breakdown per Foreman, Journeyman or General Laborer as described above.

ARTICLE 36 ELECTRONIC FILES

36.1 The Contractor shall make a ***written*** request directly to Johnson Consulting Engineers for electronic drawing files. As a part of the written request, please include the following information:

36.1.1 Clearly indicate each drawing sheet needed (i.e., E1.1, E2.1, etc.).

36.1.2 Identify the name, phone number, mailing address and e-mail address of the person to receive the files.

36.1.3 Provide written confirmation and agreement with the requirements described for payment of computer files, as described below.

36.2 Detail or riser diagram sheets, or any other drawings other than floor plans or site plans, ***will not be made available to the Contractor***.

36.3 Files will only be provided in the AutoCAD format in which they were created.

36.4 Requests for files will be processed as soon as possible; a minimum of 7 working days should be the normal processing time. The Contractor shall be completely responsible for requesting the files in time for their use.

END OF SECTION

SECTION 26 05 19

POWER CONDUCTORS

PART 1 – GENERAL

1.1 Furnish and install wire and cable for branch circuits and feeders specified herein and as shown on the electrical drawings.

1.2 Submittals: Submit manufacturers' data for the following items:

1.2.1 All cables and terminations

1.3 <u>Common submittal mistakes which will result in the submittals being rejected:</u>

1.3.1 Not including all items listed in the above itemized description.

1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining, or clouding the items to be reviewed, or crossing out the items which are not applicable.

1.3.3 Not including actual manufacturer's catalog information of proposed products.

1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed

PART 2 – PRODUCTS

2.1 Wire and cable Rated 120 volt to 600 volt.

2.1.1 All wire and cable shall be new, 600 volt insulated copper, of types specified below for each application. All wire and cable shall bear the UL label and shall be brought to the job in unbroken packages. Wire insulation shall be the color as specified herein and shall be type THWN-2. Insulated conductors shall be installed in all exterior exposed raceways. Conductors for branch circuit lighting, receptacle, power and miscellaneous systems shall be a minimum of No. 12 AWG. Increase conductor size to No. 10 AWG for 120 volt circuits greater than 100 feet from the panel to the load and for 277 volt circuits greater than 200 feet from the panel to the load. Circuit home-runs indicated to be larger than No. 12 must be increased the entire length of the circuit, including equipment grounding conductor. Wire sizes No. 14 through No. 10 shall be solid. No. 8 and larger shall be stranded.

2.1.2 Aluminum conductors will be permitted (only where specifically identified on the drawings. See "600 Volt Feeder Schedule") in sizes 2/0 or larger. Conductors shall be listed by Underwriters Laboratories (UL) and suitable for operation at 600 volts or less, at a maximum operating temperature of 90N C maximum in wet or dry locations. Conductors shall be marked "SUN-RES". Aluminum alloy conductors shall be compact stranded conductors of STABILOY® (AA-8030) as manufactured by Alcan Cable or Listed equal. AA-8000 Series aluminum alloy conductor material shall be recognized by The Aluminum Association.

2.1.3 MC type armored cable reference Section 26 05 33.

2.2 Wire and cable for systems below120 volts.

2.2.1 All low voltage and communications systems cables routed underground shall be provided with a moisture resistant outer jacket, West Penn “Aquaseal” or equal, unless otherwise specified.

PART 3 - EXECUTION

3.1 Wire and cable shall be pulled into conduits without strain using powdered soapstone, mineralac, or other approved lubricant. In no case shall wire be repulled if same has been pulled out of a conduit run for any purpose. No conductor shall be pulled into conduit until conduit system is complete, including junction boxes, pull boxes, etc.

3.2 All connections of wires shall be made as noted below:

3.2.1 Connections to outlets and switches: Wire formed around binding post of screw.

3.2.2 No. 10 wire and smaller: Circuit wiring connections to lighting fixtures and other hard wired equipment shall be made with pressure type solderless connectors, Buchanan, Scotchlock, Wing Nut, or approved equal. Alternate “WAGO” #773 series or “IDEAL” #32, 33, 34 and 39 series push wire style connectors are also acceptable.

3.3 All wiring shall be continuous without splicing unless where specifically noted on the drawings or where permitted below.

3.3.1 No. 10 wire and smaller above grade: Quantities as needed, connection made with pressure type solderless connectors, Scotchlock or equal.

3.3.2 No. 10 wire and smaller below grade: Quantities as needed, connection made with ‘Raychem’ long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide ‘Raychem’ WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.3.3 No. 8 wire and larger above grade: Quantities only where indicated, ‘Raychem’ long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide ‘Raychem’ WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.3.4 No. 8 wire and larger below grade: Quantities only where indicated, ‘Raychem’ long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide ‘Raychem’ WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.4 All wiring throughout shall be color coded as follows:

	480 volt system	208 or 240 volt system
A Phase	Brown	Black

B Phase	Orange	Red
C Phase	Yellow	Blue
Neutral	Grey	White
Ground	Green	Green

3.5 Wiring must be color coded throughout its entire length, except feeders may have color coded plastic tape at both ends and any other accessible point.

3.6 All control wiring in a circuit shall be color coded, each phase leg having a separate color, and with all segments of the control circuit, whether in apparatus or conduit, utilizing the same color coding.

3.7 At all terminations of control wiring, the wiring shall have a numbered T&B or Brady plastic wire marker.

3.8 Cables when installed are to be properly trained in junction boxes, etc., and in such a manner as to prevent any forces on the cable which might damage the cable.

3.9 All conductors to be installed into a common raceway, shall be pulled into the raceway at the same time.

3.10 All conductors shall be installed in such a manner as to not exceed the manufacturers' recommended pulling tension and bending radius. The equipment used for pulling must be specifically designed for the purpose. Motorized vehicles such as pickup trucks, are not acceptable.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 – GENERAL

1.1 Furnish and install grounding and grounding conductors and electrodes as specified herein and as shown on the drawings.

1.2 Submit catalog data for all components.

1.3 **Common submittal mistakes which will result in the submittals being rejected:**

1.3.1 Not including all items listed in the above itemized description.

1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.

1.3.3 Not including actual manufacturer's catalog information of proposed products.

1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – EXECUTION

2.1 Grounding

2.1.1 All panelboard cabinets, equipment, enclosures, and complete conduit system shall be grounded securely in accordance with pertinent sections of CEC Article 250. Conductors shall be copper. All electrically operated equipment shall be bonded to the grounded conduit system. All non-current carrying conductive surfaces that are likely to become energized and subject to personal contact shall be grounded by one or more of the methods detailed in CEC Article 250. All ground connections shall have clean contact surfaces. Install all grounding conductors in conduit and make connections readily accessible for inspection.

2.1.2 Provide an insulated equipment grounding conductor in all branch circuit and feeder raceway systems, sized in accordance with CEC 250-1122.

2.1.3 Provide an additional individual insulated grounding conductor for each circuit which contains an isolated ground receptacle or surge suppression receptacle.

2.1.4 Grounding of metal raceways shall be assured by means of provisions of grounding bushings on feeder conduit terminations at the panelboard, and by means of insulated continuous stranded copper grounding wire extended from the ground bus in the panelboard to the conduit grounding bushings.

2.1.5 Except for connections which access for periodic testing is required, make grounding connections which are buried or otherwise inaccessible by exothermite type process.

2.1.6 The following ohmic values shall be test certified for each item listed. A written report signed and witnessed by the project IOR shall be provided to the engineer. If the ohmic value listed cannot be obtained additional grounding shall be installed to reach the value listed.

2.1.6.1 Service. . . . . .10 ohms.

2.1.6.2 Step down transformers and non-current carrying metal parts . . . . . 25 ohms.

2.1.6.3 Manholes, handholes, etc. . . . . 10 ohms.

END OF SECTION

SECTION 26 05 33

CONDUIT AND FITTINGS

PART 1 – GENERAL

1.1 Furnish and install conduit and fittings as shown on the drawings and as specified herein.

1.2 Submit Manufacturer's data on the following:

1.2.1 Conduit.

1.2.2 Fittings

1.2.3 Fire stopping Material.

1.2.4 Surface Raceways.

1.2.5 Type MC or MC-PCS cable, provide construction details and UL "E" number.

1.3 **Common submittal mistakes which will result in the submittals being rejected:**

1.3.1 Not including all items listed in the above itemized description.

1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.

1.3.3 Not including actual manufacturer's catalog information of proposed products.

1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

2.1 Rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT) and flexible metallic conduit shall be steel, hot dipped galvanized after fabrication.

2.2 PVC conduit shall be Carlon or approved equal.

2.3 Liquid tight flexible metal conduit shall be Anaconda Sealtite type UA or approved equal. Fittings shall be Appleton, Crouse-Hinds, Steel City, T&B, or equivalent.

2.4 MC type armored cable, when utilized, shall be provided with the following:

2.4.1 Comply with UL 1479 and CEC 330

2.4.2 90ºC, copper, THHN conductors.

2.4.3 Minimum #12 insulated grounding conductor.

2.4.4 Conductors sized No. 10 and smaller shall be solid, No. 8 and larger shall be stranded.

2.4.5 Oversized (150%) neutrals or separate neutrals shall be provided.

2.4.6 Increase phase conductors to No. 10 AWG for 120 volt circuits greater than 100 feet from panel to load and for 277 volt circuits greater than 200 feet from panel to load. Where required increase conductor sizes for entire length of circuit.

2.4.7 Interlocked armored **aluminum** sheath.

2.4.8 AC or BX type armored cable shall **not** be substituted in lieu of MC type cable.

2.4.9 Color code cable according to cable type and configuration.

2.4.10 Acceptable manufacturers are AFC and Alflex.

2.5 MC-PCS luminary armored cable , when utilized, shall be provided with the following:

2.5.1 Comply with UL 1479 and CEC 330

2.5.2 90ºC, copper, THHN conductors.

2.5.3 Minimum #12 insulated grounding conductor.

2.5.4 Lighting phase conductors sized No. 10 and smaller shall be solid, lighting control conductors shall be sized no. 16 solid.

2.5.5 Interlocked armored **aluminum** sheath.

2.5.6 AC or BX type armored cable shall **not** be substituted in lieu of MC type cable.

2.5.7 Color code phase cable according to cable type and configuration. color code control conductors purple/gray.

2.5.8 Acceptable manufacturers are AFC and Alflex.

2.6 Fire stopping material shall provide an effective seal against fire, heat, smoke and fire gases. Fire stopping material shall be tested to comply with ASTME 814 and UL 1479. The submittal for this product shall include the UL listed system number and installation requirements for each type of penetration seal required for this project.

2.7 Each length of conduit shall be stamped with the name or trademark of the manufacturer and shall bear the UL label.

2.8 All plastic conduit shall be rigid, schedule 40, heavy wall PVC. All PVC conduit shall be UL listed. Underground utility company conduits shall comply with local utility co. requirements.

2.9 Plastic conduit shall be stored on a flat surface, and protected from the direct rays of the sun.

2.10 Where branch circuit or communication raceways cannot be concealed in ceilings or walls and are required to be exposed in interior spaces, provide nonmetallic surface raceway system sized per the manufacturer capacity requirements. A full complement of nonmetallic fittings must be available and matching device boxes and cover plates must be provided. The color of the raceway system, components and boxes shall be (white).

Where data networking cabling is to be installed, all raceway fittings shall meet Category 5 radius requirements. Where specific raceway types have been noted on the drawings they shall be as follows:

2.10.1	System 'SR'	Hubbell	WALLTRAK 1 series
		Wiremold	ECLIPSE PN05series
		Panduit	LD5 series
		Hellerman-Tyton	TSR2 series
2.10.2	System 'SR2'	Hubbell	WALTRAK 22
		Wiremold	2300D Series
		Panduit	D2P10
		Hellerman-Tyton	TSR3 series
2.10.3	System 'SR3'	Hubbell	BASETRAK series
		Wiremold	5400 - series
		Panduit	70 series
		Hellerman-Tyton	MCR Infostream" series

Provide with offset boxes, inline boxes may only be used where specifically shown on the drawings.

PART 3 – FITTINGS

3.1 All metallic fittings, including those for EMT, flexible conduit, or malleable iron. Die cast fittings of any other material are not permitted.

3.2 Locknuts shall be steel or malleable iron with sharp clean cut threads.

3.3 Entrance seals shall be 0.Z. type FSK or equivalent.

3.4 Bushings and locknuts: Where conduits enter boxes, panels, cabinets, etc., they shall be rigidly clamped to the box by locknuts on the outside, and a lock nut and plastic bushing on the inside of the box. All conduits shall enter the box squarely.

3.5 Furnish and install insulated bushings as per CEC article No. 300 - 4 (F) on all conduits. The use of insulated bushings does not exclude the use of double locknuts to fasten conduit to the box.

3.6 Transition from plastic to steel conduits shall be with PVC female threaded adaptors.

3.7 Couplings and connectors for rigid steel or IMC conduit must be threaded, or compression type (set screw fittings are not permitted).

3.8 Couplings and connectors for EMT shall be compression, watertight. Set screw connectors are not acceptable, except for systems below 120 volts.

3.9 MC or MC-PCS type armored cable shall be provided with listed clamp type die cast zinc set screw connectors. Anti-short bushings shall be provided at all cable ends.

3.10 Connectors for flexible metal conduit shall be steel or malleable iron with screw provided to clinch the conduit into the adapter body. For sizes up to ¾" a screw-in, "Jake type," fitting may be used.

3.11 Install approved expansion fittings, or liquid tight flex conduit with a minimum 6" slack for conduits passing through all expansion and seismic joints.

PART 4 - EXECUTION

4.1 All branch circuits shall be installed concealed in walls or above ceilings or in concrete floor slabs. PVC conduits installed in concrete floor slabs shall transition to PVC coated rigid steel where conduits penetrate above finished grade or finished floor.

4.2 Conduit sizes for various numbers and sizes of wire shall be as required by the CEC, but not smaller than ½" for power wiring and ¾" for communications and fire alarm systems unless otherwise noted. Conduit in slab or below grade shall be ¾" minimum trade size, unless otherwise identified.

4.3 Conduit size shall be such that the required number and sizes of wires can be easily pulled in and the Contractor shall be responsible for the selection of the conduit sizes to facilitate the ease of pulling. Conduit sizes shown on the drawings are minimum sizes in accordance with appropriate tables in the CEC. If because of bends or elbows a larger conduit size is required, the Contractor shall so furnish without further cost to the Owner.

4.4 The Contractor shall be entirely responsible for the proper protection of this work from the other trades on the job. When conduit becomes bent or holes are punched through same, or outlets moved after being roughed-in, the Contractor shall replace same, without additional cost to the Owner.

4.5 Rigid steel conduit or IMC shall be used as follows:

4.5.1 Exposed exterior locations.

4.5.2 Exposed interior locations below eight feet above floor, except in electrical rooms and closets.

4.5.3 In hazardous or classified areas as required by CEC.

4.6 EMT conduit shall be used for areas as follows:

4.6.1 All interior communications, signal, and data networking systems.

4.6.2 All interior power wiring systems where not required to be in rigid steel, IMC or flexible conduit.

4.7 Flexible conduit shall be used for areas as follows:

4.7.1 To connect motors, transformers, and other equipment subjected to vibration or where specifically detailed on the drawings.

4.7.2 Flexible conduit shall not be used to replace EMT in other locations where the conduit will be exposed.

4.7.3 Flexible metal conduit shall be ferrous. Installation shall be such that considerable slack is realized. The conduit shall contain separate code sized grounding conductor.

4.7.4 Liquid tight flexible conduit shall be used in conformance with CEC in lengths not to exceed 4'. For equipment connections, route the conduit at 90 degrees to the

adjacent path for point of connection. The conduit shall contain separate code sized grounding conductor. Use liquid tight flexible conduit for all equipment connections exposed in possible wet, corrosive or oil contaminated areas, e.g., shops and outside areas.

4.8 MC armored cable may be used as follows:

4.8.1 All branch circuit wiring for lighting and power circuits where permitted and installed in compliance with UL 1569 and CEC 330.

4.9 MC-PCS luminary armored cable may be used as follows:

4.9.1 All Lighting branch circuit wiring for lighting circuits where permitted and installed in compliance with UL 1569 and CEC 300-22(c), 330. This cable permits conductors of control circuits to be placed in a cable with lighting power circuits or class 1 circuits.

4.9.2 It shall not be considered an acceptable option to install lighting control class 1 circuits as an open wire installation.

4.10 MC and MC-PCS armored cable shall **not** be used for the following areas:

4.10.1 Any exterior, underground or buried in concrete circuits.

4.10.2 Any circuits feeding HVAC equipment or pumps or any circuit with 30 AMPs or greater overcurrent protection.

4.10.3 Any exposed interior locations except in electrical, communication or mechanical equipment rooms.

4.10.4 Any exposed interior damp/wet locations, kitchens, science classrooms, shop areas, or concealed in science classroom casework, unless provided with approved PVC jacket.

4.10.5 Any hazardous rated area.

4.11 Plastic conduit shall be used for all exterior underground, in slab, and below slab on grade conduit installations. Install bell ends at all conduit terminations in manholes and pull boxes. Where plastic conduit transitions from below grade to above grade, no plastic conduit shall extend above finished exterior grade, or above interior finished floor level.

4.12 Plastic conduit joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected. Conduit joint couplings shall be made watertight. Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of a plastic fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly.

4.13 All underground conduit depths shall be as detailed on the drawings or a minimum of 30" below finished grade (when not specifically detailed otherwise), for all exterior underground conduits. Where concrete slurry or concrete encasement is provided, include “Red” color dye in mixture.

4.14 All underground conduits for power systems (600v and higher), shall be concrete encased and a minimum of 48” below grade or as detailed on the drawings. Where concrete slurry or concrete encasement is provided, include “Red” color dye in mixture.

4.15 Conduit shall be continuous from outlet to outlet, cabinet or junction box, and shall be so arranged that wire may be pulled in with the minimum practical number of junction boxes.

4.16 All conduits shall be concealed wherever possible. All conduit runs may be exposed in mechanical equipment rooms, electrical equipment rooms, electrical closets, and in existing or unfinished spaces. No conduit shall be run exposed in finished areas without the specific approval of the Architect.

4.17 All raceways which are not buried or embedded in concrete shall be supported by straps, clamps, or hangers to provide a rigid installation. Exposed conduit shall be run in straight lines at right angles to or parallel with walls, beams, or columns. In no case shall conduit be supported or fastened to other pipes or installed to prevent the ready removal of other trades piping. Wire shall not be used to support conduit.

4.18 It shall be the responsibility of the Contractor to consult the other trades before installing conduit and boxes. Any conflict between the location of conduit and boxes, piping, duct work, or structural steel supports, shall be adjusted before installation. In general, large pipe mains, waste, drain, and steam lines shall be given priority.

4.19 Conduits above lay-in grid type ceilings shall be installed in such a manner that they do not interfere with the "lift-out" feature of the ceiling system. Conduit runs shall be installed to maintain the following minimum spacing wherever practical.

4.19.1 Water and waste piping not less than 3".

4.19.2 Steam and steam condensate lines not less than 12".

4.19.3 Radiation and reheat lines not less than 6".

4.20 Provide all necessary sleeves and chases required where conduits pass through floors or walls as part of the work of this section. Core drilling will only be permitted where approved by the Architect.

4.21 All empty conduits and surface mounted raceways shall be provided with a ¼" polypropylene plastic pull cord and threaded plastic or metal plugs over the ends. Fasten plastic "Dymo" tape label to exposed spare conduit to identify "power" or "communication" system, and to where it goes.

4.22 The ends of all conduits shall be securely plugged, and all boxes temporarily covered to prevent foreign material from entering the conduits during construction. All conduit shall be thoroughly swabbed out with a dry swab to remove moisture and debris before conductors are drawn into place.

4.23 Bending: Changes in direction shall be made by bends in the conduit. These shall be made smooth and even without flattening the pipe or flaking the finish. Bends shall be of as long a radius as possible, and in no case smaller than CEC requirements.

4.23.1 For power conduits for conductors (600v and below), provide minimum 36” radius (vertical) and 72” radius (horizontal) bends.

4.23.2 For power conduits for conductors (greater than 600v), provide minimum 72" radius (vertical) and 72" radius (horizontal) bends.

4.24 Supports: Conduit shall be supported at intervals as required by the California Electrical Code. Where conduits are run individually, they shall be supported by approved conduit straps or beam clamps. Straps shall be secured by means of toggle bolts on hollow masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction. **[No perforated straps or wire hangers of any kind will be permitted. Where individual conduits are routed, or above ceilings, they shall be supported by hanger rods and hangers.]** Conduits installed exposed in damp locations shall be provided with clamp backs under each conduit clamp, to prevent accumulation of moisture around the conduits.

4.25 Where a number of conduits are to be run exposed and parallel, one with another, they shall be grouped and supported by trapeze hangers. Hanger rods shall be fastened to structural steel members with suitable beam clamps or to concrete inserts set flush with surface. A reinforced rod shall be installed through the opening provided in the concrete inserts. Beam clamps shall be suitable for structural members and conditions. Rods shall be galvanized steel 3/8" diameter minimum. Each conduit shall be clamped to the trapeze hanger with conduit clamps.

4.26 All concrete inserts and pipe clamps shall be galvanized. All steel bolts, nuts, washers, and screws shall be galvanized or cadmium plated. Individual hangers, trapeze hangers and rods shall be prime-coated.

4.27 Openings through fire rated floors/walls and/or smoke walls through which conduits pass shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. Sleeves shall be provided for power or communication system cables which are not installed in conduits, and shall be sealed inside and out to comply with manufacturers UL system design details. Where multiple conduits and/or cable tray systems pass thru fire-rated walls at one location, the Contractor shall submit copies of the manufacturers UL system design details proposed for use on this project. All Fire stopping material shall have an hourly fire-rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.

4.28 Provide cap or other sealing type fitting on all spare conduits. Conduits stubbed into buildings from underground where cable only extends to equipment, the conduit/cable end shall be sealed to prevent moisture from entering the room or space.

4.29 All conduits which are part of a paralleled feeder or branch circuit shall be installed underground.

4.30 All conduits which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.

4.30.1 The Contractor shall coordinate all conduit requirements with each system supplier prior to bid to determine special conduit system requirements.

4.30.2 The Contractor shall provide a pull rope in all conduits for these systems.

4.30.3 The Contractor shall provide conduit sleeves for all open cable installations thru rated walls or block walls. Provide conduit from each building main termination cabinet or backboard to the nearest accessible ceiling for access into all electrical or communications rooms.

4.31 In addition to the above requirements, the following requirements shall apply to all data networking conduits:

4.31.1 Flexible metal conduit may only be used where required at building seismic and/or expansion joints.

4.31.2 All underground conduits shall be provided with minimum 24" radius elbows (vertical) and 60” (horizontal).

4.31.3 No length of conduit above grade shall be installed to exceed 150 feet between pull boxes, or points of connection, unless where specifically detailed on the drawings.

4.31.4 No length of conduit shall be installed to exceed two 90 degree bends between pull boxes, or points of connection, unless where specifically detailed on the drawings.

4.32 Where surface raceways are installed in interior spaces, the Contractor shall take care to route in straight lines at right angles to or parallel with walls, beams, or columns. All raceways and device boxes shall be securely screwed to the finish surface with zinc screw “Auger” anchors Stk #ZSA1K by Gray Bar Electric or equal. Tape adhesive application will not be permitted.

4.33 The Contractor who installs surface raceway systems shall provide and install complete with wire retention clips, one for every (8) vertical feet or (5) horizontal feet or portion thereof. This Contractor shall also provide each raceway channel with pull strings.

4.34 It shall be the responsibility of the Contractor installing the raceway to coordinate the installation of raceway device plates and inserts with the communications or data contractors.

4.35 MC or MC-PCS cable shall be cut using a specific metallic sheath armor stripping tool. The use of hacksaws, dikes or any other tools not specifically designed to remove the armor sheath will not be permitted.

4.36 MC or MC-PCS cables installed in attic spaces or above lay-in ceilings shall be installed to be protected from physical damage. The cable shall be mounted along the sides or bottom of joists, rafters or studs.

4.37 Support wires used for supporting ceilings, lighting fixtures or other equipment items shall **not** be used to support MC or MC-PCS cables. Conduits, duct work, piping or any other equipment shall not be used to support or mount MC cables.

4.38 MC or MC-PCS cable supports, fasteners and clips shall be designed specifically for use with MC cables. Standard conduit supports, fasteners and clips, nails or other items are not permitted for installing MC cables.

END OF SECTION

SECTION 26 05 34

OUTLET AND JUNCTION BOXES

PART 1 – GENERAL

1.1 Furnish and install electrical wiring boxes as specified and as shown on the electrical drawings.

1.2 Submit manufacturer's data for all items.

1.3 <u>Common submittal mistakes which will result in the submittals being rejected:</u>

1.3.1 Not including all items listed in the above itemized description.

1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.

1.3.3 Not including actual manufacturer’s catalog information of proposed products.

1.3.4 Do not include multiple manufacturers for similar products and do not indicate “or approved equal” statements, or “to be determined later” statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

2.1 Boxes shall be as manufactured by Steel City, Appleton, Raco, or approved equal.

2.2 All boxes must conform to the provisions of Article 370 of the CEC. All boxes shall be of the proper size to accommodate the quantity of conductors enclosed in the box. Minimum box size shall be 4" square x 1-½" deep.

2.3 Boxes generally shall be hot dipped galvanized steel with knockouts. Boxes on exterior surfaces or in damp locations shall be corrosion resistant, cast feraloy and shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Boxes shall be Appleton Type FS, Crouse-Hinds, or the approved equal. Conduit bodies shall be corrosion resistant, cast malleable iron. Conduit bodies shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Conduit bodies shall be Appleton Unilets, Crouse-Hinds, or the approved equal. Where recessed, boxes shall have square cut corners.

2.4 Deep boxes shall be used in wall covered by wainscot or paneling and in walls or glazed tile, brick, or other masonry which will not be covered with plaster. Through the wall type boxes shall not be used unless specifically called for. All boxes shall be nongangable. Boxes in concrete shall be of a type to allow the placing of conduit without displacing the reinforcing bars. All lighting fixture outlet boxes shall be equipped with the proper fittings to support and attach a light fixture.

2.5 All light, switch, receptacle, fire alarm devices and similar outlets shall be provided with approved boxes, suitable for their function. Back boxes shall be furnished and installed as required for the equipment and/or systems under this contract.

2.6 Pull and junction boxes shall be code gauge boxes with screw covers. Boxes shall be rigid under torsional and deflecting forces and shall be provided with angle from framing where required. Boxes shall be 4" square with a blank cover in unfinished areas and with a plaster ring and blank cover in finished areas. Covers for flush mounted oversize boxes shall extend ¾" past boxes all around. Covers for 4" square boxes shall extend ¼" past box all around.

2.7 All terminal cabinets and junction boxes or equipment back boxes which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.

2.7.1 The Division 26 Contractor shall coordinate all box requirements with each system supplier prior to bid to determine special cabinet or back box requirements. The Contractor shall also provide stainless steel blank cover plates for all low voltage systems installed for future equipment.

2.7.2 The Contractor shall provide all plywood backboards indicated on walls or inside equipment enclosures. All backboards shall be a minimum of ¾" thick fire rated type plywood.

2.7.3 The Contractor shall coordinate exact rough in locations and requirements with each system supplier.

2.8 In addition to the above requirements, boxes for data networking wiring and equipment shall comply with the following:

2.8.1 All boxes shall be a minimum of 4-11/16" square x 2-1/8" deep.

2.8.2 Where pull boxes are required on individual conduits 1-¼" or smaller, provide 4-11/16" square x 2-1/8" deep boxes. Where pull boxes are required on conduits larger than 1-¼" for straight pull through, provide eight times the conduit trade size for box length. Where pull boxes are required on conduits larger than 1-¼" for an angle or a U-pull through installation, provide a minimum distance of six times the conduit trade size between the entering and exiting conduit run for each cable.

2.9 Recessed boxes installed in fire rated floors/walls and /or smoke walls shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. The Contractor shall submit copies of the manufacturers UL system design details proposed for use on this project. All Fire stopping material shall have an hourly fire-rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.

PART 3 – EXECUTION

3.1 Boxes shall be installed where required to pull cable or wire, but in finished areas only by approval of the Architect. Boxes shall be rigidly attached to the structure, independent of any conduit support. Boxes shall have their covers accessible. Covers shall be fastened to boxes with machine screws to ensure continuous contact all around. Covers for surface mounted boxes shall line up evenly with the edges of the boxes.

3.2 Outlets are only approximately located on the plans and great care must be used in the actual location of the outlets by consulting the various detailed drawings and specifications. Outlets shall be flush with finished wall or ceiling, boxes installed

symmetrically on such trim or fixture. Refer to drawings for location and orientation of all outlet boxes.

3.3 Furnish and install all plaster rings as may be required. Plaster rings shall be installed on all boxes where the boxes are recessed. Plaster rings shall be of a depth to reach the finished surface. Where required, extension rings shall be installed so that the plaster ring is flush with the finished surface.

3.4 All cabinets and boxes shall be secured by means of toggle bolts on hollow masonry; expansion shields and machine screws or standard precast inserts on concrete or solid masonry; machine screws or bolts on metal surfaces and wood screws on wood construction. All wall and ceiling mounted outlet boxes shall be supported by bar supports extending from the studs or channels on either side of the box. Boxes mounted on drywall or plaster shall be secured to wall studs or adequate internal structure.

3.5 Boxes with unused punched-out openings shall have the openings filled with factory-made knockout seals.

3.6 Where standby power and normal power are to be located in the same outlet box or 480V in a switch box, install partition barriers to separate the various systems.

3.7 All device boxes and junction boxes for fire alarm system shall be painted red and shall be 4-11/16” square by 2-1/8” deep. No exceptions.

END OF SECTION

SECTION 26 05 43

UNDERGROUND PULL BOXES AND MANHOLES

PART 1 – GENERAL

1.1 Furnish and install electrical underground pullboxes and manholes as specified and as shown on the electrical drawings.

1.2 Submit manufacturer's data for all items.

1.3 **Common submittal mistakes which will result in the submittals being rejected:**

1.3.1 Not including all items listed in the above itemized description.

1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.

1.3.3 Not including actual manufacturer’s catalog information of proposed products.

1.3.4 Do not include multiple manufacturers for similar products and do not indicate “or approved equal” statements or “to be determined later” statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

2.1 The concrete for pull boxes and manholes shall be class 5500 psi or as noted on the drawings. All pullboxes and manholes and covers located in parking lots, driveways, roads, or any other driveable areas shall be traffic rated.

2.2 Each manhole shall be provided with a fiberglass ladder and ground rod. Ground rods shall be copper or a copper-clad steel 3/4" diameter by 10-feet long. All non-current carrying metallic components shall be grounded to the ground rods with minimum #6 copper wire.

2.3 All underground pullboxes shall be provided with steel bolt down type covers. Bolts shall be bronze or brass. All communication or signal system pullboxes shall be sized to comply with CEC Article 370 unless where other sizes are specifically noted on the drawings.

2.4 All underground pullbox and manhole covers shall be provided with either "electrical" or "telephone" or "fire alarm" markings. The telephone marking shall be used to identify telephone, T.V., clock or any other types of communication systems.

2.5 All power and communication systems shall be provided with separate pullboxes or manholes. Fire alarm circuits shall also be provided with separate pullboxes from any other type of communication systems.

PART 3 – INSTALLATION

3.1 Shoring of the excavation shall be in accordance with all federal, state and local regulations.

3.2 Provide sealing material for the joints between sections per manufacturer's instructions.

3.3 The contractor shall make the top and access assembly or lid flush with surrounding areas where installed in driveable or normal walking areas.

END OF SECTION

SECTION 26 24 16

PANEL BOARDS

PART 1 – GENERAL

1.1 Furnish and install branch circuit panel boards as specified herein and as indicated on the drawings. Submit manufacturers' data on all items.

1.2 Submit manufacturers' data on all panel boards and components including:

1.2.1 Enclosures and covers

1.2.2 Breakers

1.2.3 Surge Protective Device (SPD) equipment

1.2.4 Incident energy level calculations

1.2.5 Common submittal mistakes which will result in the submittals being rejected:

1.2.5.1 Not arranging the circuit breakers in panels to match the orientations indicated on the drawings. In other words, if a 30 amp breaker is shown on the drawing in Space #2, this must be the location it appears on the submittal schedule. Standard factory arrangements will not be accepted.

1.2.5.2 Not including all items listed in the above itemized description.

1.2.5.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.

1.2.5.4 Not including actual manufacturer's catalog information of proposed products.

1.2.5.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

2.1 The interrupting rating of circuit breakers shall be 10,000 amps for the 120/208 system and 14,000 amp for 277/480 volt systems. Refer to drawings for higher interrupting rating requirements. All components and equipment enclosures shall be manufactured by the same manufacturer. Circuit breakers shall be permitted to be series rated to limit the available fault current to no more than the above ratings.

2.2 All panels shall be fully bussed. Recessed panel enclosures shall be a maximum of 20" wide and 5-3/4" deep for all panels 600 amp rated and less.

2.3 All busses shall be tin-plated aluminum and shall be located in the rear of the panelboard cabinet. Individual circuit breakers shall be bolt on type and removable from the cabinet without disturbing the bussing in any way. All panel boards shall contain ground busses.

2.4 Panel covers shall be door in door style, with one lock. Door lock shall allow access to breakers only. Access to wireways without removal of cover shall be permitted by (non removable) screws behind the locked door. Panel cover shall be provided with full length piano hinge. All locks for all panels provided in this project shall be keyed alike.

2.5 Each panel shall have a two-column circuit index card set under glass or glass equivalent on the inside of the door. Each circuit shall be identified as to use and room or area. Areas shall be designated by room numbers. Room numbers shown on the drawings may change and contractor shall verify final room numbers with the architect prior to project completion.

2.6 Tandem mounted or wafer type breakers are not acceptable.

2.7 Multiple breakers shall have one common trip handle or be internally connected. Handle ties are not acceptable.

2.8 Breaker arrangements shown in the drawings shall be maintained. The circuit breakers in panels must match the orientations indicated on the drawings. In other words, if a 30 amp breaker is shown on the drawing in Space #2, this must be the location it appears on the submittal schedule. Standard factory arrangements will not be accepted.

2.9 Where conductor sizes exceed the standard breaker lug wire range, or where multiple conductors per phase are required, the panelboard manufacturer shall provide the breaker with suitable lugs for terminating the specified conductors.

2.10 Acceptable manufacturers are Square D, Eaton, Siemens or General Electric.

2.11 Equipment manufactured by any other manufacturers not specifically listed in Section 2.10 are <u>not</u> considered equal, or approved for use on this project.

Surge Protective Devise (SPD)

2.12 Surge Protective Device (SPD) panelboards, shall be provided with an integrated circuit breaker panelboard and parallel connected suppression / filter system in a single enclosure. The SPD panelboard shall meet the following parameters: IEEE C62.41.1, IEEE C62.41.2, IEEE C62.45, UL 1283 and the UL 1449, Third Edition, effective September 29, 2009.

2.13 The panelboard shall be UL 67 Listed and the SPD shall be UL 1449 labeled as Type 1 or Type 2 or as Type 4 intended for Type 1 or Type 2 applications. SPD shall be factory installed integral to the panel board.

2.14 The SPD panelboard shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.

2.15 SPD shall meet or exceed the following criteria:

2.15.1 For standard areas supply SPD having 100kA per phase surge current capacity. For mountain and desert areas (areas with over 5 lightning strikes per year), SPD shall have a per phase surge current capacity of 200kA.

2.15.2 UL 1449 – Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

VOLTAGE	L-N	L-G	N-G	L-L	MCOV
208Y/120	700V	700V	700V	1200V	150V
480Y/277	1200V	1200V	1200V	2000V	320V

2.15.3 SPD shall be UL labeled with 100kA Short Circuit Current Rating (SCCR).

2.16 UL 1449 - Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

VOLTAGE	L-N	L-G	N-G	L-L	MCOV
208Y/120	700V	700V	700V	1200V	150V
480Y/277	1200V	1200V	1200V	2000V	320V

2.17 SPD shall be UL labeled with a minimum 100kVA short circuit rated (SCCR).

2.18 UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277	15%	320V

2.19 SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz. No filtering is required for a 100kA SPD.

2.20 Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30mm diameter.

2.21 Type 4 SPD shall include a serviceable, replaceable module.

2.22 SPD shall be equipped with the following diagnostics:

2.22.1 Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.

2.22.2 No other test equipment shall be required for SPD monitoring or testing before or after installation.

2.23 SPD shall have a response time no greater than 1/2 nanosecond

2.24 SPD shall have a 10 year warranty

2.25 The SPD panelboard shall have removable interior

2.26 The SPD panelboard main bus shall be aluminum and rated for the load current required

2.27 The SPD panelboard shall include a 200% rated neutral assembly with copper neutral bus

2.28 The unit shall be provided with a safety ground bus

(SPD) Quality Assurance

2.29 Manufacturer Qualifications: Engage a firm with at least 5 years experience in manufacturing transient voltage surge suppressors.

2.30 Manufacturer shall be ISO 9001 or 9002 certified.

2.31 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

2.32 The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

PART 3 – EXECUTION

3.1 Painting of panelboard covers in finished areas shall be done by the general contractor.

3.2 Provide a spare 3/4" conduit stubbed to an accessible area for each of every three (3) spares or spaces provided in recessed panel boards.

3.3 All lugs shall be torque tested in the presence of the inspector of record.

Arc Flash and Shock Hazard

3.4 The Contractor is to provide, and submit to the engineer for approval, incident energy level calculations as determined using the methodologies described in NFPA 70E or IEEE standard 1584-2002.

3.4.1 **All studies shall be performed by "Emerson Electric" (858) 695-9551, MTA (858) 472-0193, or Terra Power Solutions (858) 380-8170. Studies performed by manufactures or other engineering or testing companies must submit qualifications for approval by Johnson Consulting Engineers, 7 days prior to bid for this project**.

3.5 A warning label, as specified in the above standard, shall be placed on each switchboard, panelboard, and safety switch indicating the incident energy levels on the equipment to warn qualified personnel in accordance with NFPA 70E, section 110.16 Labels shall be laminated white micarta with black lettering on each. Letters shall be no less than 3/8" high.

3.6 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department

3.7 The design goal is to minimize the incident energy to which a maintenance employee may be exposed.

END OF SECTION

SECTION 26 27 26

SWITCHES AND RECEPTACLES

PART 1 – GENERAL

1.1 Furnish and install all wiring devices as shown on drawings and as herein specified. Unless otherwise noted, device and plate numbers shown are Hubbell and shall be considered the minimum standard acceptable. Other acceptable manufacturers are Pass and Seymour, Leviton, General Electric and Bryant.

1.2 Submit manufacturers' data on all items.

1.3 **Common submittal mistakes which will result in the submittals being rejected:**

1.3.1 Not correctly indicating ampacity rating of proposed devices.

1.3.2 Not including all items listed in the above itemized description.

1.3.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.

1.3.4 Not including actual manufacturer's catalog information of proposed products.

1.3.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements or "to be determined later" statements. The products being submitted must be the products installed.

PART 2 – PRODUCTS

2.1 All switches shall be of the quiet mechanical type, Specification Grade, 20 amp, 120/277 volt AC as follows:

	HUBBELL	LEVITON	PASS & SEYMOUR
Single Pole	CS120	CS1202	CS20AC1
Two Pole	CS1222	CS2202	CSB20AC2
Three-way	CS320	CS3202	CS20AC3
Key Switch	HBL1221L	1221-2L	PS20AC1-L

2.2 All switches shall have the "on" and the "off" position indicated on the handle. If switches of higher ampere ratings are required, they shall be of similar type and quality as those shown above. Groups of switches shown at one location shall be installed under a single plate up to a maximum of six where more than six switches are shown coordinate arrangement with the Architect.

2.3 Dimmer switches for incandescent lamp loads shall be square-law type, slide control dimmer with OFF position, Lutron or Hubbell "Nova-T" Series NT-600 (0-500 watt load), NT-1000 (501-900 watt load), NT-1500 (901-1500 watt load), or equal (no known equal).

2.4 All convenience receptacles and special outlets throughout shall be grounding type. Convenience receptacles shall be side wired, parallel slot, two pole, three wire, 20 amp as follows:

	HUBBELL	LEVITON	PASS & SEYMOUR
Duplex	5352	5362	PS5362
GFCI	GFR5362	7899	2097
Isolated Ground	IG5362	5362IG	IG6300
Tamper Proof		8300SG	TR63H

2.5 All safety or tamper proof receptacles shall have no exposed external current carrying metal parts, and shall have integral wiring leads suitable for two or three wire installations.

2.6 Special receptacles shall be as noted on the drawings.

2.7 Weatherproof plates shall be designed to meet CEC Article 410-57, wet location listed with cover "open." Where weatherproof receptacles have been identified to be provided with locking covers, the cover shall be as manufactured by Pass & Seymour #4600-8 or Cole Lighting 310 Series. Rough-in requirements vary between manufacturers. Contractor to field verify requirements prior to installation.

2.8 All plates throughout shall be stainless steel. Where wiring devices are installed in concrete block walls, provide oversized 3-1/2" x 5" coverplates.

2.9 All devices shall be white unless otherwise noted or a special purpose outlet.

2.10 Unless where specifically detailed on the drawings, floor boxes shall be PVC suitable for concrete poured floors of minimum 3-1/2" depth, with a modular design to gang two or three sections together.

2.10.1 Carlon #E976 series or approved equal

2.10.2 Provide brass cover with brass carpet flange unless otherwise detailed.

PART 3 – EXECUTION

3.1 Switches for room lighting shall be located no more than 12" center line from door jamb at plus 48" center line above finished floor or +46" to top of devices where located over casework, reference CBC Figure 11B-5D.

3.2 All receptacles shall be mounted at plus 18" to center line above finished floor unless noted or shown otherwise. All receptacles shall be installed with the ground pin up, at the top of the receptacle to comply with IEEE 602-1986.

3.3 Furnish and install wall plates for all wiring devices, and outlet boxes, including special outlets, sound, communication, signal, and telephone outlets, etc. as required. All cover plates shall be appropriate for type of device.

END OF SECTION

SECTION 27 01 00

COMMUNICATIONS GENERAL PROVISIONS

ARTICLE 1 - SUMMARY

1.1 This Division of the specifications outlines the provisions of the contract work to be performed as a sub contract under the Division 26 scope of work. Reference the Division 26 Electrical General Provisions for scope of work and general requirements.

1.2 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under Division 1 requirements.

END OF SECTION

SECTION 27 10 00

VOICE / DATA INFRASTRUCTURE

PART 1 – GENERAL

1.1 Include all labor, equipment and materials necessary for providing a complete networking infrastructure system as described herein and/or as indicated on the drawings.

1.2 Related specification sections:

1.2.1 Section 26 01 00 - General Provisions.

1.2.2 Section 26 05 33 - Conduit and Fittings.

1.2.3 Section 26 05 19 - Conductors.

1.2.4 Section 26 05 34 – Outlet and Junction Boxes.

1.3 Approved minimum Product and Contractor Extended Warranty Certifications;

1.3.1 All components shall be manufactured by one of approved manufacturers, the installing Contractor must have the accompanying certification from the product manufacturer(s) for installation of a “Extended Warranted System” as required by each manufacturer and as indicated in these specifications.

1.3.1.1 Specified system warranties are to be established between the component and cable manufacturers and the District, warranties between the cable manufacturer only or installing Contractor and the District are not considered equal.

1.3.1.2 Warranty shall be a full “Performance Warranty” installed by a “Certified Contractor” as specified by one of the approved manufacturer’s. A “Component Warranty” will not be considered equal. All components, labor, and “Performance Criteria" shall be warranted by one of the approved manufacturers;

1.4 Acceptable manufacturers are:

1.4.1 **Leviton / Berk-Tek**

1.4.1.1 Installing Contractor must be LEVITON Network Solutions Premier certified to install this system.

1.4.1.2 Warranty provision and training must be for the Levition/Berk-Tek – Limited Lifetime Premium Performance Warranty program.

1.4.2 **Commscope**

1.4.2.1 Commscope’s Training and Warranty programs encompass the brand names known as AMP Netconnect,.

1.4.2.2 Installing Contractor must be PartnerPro certified to install any of the systems under the Commscope Family of brand names. Alternate certification that applies is AMP ND&I Premier Certification for products installed with the AMP Netconnect brand name.

1.4.2.3 Warranty provision and training must be for the Commscope (AMP Netconnect, Uniprise and Systimax) – 25-Year Premium Performance Warranty program.

1.4.3 **Ortronics (Legrand)/Superior Essex**

1.4.3.1 Installing Contractor must be CIP-ESP or CIP certified to install this system.

1.4.3.2 Warranty provision and training must be for the nCompass – Lifetime Premium Performance program.

1.4.4 **Panduit/General Cable**

1.4.4.1 Installing Contractor must be PanGen certified to install this system.

1.4.4.2 Warranty provision and training must be for the PanGen Certification Plus – 25-Year Siemon Premium Performance program.

1.4.5 Warranty shall be to the District, for the period as defined by the Network Infrastructure System selected for installation, after District acceptance and sign-off of the completed system. The Contractor must provide documentation from one of the approved manufacturers, as indicated in Section 1.3, indicating their qualifications for installation of this system in compliance with the manufacturer's warranty period requirements as a warranted Contractor.

1.4.6 Equipment qualifications: It is the intent of these specifications that each bidder provides all hardware, components and installation services that are necessary to ensure a fully operational wiring system including warranties, as shown in the EIA/TIA Category-6 and the Augmented Category-6 (6A) guidelines.

1.4.7 All components, parts, infrastructure, patch cables, termination panels and cables must be classified by the manufacturer or manufacturers as a part of the "Extended Warranty" program. Contractor may not mix in components from other certified programs or materials that are not considered part of the "Lifetime" warranty.

1.4.8 Systems or components as manufactured by any other manufacturer which, are not specifically listed in 1.3, are **not** approved for use on this project.

1.5 **Installing Contractor qualifications:** Firms and their personnel must be regularly engaged in the installation of data networking cabling and equipment for systems of similar type and scope. The Contractor must have a full-service office able to respond to emergency callouts during the warranty period. The Contractor must also provide complete installation of all wiring and devices or equipment. **Subcontracts with Electrical Contractors or other warranted or non-warranted Contractors for supervised installation of any part of this system are not approved**.

1.5.1 Contractor shall have on staff a minimum of (1) BICSI RCDD on staff as full-time employees.

1.5.2 The successful Contractor shall be a California licensed C7 or C10 Premise Wiring Contractor as defined in this specification.

1.5.3 All work shall be performed under the supervision of a company accredited and trained by the Manufacturer of the components and cable and such accreditation

must be presented with the bid submittal. Contractor must be accredited a minimum of 180 days prior to bid submittal date. All personnel performing work on this project must have successfully completed the manufacturer's training courses to completely comply with the extended warranty requirements prior to performance of any work on this project. Accreditation will consist of individual employee certifications issued by the manufacturer or manufacturers.

1.5.4 All personnel engaged in the testing of premises fiber optic and copper UTP cable systems must have successfully completed the test equipment manufacturer's training courses. Certification of such training must be presented with the bid submittal. Cut sheets of the test equipment to be utilized shall be provided with the Phase I project material submittals.

1.5.5 This project shall employ both Category-6 and Augmented Category-6 cabling. The Contractor shall install the related components in relation to the performance requirements for each type of cable installed.

1.5.6 If Contractor routes cables and/or associated pathways in another route than indicated on the drawings, they shall maintain all maximum cable installation distances as required by the manufacturer's distance limitations**.**

1.6 In order to ensure project cohesion, a single point of contact is required to provide a "TURNKEY" solution. The work covered under this section of the specification consists of furnishing all; labor; cabling; equipment; supplies; materials, and training. The Contractor will perform all operations necessary for the "TURNKEY" and fully completed installation in accordance with the specifications herein. As such, the successful Contractor must be factory trained on all aspects of Network Infrastructure Cabling System.

1.7 The drawings indicate a schematic routing of cables above ceilings. The Contractor shall field-verify the most appropriate routing of all above-ceiling cable prior to bid. Where cables penetrate through walls a conduit sleeve shall be provided. Where cables pass through fire rated walls, the conduit sleeve shall be sealed to maintain the rating of the wall assembly.

1.8 Unless otherwise noted in the project drawings or these specifications, the Division 26 Contractor shall provide the installation of all conduits, outlet and junction boxes, trenching and pull box installation.

1.9 The Contractor shall provide a licensed, qualified electrical Contractor for installation of all conduits, outlet and junction boxes, trenching and pull box installations.

1.10 General Submittal Requirements

1.10.1 **Phase I Submittal** shall be made in electronic format within (20) working days after the award of the contract by the District. This submittal shall include the following:

1.10.1.1 Complete Bill of Materials in Excel Spreadsheet format with bills of quantities, including all materials, components, devices, and equipment required for the work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each Section listed:

1.10.1.2 Description and quantity of each product.

1.10.1.3 Manufacturer's Name and Model Number.

1.10.1.4 Manufacturer's Specification Sheet or Cut Sheet.

1.10.1.5 Specification Item Number referenced for each required product or if not shown in the specifications, Drawing Detail Number being referenced. (ie; Spec. 271000 Item 2.1 or DWG E4.15/#1)

1.10.1.6 Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment.

1.10.2 **Phase II Submittal** shall be provided within (20) working days after the approval of the Phase I submittals and prior to any fabrication or field conduit installations. All shop drawings shall be engineered in a CAD Software. Submission shall include electronic print copies to match the contract drawings, and Phase II submittals drawings shall include the following.

1.10.2.1 MDF and IDF equipment rack or cabinet elevations will be required to be provided including cable routing, grounding, support, UPS, network electronics, etc. and position of all components in the rack or cabinet.

1.10.2.2 Provide labeling plan which identifies the proposed scheme for identifying all components including Racks, patch panels (fiber and copper), site distribution feed cables, horizontal station cables and site conduit systems (handholes, pullboxes,etc.).

1.10.2.3 Provide shop drawings showing all end device locations, tap values, paging zones and amplifier sizing for each zone for analog speakers and horns, including devices connected to IP-Based zone controllers.

1.10.3 Common submittal mistakes which will result in submittals being rejected:

1.10.3.1 Not including the qualifications of the installing Contractor Company and Contractor’s Staff.

1.10.3.2 Not including all items listed in the above itemized description.

1.10.3.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed (provided for the project) or crossing out the items which are not applicable.

1.10.3.4 Not including actual manufacturer’s cut sheets or catalog information of proposed products.

1.10.3.5 Do not include multiple manufacturers for similar products and do not indicate “or approved equal” statements, or “to be determined later” statements. The products being submitted must be the products installed.

1.10.4 The Contractor shall make a written request directly to Johnson Consulting Engineers for electronic drawing files (CAD). As a part of the written request, please include the following information:

1.10.4.1 Clearly indicate Project Name and Client, Johnson Consulting Job Number (located in bottom left corner of JCE Engineering Stamp) and each drawing Sheet Number required (i.e., E1.1, E2.1, E4.1 etc.).

1.10.4.2 Identify the name, Company, Title, phone number, mailing address and e-mail address of the person to receive the files.

1.10.4.3 Detail or Riser diagram sheets, System Schematic drawings or any other drawings other than floor plans or site plans, will not be made available to the Contractor.

1.10.4.4 Files will only be provided in the AutoCAD format in which they were created (i.e., version 2015 or version 2016). Files will not be made available in REVIT format.

1.10.5 Requests for files will be processed as soon as possible; a minimum of 7 working days should be the normal processing time. The Contractor shall be completely responsible for requesting the files in time for their use and delays in requesting files will not alleviate the Contractor from submitting required documents within the required timeline.

PART 2– RACKS AND CABINETS

2.1 Equipment racks have been detailed on the drawings and additional component information requirements have been described in the MDF or IDF products sections. The following is a list of approved manufacturers for each type of rack to be furnished.

2.1.1 Alternate equipment manufacturers other than those indicated will not be reviewed or approved for use on this project.

2.1.2 **(Open Frame – 4-Post or 2-Post)** shall be manufactured by Chatsworth CPI QuadraRack or Middle Atlantic R4 Series. Reference drawing details and specifications for complete requirements.

2.1.3 **(Mini Vertical Equipment Mount)** shall be manufactured by Middle Atlantic HDR Series wall mount cabinet with vertical mounting rails for the electronics. Reference drawing details and specifications for complete requirements.

2.1.4 **(Enclosed Swing Wall Mount)** shall be manufactured by Middle Atlantic DWR Series or Cooper B-Line V-Line Dual Hinge. Reference drawing details and specifications for complete requirements.

2.1.5 **(Freestanding Enclosed Cabinet)** shall be manufactured by Middle Atlantic WRK Series freestanding cabinet. Reference drawing details and specifications for complete requirements.

2.1.6 **(Enclosed Wall/Floor Mount)** shall be manufactured by Middle Atlantic SR Series. Reference drawing details and specifications for complete requirements.

2.1.7 **(Freestanding Outdoor Enclosed)** shall be manufactured by DDB Unlimited drawing details and specifications for complete requirements. All cabinets for the project shall be keyed alike and keys shall match among all cabinets. Coordinate with the manufacturer to match the keys that will be provided by the manufacturer of the interior cabinets.

PART 3– MDF ROOM REQUIREMENTS

Main Distribution Frame (MDF is existing)

3.1 The Main Distribution Frame (MDF) Room is existing. The Contractor shall include the following items at this location;

3.1.1 Provide all accessories required whether shown on the project drawings or within these specifications. The drawings and specifications shall be considered a single document.

3.1.2 Fiber Optic Feed Cable Patch Panels - Fiber optic termination equipment (rack mounted), including all associated installation hardware. The equipment must have sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future wiring requirements, including bulkheads in the fiber patch panel. Provide blank fillers for all used portions of the panel. All fiber feed cables shall be terminated in a single fiber optic patch panel up to 144 strands. Additional strands shall be terminated in the largest size required to contain the remaining fibers.

3.1.2.1 Contractor shall provide a minimum of 6-feet of slack on the fiber feed cable in the fiber optic patch panel. The first 48” of a tight buffered cable or the first 24” of a loose tube cable shall not be stripped back in the patch panel. Each type of cable shall have a minimum of 24” of stripped slack within the patch panel. Total slack within the patch panel shall not be less than 6-feet in length.

3.1.2.2 All fiber cables shall be secured to the patch panel with the Kevlar strength members at the manufacturer provided anchor point at the rear of the panel.

Additional items required for each MDF are as follows:

3.1.3 All fiber optic feed cables routed to the MDF Room shall be provided with 20-feet of slack for a service loop mounted on the backboard behind the racks. Contractor shall provide a 24” diameter wall mounted service loop manager for the fiber optic feed cables as manufactured by Leviton #48900-FR. Maximum of (3) fiber feed cables per manager. Provide quantity of managers as required to manage all service loops

3.1.4 Provide all other items as detailed on the drawings.

PART 4 – IDF REQUIREMENTS

Intermediate Distribution Frame (IDF) Typical Requirements

4.1 The Intermediate Distribution Frame (IDF) Room shall be a secondary wiring and equipment location for the data networking system. The Contractor shall include the following items at this location.

4.1.1 Provide backboard 8'-0" high x 3/4" thick, with a minimum 48” width. Refer to the floorplans for the actual layout of the backboard coverage. Plywood mounting backboard shall be flame resistant, painted with fire resistant paint “white” or color to match the room finish. Contractor shall provide minimum one side finish grade plywood. Backboard shall be mounted with finish side out, regardless of location of fire rating stamp. Show proof of fire rating stamp to IOR or Inspector prior to installation.

4.1.2 Fiber Optic Feed Cable Patch Panels - Fiber optic termination equipment (rack mounted), including all associated installation hardware. The equipment must have sufficient number of ports to connect all fibers in every cable terminated at this location. Provide 25% spare capacity for future wiring requirements. Provide blank fillers for all used portions of the panel. All fiber feed cables shall be terminated in a single fiber optic patch panel.

4.1.2.1 Each IDF location shall be furnished with a minimum 24-Port patch panel, fully loaded with bulkheads. Type of connectors in the bulkheads shall be determined by the type of connectors used for termination of the fiber feed cables.

4.1.2.2 Contractor shall provide a minimum of 6-feet of slack on the fiber feed cable in the fiber optic patch panel. The first 48" of a tight buffered cable or the first 24" of a loose tube cable shall not be stripped back in the patch panel. Each type of cable shall have a minimum of 24" of stripped slack within the patch panel. Total slack within the patch panel shall not be less than 6-feet in length.

4.1.2.3 All fiber cables shall be secured to the patch panel with the Kevlar strength members at the manufacturer provided anchor point at the rear of the panel.

4.1.3 Category-6 Modular Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each Voice/Data, AV Equipment and IP Camera outlet, served from this location. Provide 25% spare capacity for future wiring requirements. All patch panels shall be 24 or 48-ports maximum. Provide cable support bars at the rear of each patch panel all cables shall be secured to bars with velcro straps.

4.1.4 Augmented Category-6 Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each WAP outlet served from this location. Provide 25% spare capacity for future wiring requirements. All patch panels shall be 24 or 48-port maximum. Provide cable support bars at the rear of each patch panel all cables shall be secured to bars with velcro straps.

4.1.5 If the project requires the installation of both Category-6 and Augmented Category-6 cabling and patch panel connections, the Augmented Category-6 patch panel shall be clearly labeled as "Augmented Category-6" and the RJ45 port connections shall be either a different color than the standard Category-6 patch panel ports, or the patch panel ports shall be provided with a colored icon to differentiate the Augmented Cat-6 connections from the Category-6 connections.

4.1.6 Uninterruptible Power Supplies (UPS) shall be furnished and installed by the District. Contractor shall furnish the required power outlet for the UPS at the IDF location. See the floor plans for the power requirements.

4.2 IDF Rooms provided with 4-Post Racks - Furnish and install equipment mounting racks as shown on project floor plans and details. Furnish the following additional components and installation practices for the racks;

4.2.1 Provide all accessories required whether shown on the project drawings or within these specifications. The drawings and specifications shall be considered a single document.

4.2.2 The racks shall be provided with structural seismic bracing using cable runway to the top of the rack, with the width of runway as shown on the MDF Room drawings and details.

4.2.3 Universal 12” cable runway shall be as manufactured by CPI Model 10250-712. The cable runway shall be furnished with the additional adapters, connectors, support components, bends and offsets and extensions as required to fit the room and layout as shown in the drawings. Cable runway shall be bonded together as shown in the detail drawings.

4.2.4 Anchor the cable runway to the wall with the appropriate width angle bracket and bolts as manufactured by CPI Model #11421-712.

4.2.5 The cable runway shall also the attached to the top of the rack with the appropriate adapter panel. Cable runway shall be directly attached to the 4-Post racks with J-Hooks.

4.2.6 Cable runway routed along walls, shall be offset from the wall a minimum of 6” and shall be supported with cantilevered wall mount brackets as shown in the detail drawings.

4.2.7 The racks shall be structurally anchored to the floor with the anchors and bolts as shown in the detail drawings. Anchoring shall comply with all Local, State and National Codes.

4.2.8 Provide Standard 4-Post Racks, 19” mounting width by 84” High by 29” Deep with #12-24 mounting holes as shown in the IDF Room layout and details. See detail drawings for quantity of racks and additional requirements. Contractor shall be responsible for providing all racks and accessories as shown in the details. The 4-Post racks shall be as manufactured by CPI Model #50120-703 or approved equal by Middle Atlantic R4 Series.

4.2.9 Provide (1) adjustable full depth vented shelf for each 4-Post equipment rack as manufactured by CPI #12700-719.

4.2.10 Provide full length vertical wire managers, CPI Double-Sided Narrow Vertical Manager, Part #12096-703, on each side of each rack. Vertical managers between racks may be substituted with the CPI #11729-703 6” wide double-sided manager. Single narrow vertical managers shall be provided on each end of the group of racks.

4.2.11 Provide Middle Atlantic Model #VDC-6-45-DC vertical managers when installing the Middle Atlantic R4 Series racks.

4.2.12 Provide horizontal wire managers between each patch panel or (1) manager per patch panel. Provide (1) spare manager per rack. Provide 2RMU height managers for each 48-Port patch panel and 1RMU height managers for 24-Port patch panels. CPI Part #30130- 719 and # 30139-719.

4.2.13 Provide (1) ground bus bar kit with lugs per IDF Room as detailed in the drawings. Ground Bus Bar kit as manufactured by CPI #40158-012 (or approved equal). Ground Bus Bar and all bonding conductors to the bus bar shall be labeled as shown in the drawing details. Grounding conductors shall be routed to the equipment racks, cable runway and electrical panel.

4.2.14 Furnish grounding to each rack as shown in the detail drawings. Each rack shall be provided with a grounding terminal block, #6 Ground wire from the rack to the busbar and a compression lug on the end of the ground wire at the busbar. Provide grounding components as manufactured by CPI #40167-001 terminal block and #40162-901 compression lug or approved equal.

4.2.15 All fiber optic feed cables routed to the IDF Room shall be provided with 20-feet of slack for a service loop mounted on the backboard behind the racks. Contractor shall provide a 24" diameter wall mounted service loop manager for the fiber optic feed cables as manufactured by Leviton #48900-FR. Maximum of (3) fiber feed cables per manager. Provide quantity of managers as required to manage all service loops.

4.2.16 All cable runway, racks, accessories, supports and wire management shall be black in color. (Unless Otherwise Noted)

4.3 IDF Rooms provided with Full Height Enclosed Cabinet - Furnish and install equipment mounting cabinets as shown on project floor plans and details. Furnish the following additional components and installation practices for the racks;

4.3.1 Provide all accessories required whether shown on the project drawings or within these specifications. The drawings and specifications shall be considered a single document.

4.3.2 The racks shall be provided with structural seismic bracing using cable runway to the top of the cabinet, with cable runway as shown on the IDF Room drawings and details. Minimum of 6" gap between wall and cabinet, unless otherwise shown on the floor plans.

4.3.3 Universal 12" cable runway shall be as manufactured by CPI Model 10250-712. The cable runway shall be furnished with the additional adapters, connectors, support components, bends and offsets and extensions as required to fit the room and layout as shown in the drawings. Cable runway shall be bonded together as shown in the detail drawings.

4.3.4 Anchor the cable runway to the wall with the appropriate width angle bracket and bolts as manufactured by CPI Model #11421-712.

4.3.5 The cable runway shall also the attached to the top of the cabinet with the appropriate adapter panel. Cable runway shall be directly attached to the cabinet with J-Hooks.

4.3.6 Cable runway routed along walls, shall be offset from the wall a minimum of 6" and shall be supported with cantilevered wall mount brackets as shown in the detail drawings.

4.3.7 The cabinets shall be provided with leveling floor glides on the bottom of the cabinet, side panels on the ends of the cabinet group (no panels between cabinets), rear solid door and 25% vented front door with key lock. All key locks shall be the same for all cabinets.

4.3.8 Provide Standard Fully Enclosed Equipment Cabinets, 19" mounting width by 84" High by 32" Deep with #10-32 mounting holes as shown in the IDF Room layout and details. See detail drawings for quantity of cabinets and additional requirements. Contractor shall be responsible for providing all cabinets and accessories as shown in the details. The cabinets shall be as manufactured by

Middle Atlantic Model #WRK-44-32 Series. (Stand Alone single cabinet location shall be provided with the Middle Atlantic Model #WRK-44SA-32 Series)

4.3.9 Provide (1) adjustable full depth vented shelf for each cabinet as manufactured by Middle Atlantic Model #VSA-2744.

4.3.10 Provide horizontal wire managers between each patch panel or (1) manager per patch panel. Provide (1) spare manager per cabinet. Provide 1RMU height managers for patch panels. CPI Part # 30139-719.

4.3.11 Provide (1) ground bus bar kit with lugs per IDF Room as detailed in the drawings. Ground Bus Bar kit as manufactured by CPI #40158-012 (or approved equal). Ground Bus Bar and all bonding conductors to the bus bar shall be labeled as shown in the drawing details. Grounding conductors shall be routed to the equipment cabinets, cable runway and electrical panel.

4.3.12 Furnish grounding to each cabinet as shown in the detail drawings. Each cabinet shall be provided with a grounding terminal block, #6 Ground wire from the cabinet to the busbar and a compression lug on the end of the ground wire at the busbar. Provide grounding components as manufactured by CPI #40167-001 terminal block and #40162-901 compression lug or approved equal.

4.3.13 All fiber optic feed cables routed to the IDF Room shall be provided with 20-feet of slack for a service loop mounted on the backboard behind the cabinet. Contractor shall provide a 24” diameter wall mounted service loop manager for the fiber optic feed cables as manufactured by Leviton #48900-FR. Maximum of (3) fiber feed cables per manager. Provide quantity of managers as required to manage all service loops. (Do not provide service loop manager for existing fiber cables without sufficient slack)

4.3.14 All cable runway, racks, accessories, supports and wire management shall be black in color. (Unless Otherwise Noted)

4.4 IDF Locations provided with an Enclosed Dual Swing Wall Mount Cabinet - Each Wall Mounted IDF Cabinet shall be furnished with the following accessories;

4.4.1 Wall mounted IDF cabinets shall not be less than 45” in overall height unless specifically noted in the drawings.

4.4.2 Provide horizontal wire managers between each patch panel or (1) manager per patch panel. Provide (1) spare manager per rack. Horizontal managers shall not be more than 1RU in height installed in the cabinet. Provide 1RMU height managers for each data patch panel in the cabinet by CPI Part # 30139-719 or approved equal.

4.4.3 Provide (1) ground bus bar kit with lugs per IDF Cabinet as detailed in the drawings. Ground Bus Bar kit as manufactured by CPI #40156-012 (or approved equal) for IDF Cabinets. Ground Bus Bar and all bonding conductors to the bus bar shall be labeled as shown in the drawing details.

4.4.4 Each cabinet shall be provided with a grounding terminal block, #6 Ground wire from the cabinet to the busbar and a compression lug on the end of the ground wire at the busbar. Provide grounding components as manufactured by CPI #13622-010 ground bus bar, #40167-001 terminal block and #40162-901 compression lug or approved equal.

4.4.5 All fiber optic feed cables routed to the IDF Cabinet shall be provided with 20-feet of slack for a service loop mounted in the back of the cabinet, in the backcan. Provide a 12" diameter service loop manager in the rear of wall mount IDF cabinets by Leviton #48900-IFR. Maximum of (3) fiber feed cables per manager.

4.5 IDF Locations provided with a Mini Wall Mount Equipment Cabinet with Vertical rack mounting rails - Each Mini Wall Mounted IDF Cabinet shall be furnished with the following accessories;

4.5.1 Provide wall mount cabinet with vertical mounting rails for the lower equipment. Provide Middle Atlantic Model #HDR-9X, with 4RU upper rack rail capacity and 5RU lower rack rail capacity. Refer to floor plans and detail drawings for additional requirements.

4.5.2 Provide optional Bonding Kit for cabinet by Middle Atlantic Model #PET-K-HDR. Bond to electrical box in cabinet. Follow manufacturer's instructions.

4.5.3 Provide optional fan kit for the HDR Series cabinet by Middle Atlantic Model #HDR-FAN.

4.5.4 All fiber optic feed cables routed to the IDF Cabinet shall be provided with 20-feet of slack for a service loop, mounted on the wall near the IDF cabinet. Provide a 12" diameter service loop manager for fiber by Leviton #48900-IFR. Maximum of (3) fiber feed cables per manager.

Additional items required for each IDF location are as follows:

4.5.5 All fiber optic feed cables routed to the IDF Room shall be provided with 20-feet of slack for a service loop mounted on the backboard behind the racks. Contractor shall provide a 24" diameter wall mounted service loop manager, for the fiber optic feed cables as manufactured by Leviton #48900-FR. Maximum of (3) fiber feed cables per manager. Provide quantity of managers as required to manage all service loops.

4.5.6 Provide a 12" diameter service loop manager, in the rear of the Dual Swing Wall Mount IDF cabinets and mounted on the wall next to the Mini Wall Mount IDF cabinet, by Leviton #48900-IFR.

4.5.7 Provide all other items as detailed on the drawings.

Existing IDF Being Replaced or Relocated General Requirements

4.6 Contractor shall refer to the floor plans for the requirements at each individual IDF location. The existing room may be re-used or expanded to accommodate additional racks/cabinets or the existing IDF cabinet/rack may be replaced and installed in the same location. Some of the IDF locations are new and will be furnished with all the accessories shown in the specifications and drawings. Refer to the instructions in the specifications for additional IDF requirements.

4.7 General instructions for replacement of an existing IDF cabinet in the same location it currently occupies;

4.7.1 Any cabinet that is being replaced in the same location must be coordinated with the District IT Department and the local school campus Administration if there is to be any down time that may affect the operational ability of the network connections. **The change must be performed after hours or on the weekends**

or if done during the work week, the change must be able to be done bringing down the entire IDF location. Full operational ability must be restored for normal working hours.

4.7.2 Do not replace the rack or cabinet until the new UTP cables have been installed and are ready for termination, and the outlets must be completed to allow the users to access the network, unless arrangements have been made with the District IT Department for a complete system shut-down.

4.7.3 New UPS requirements shall be furnished and installed by the District.

4.7.4 Terminate the new cabling according to the requirements shown in the drawings and specifications. All new cabling shall be integrated with the existing cabling to be retained, where applicable.

4.7.5 Follow the instructions as shown for all new fiber feeds and provide the cable managers, patch panels and labeling as required for each IDF location.

4.7.6 Contractor shall remove the existing equipment and patch panels from the existing cabinet or rack. The new cabinet shall be provided with new UTP patch panels, wire mangers (unless the existing managers meet the specification requirements) and fiber optic patch panels. Re-install the existing switches in the new cabinet. Coordinate with the District IT Department for any replacements of the network electronic equipment.

4.7.7 Instructions for existing CAT-6 cables that are being retained and re-terminated on new patch panels on the new rack or cabinet:

4.7.7.1 Re-terminate and re-label all existing Cat-6 UTP cables to be retained on new patch panels in the new rack or cabinet. The patch panels shall be provided to match all new requirements for new cabling.

4.7.7.2 Labeling of the existing cables shall be the same as is required in these specifications for all new Cat-6 UTP cables. The existing cables shall be provided with wrap-around labeling at the rear of the patch panel, meeting the same requirements as new cable drops. Contractor shall re-label the existing cabling and the existing outlet faceplates. If the existing outlet locations are unknown, the Contractor shall tone out and locate the outlets.

4.7.7.3 All existing cabling shall be neatly dressed, routed and supported both outside the rack or cabinet back to the entrance point and inside the rack or cabinet. Provide tie supports and Velcro cable ties to secure all cabling. Contractor shall “clean up” the existing cabling if the cabling is not currently dressed in the proper manner.

4.7.7.4 Test all re-terminated cables to insure proper operation and to insure the cable meets Category-6 levels according to the testing requirements in this specification. Keep test results for the re-terminated UTP cables separate from the new UTP cable run tests. Report any inconsistencies with the UTP tests to the Project Engineer and District IT Department for a decision on a resolution to any problems with the existing UTP cable drops.

4.7.7.5 Replace all copper patch cords that are rated for Enhanced Category-5 or below. New patch cables must be a minimum of Enhanced

Category-6 rated. Contractor shall confirm the exact quantity of patch cords to be replaced.

4.7.7.6 Document each outlet location on the As-Built drawings with the new labeling format.

4.7.8 Category-6 Modular Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each Voice/Data, AV Equipment and IP Camera outlet, served from this location. Provide 25% spare capacity for future wiring requirements. All patch panels shall be 24 or 48-ports maximum. Provide cable support bars at the rear of each patch panel all cables shall be secured to bars with velcro straps.

4.7.9 Augmented Category-6 Patch Panels (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each WAP outlet served from this location. Provide 25% spare capacity for future wiring requirements. All patch panels shall be 24 or 48-port maximum. Provide cable support bars at the rear of each patch panel all cables shall be secured to bars with velcro straps.

4.7.9.1 If the project requires the installation of both Category-6 and Augmented Category-6 cabling and patch panel connections, the Augmented Category-6 patch panel shall be clearly labeled as “Augmented Category-6” and the RJ45 port connections shall be either a different color than the standard Category-6 patch panel ports, or the patch panel ports shall be provided with a colored icon to differentiate the Augmented Cat-6 connections from the Category-6 connections

4.7.10 IDF Rooms where rack is to be replaced - Contractor shall replace the existing IDF rack, with a new IDF rack, as shown in the drawings and specifications. Provide size and quantity of racks as shown for each location in the instructions section. Refer to the details for additional rack requirements.

4.7.10.1 Ground all new racks as required in the detail drawings and provide power to the cabinet as shown on the drawings.

4.7.10.2 Racks being replaced shall be furnished with the same components and installation requirements as new racks in a new IDF location.

4.7.11 IDF Cabinets to be replaced - Provide a new wall mount IDF cabinet and plywood backboard in place of the existing IDF cabinet and plywood, per the drawing details and specifications. Provide size of cabinet as shown for each location in the campus instructions section. Refer to the details for additional cabinet requirements.

4.7.11.1 Cabinets being replaced shall be furnished with the same components and installation requirements as new cabinets in a new IDF location.

4.7.11.2 Ground all new cabinets and provide power to the cabinet as shown on the drawings.

4.7.11.3 Provide conduit sleeves into the accessible ceiling space from the cabinet backcan as shown in the details or on the floor plans. All sleeves shall be provided with connectors and bushings. For cabinets

installed in a room with a non-accessible ceiling or no ceiling, provide 3" nipples in backcan in place of the sleeves.

4.7.11.4 Contractor shall be responsible for re-routing and re-connecting any existing conduits or surface mount raceway, currently routed to the existing cabinet, to the new cabinet. Field verify existing conditions to confirm each individual location's requirements.

4.7.12 Instructions for relocation (change of physical location) of the existing IDF rack/cabinet or IDF Room were shown in the specifications and drawings;

4.7.12.1 For areas that are being serviced by a relocated IDF cabinet or room, the relocated IDF shall be considered a new location and shall be furnished with the same requirements as shown in the drawings and specifications for new IDFs.

4.7.12.2 The existing IDF location, serving the area where the IDF is to be relocated, shall be kept operational through-out the installation process until the new network connections can be activated, unless other arrangements have been made with the District IT Department for a complete system shut-down.

4.7.12.3 The Contractor shall not re-use the existing IDF rack or cabinets in the new IDF location. The existing rack or cabinet shall be disposed of by the Contractor. The existing components and switches shall be returned to the District IT Department, unless otherwise instructed. All items shall be boxed up, labeled with campus name and room of origin or building location, and delivered to a location designated by the District.

4.7.12.4 If the existing cabinet contains terminations or equipment for any other low voltage system, the cabinet shall be abandoned in place and just the data system components removed. If local power is required for other low voltage systems equipment, the existing power shall be left in place. The Contractor shall not remove any components that will disable another low voltage system connection without express permission from the District and the Project Engineer. If it appears that removal of the data components will disable another system, the Contractor shall immediately notify the District and the Project Engineer for a resolution.

4.8 Contractor shall refer to the drawings for any architectural modifications that are required to be made to the space to fit the new rack or cabinet for IDFs that are being either relocated or replaced. Some locations may require the removal or modification of the existing walls, shelves, cabinets, ceilings, lighting, etc. The Contractor shall be responsible for planning, coordination of trades and completion of the modifications.

4.8.1 The District shall remove all existing materials, supplies, furniture, office equipment an any other non-structural obstructions and items stored in the designated space to make room for the new or reused IDF location. Coordinate with the District Project Manager and local site staff for removal of obstructions.

Existing location IDF Being Reused General Requirements

4.9 Refer to the drawings and the instructions in the specifications for existing IDF locations that are designated to re-used. The existing rack or cabinet shall be furnished with the

same accessories, grounding and power requirements as a new IDF location, unless otherwise noted.

4.10 Consolidation instructions for IDF racks or cabinets that are to remain - Contractor shall consolidate existing equipment and patch panels at the existing IDF cabinets to remain in place. Move all components up towards the top of the rack. Existing UTP cables will either be replaced or re-terminated per the instructions for that location.

4.11 Installation of a new UPS shall be furnished by the District.

Outdoor IDF Cabinet Requirements

4.12 Provisions for Freestanding Outdoor IDF Cabinet – Contractor shall provide a freestanding outdoor cabinet at the locations shown on the drawings with the following requirements;

4.12.1 The Outdoor IDF Cabinet shall be provided with a concrete housekeeping pad. Refer to the detail drawings for the requirements of the concrete pad. The cabinet shall be anchored to the concrete pad as shown in the detail drawings.

4.12.1.1 Concrete housekeeping pad shall be provided by a California C8 Licensed Contractor, provided by the 27 10 00 Contractor as a Subcontractor. The 27 10 00 Contractor shall be responsible for coordination and location of the housekeeping pad for the cabinet. Coordinate with the Division 26 Contractor for the entry and placement of the conduits in the concrete pad.

4.12.2 The Outdoor IDF Cabinet shall also be provided with a chain link enclosure around all sides and a chain link roof, or top, over the chain link fence surround. The chain link enclosure shall be provided with a 3-foot wide door on each side, opening out, with the doors allowing access to the front and rear doors on the outdoor IDF cabinet. The fence enclosure shall be provided as follows:

4.12.2.1 Chain link fencing enclosure shall be provided by a California C13 Licensed Contractor, provided by the 27 10 00 Contractor as a Subcontractor. The 27 10 00 Contractor shall be responsible for coordination and location of the fence enclosure for the cabinet. Coordinate with the District Project Manager, Project Engineer and local site staff for extent and placement of the enclosure.

4.12.2.2 The chain link enclosure shall be provided with a minimum of 11-gauge fence fabric heavy-duty fencing and a minimum 1-7/8” heavy-duty posts. The fencing shall be commercial or industrial grade.

4.12.2.3 The Contractor shall take into account that the chain link fencing enclosure must have a minimum of 3-feet clearance from all sides of the Outdoor IDF Cabinet with the A/C package unit installed on it. The A/C package unit must have clearance for future maintenance and access. The enclosure shall be 10-feet high.

4.12.2.4 The chain link enclosure shall be provided with privacy slats in the fencing to obscure the view into the enclosure and to provide shade for the IDF cabinet. All sides and the top shall be completely provided with slats. The color of the privacy slats shall be determined by the District. The slats shall be rated for exposure for a minimum of 10-

years and must be the locking type slats so they can't be removed by vandals.

4.12.2.5 The posts for the fencing shall be set in concrete a minimum of 4-feet in the ground.

4.12.3 Refer to the site plans and floor plans for the quantities and sizes of conduits entering the IDF cabinet. All conduits must enter the cabinet as far towards the rear of the cabinet as possible to allow the maximum amount of space for the mounting of equipment and routing of cables. The conduits shall enter from below or from the side of the cabinet. Do not route conduits through the top front or back of the cabinet. The bottom 6" to 10" of the cabinet shall be reserved for the mounting of the UPS (from the front rails).

4.12.4 The Outdoor IDF Cabinet shall be provided with the same accessories as the interior IDF cabinets, unless otherwise noted on the drawings. Each cabinet shall be furnished with two sets of 19" rack rails on the front and back of the cabinet.

4.12.5 The Outdoor IDF Cabinet shall be provided with a self-contained air conditioning unit provided and installed by the manufacturer. Only an A/C unit provided by the manufacturer may be installed on the cabinet. The A/C unit must be ordered with the cabinet.

4.12.5.1 Provide the Pentair 8,000 BTU A/C unit, mounted to the side of the cabinet. Contractor must confirm which side of the cabinet the A/C unit is to be mounted on prior to ordering. Manufacturer Option 8000 BTU, Pentair AC Unit – ACP-8000-N36-220 (N360826G100), 230V/60HZ power option.

4.12.5.2 The A/C unit shall not be installed on the side of any cabinet that is adjacent to the side of a building unless the A/C unit has sufficient clearance. The A/C unit must be placed to allow for full maintenance and replacement if necessary.

4.12.5.3 The A/C unit shall be provided with the permanent, washable filter kit for the unit. The use of temporary (paper or plastic body) filters shall not be considered equal.

4.12.5.4 A/C unit must be furnished with thermostatic control module installed on the interior of the cabinet.

4.12.5.5 A/C unit shall be the Outdoor Model without the heat package. The unit shall be rated for operation from -40 to 131 degrees Fahrenheit.

4.12.5.6 Provide drain pipe for A/C unit on the exterior cabinet so that all condensation is carried out beyond the concrete pad a minimum of 24". The drain pipe shall be routed to allow the drainage to drain away from the pad.

4.12.5.7 Contractor shall refer to the drawings for the power requirements for the A/C unit on the Outdoor Cabinet. Coordinate with the Div 26 Contractor for power connections.

4.12.6 The interior of the cabinet shall be fully insulated (all interior sides, interior of doors and interior of ceiling) with ½" dense styrofoam insulation for maximum

cooling capabilities and cooling retention. Order cabinet with Option #135060, ½" insulation.

4.12.7 The cabinet shall also be equipped with door contacts on both front and rear doors, with slack for connection to the UPS by the District IT Department. The door contacts are not provided by the manufacturer and shall be Contractor provided and installed. Standard magnetic door contacts may be used.

4.12.8 The enclosure shall be provided as the NEMA-4 (closed loop A/C) option. Do not order the cabinet with vented doors or vented top. The unit must be kept free of dirt and dust. All openings in the cabinet shall be completely sealed from the factory. The Contractor shall specify to the manufacturer when ordering all openings permanently sealed.

4.12.9 Seal interior of conduits entering the cabinet after the cabling has been installed. The sealant must be removable and re-enterable for future use. The conduit entry location shall also be completely sealed on the outside of the cabinet with a permanent, flexible sealant. DO NOT USE EXPANDING FOAM INSULATION.

4.12.10 Power shall be provided to the cabinet as shown on the drawings.

4.12.11 The cabinet shall be furnished with powder coated Zinc Die locking door handles on the front and back of the cabinet. All cabinets in the District shall be keyed alike. The handle shall be furnished with both key and padlock options. The handle shall be option #135059 Heavy Duty EMKA Handle, key lock #KeyZP-1091-U140.

4.12.12 Provide Outdoor IDF Cabinet with the 100-Amp Load Center option, with the load center mounted on the outside of the cabinet. Coordinate the exact location of the load center with the location of the A/C unit prior to ordering cabinet. See floor plans for the power feed conduit coming from the electrical panel board on the building. The Load Center shall be furnished with 12-spaces, including the main breaker, as a special order option #LC-100-12-Siemens. In addition, have the manufacturer install only one (1) quad receptacle in the cabinet, instead of the standard two (2) receptacles. The quad receptacle shall be placed at the rear of the cabinet, near the top.

4.12.13 For exterior cabinets there shall be a maximum of 288 ports within the outdoor cabinet.

4.12.14 The cabinet shall be 78"H by 25"W by 42" Deep, with minimum 42 RU racking space available (on both front and rear rails individually). Unit shall be furnished with a 15-Year Unconditional warranty. Top cover of cabinet shall be provided with the "Alumishield" option. The cabinet shall be furnished with (2) LED light fixtures, one mounted vertically in the rear of the cabinet and one mounted to allow for coverage of the front of the patch panels and switches. All cabinets shall be provided with powder-coated textured paint.

4.12.15 Provide exterior IDF cabinet as manufactured by DDB Unlimited (No Approved Equal) Model # OD-78DDXC. Contractor shall submit a complete build sheet for the outdoor enclosures for approval by the Project Engineer prior to ordering. Any units ordered without approval of the Project Engineer shall be the responsibility of the Contractor.

4.12.16 Other items to be included with the cabinet from the manufacturer;

4.12.16.1 3-Point pad locking system

4.12.16.2 New style design with RU rail markings

4.12.16.3 (4) 1.25" Cable pass through holes on each rail

4.12.16.4 NEMA 3R/4X Class 250

4.12.16.5 (2) Sets of adjustable 19” racking rails

4.12.17 Provide all other items as detailed on the drawings.

PART 5 – MDF/IDF PATCH CORD REQUIREMENTS

5.1 **Fiber Optic Patch Cords (New Fiber Feed Runs)**

5.1.1 Fiber optic patch cords shall be furnished and installed by the Contractor.

5.1.2 All fiber optic patch cords furnished by the Contractor shall match the grade and glass of the fiber optic feed cable installed for the network infrastructure cabling system. The Contractor shall confirm with the District IT Department the type of connector required at the network equipment prior to ordering or installing the patch cords.

5.1.3 Multimode Fiber Optic Patch Cords - Patch cords shall be duplex 50/125um, laser-optimized, OM4 grade multimode optical glass. Fiber optic patch cords shall be furnished with LC connectors at the network switch port end and LC connectors at the fiber optic patch panel end. Fiber patch cords shall be furnished with ceramic ferrules. All Multimode patch cords shall be Aqua (Lt. Blue) in color. Patch cords shall be 3-feet (1 meter) in length.

5.1.4 Single Mode Fiber Optic Patch Cords - Patch cords shall be duplex 8.3/125um, (OS2) grade single mode optical glass. Fiber optic patch cords shall be furnished with LC connectors at the network switch port end and LC connectors at the fiber optic patch panel end. All Single Mode patch cords shall be Yellow in color. Patch cords shall be 3-feet (1 meter) in length. If the single mode fiber is directed to be stored for future use, the single mode patch cords will not be required. Refer to the new fiber optic feed cable section for instructions on termination of the new single mode fiber feed runs.

5.1.5 Each fiber optic feed cable from the MDF Room to the IDF location requires (1) duplex fiber optic patch cord for connection to the IDF switch. Contractor shall furnish (1) Multimode fiber patch cord for each fiber optic feed cable terminated in the MDF Room patch panels. Contractor shall be responsible for confirming the network switch connections with the District IT Director prior to ordering or installing the patch cords.

5.2 **Fiber Optic Patch Cords (Existing Fiber Feed Runs)**

5.2.1 Fiber optic patch cords shall be furnished and installed by the Contractor.

5.2.2 All fiber optic patch cords furnished by the Contractor shall match the grade and glass of the existing fiber optic feed cable currently installed for the existing network infrastructure cabling system. The Contractor shall confirm with the District IT Department the type of connector required at the network equipment prior to ordering or installing the patch cords.

5.2.3 Replacement of existing Multimode Fiber Optic Patch Cords - Patch cords shall be duplex 62.5/125um, OM1 grade multimode optical glass. Fiber optic patch cords shall be furnished with LC connectors at the network switch port end and ST or SC type connectors at the fiber optic patch panel end. Contractor to confirm the connector type prior to ordering or installation. Fiber patch cords shall be furnished with ceramic ferrules. All Multimode patch cords shall be Orange in color. Patch cords shall be 3-feet (1 meter) in length.

5.2.4 Each existing fiber optic feed cable that is scheduled to be re-used from the MDF Room to the IDF location requires (1) duplex fiber optic patch cord for connection to the IDF switch. Contractor shall furnish (1) Multimode fiber patch cord for each fiber optic feed cable terminated in the MDF Room patch panels. Contractor shall be responsible for confirming the network switch connections with the District IT Director prior to ordering or installing the patch cords.

5.3 Copper Patch Cords

5.3.1 Copper patch cords shall be furnished and installed by the Contractor.

5.3.2 Provide Enhanced Category-6 rated (Patch Panel End) patch cords with pre-molded boot, provide quantity equal to:

5.3.2.1 Provide 100% of the total Enhanced Category-6 rated cable ports provided on the patch panels.

5.3.2.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (2) feet in length.

5.3.3 Provide Enhanced Category-6 rated (Workstation End) patch cords with pre-molded boot, provide quantity equal to:

5.3.3.1 Provide 100% of the total Enhanced Category-6 rated cable ports provided on the patch panels.

5.3.3.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required for voice and data locations, to be (10) feet in length, unless otherwise noted.

5.3.3.3 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required for IP Camera and AV Equipment locations, to be (2) feet in length, unless otherwise noted.

5.3.4 Provide Augmented Category-6 (Patch Panel End) patch cords with pre-molded boot, provide quantity equal to:

5.3.4.1 Provide 100% of the total Category-6A cable ports provided on the patch panels.

5.3.4.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (2) feet in length.

5.3.4.3 Augmented Category-6 patch cords shall be differentiated from the Category-6 patch cords with a different color jacket.

5.3.5 Provide Augmented Category-6 (Workstation End) patch cords with pre-molded boot, provide quantity equal to:

5.3.5.1 Provide 100% of the total Category-6A cable drops provided on the patch panels.

5.3.5.2 Patch cords installed at WAP (Wireless Access Point) locations shall be (2) feet in length.

5.3.5.3 Augmented Category-6 patch cords shall be differentiated from the Category-6 patch cords with a different color jacket.

5.3.6 Requirements for all copper patch cords furnished:

5.3.6.1 Color of patch cords shall be determined by the color codes shown in the drawing details or as otherwise directed by the District IT Department.

5.3.6.2 Patch cords shall be as manufactured by Leviton, Commscope, Panduit or Ortronics based on the network infrastructure system furnished by the Contractor.

5.3.6.3 Definition of “Enhanced Category-6 Rated” patch cables – Since there is no official EIA/TIA rating level determined to be “Enhanced Category-6”, the provision of any cables shall be based on the manufacturer’s performance claims for the product.

5.3.6.4 Patch cords furnished must be in compliance with the manufacturer’s “Channel” warranty requirements. Patch cords not warranted through the selected manufacturer Channel warranty program will not be approved for use with the network infrastructure.

PART 6 – CABLING REQUIREMENTS

6.1 **New Campus Fiber Optic Feed Cable Requirements**

6.1.1 Provide one continuous fiber optic cable routed from the Main Distribution Frame fiber patch panel to each Intermediate Distribution Frame fiber patch panel, and/or other locations as shown on the drawings.

6.1.2 For new Fiber Optic Feed Cables shown on the drawings and in the specifications; Fiber optic feed cables shall be installed in the existing pathways, unless otherwise shown on the drawings. Contractor shall not interrupt service to the users without a planned outage approved by the District. The Contractor may use the existing feed cable as a pull wire or other cables identified to be removed from the existing conduits, provided that the service is back on-line prior to the user’s normal working hours.

6.1.3 Provide (1) fiber optic feed cable to each IDF location from the campus MDF location as designated in the drawings and specifications. Each cable shall contain all of the quantities and types of fibers required in the drawings and specifications.

6.1.4 Outdoor Fiber Feed Cable Applications - Fiber optic cable shall be rated for indoor/outdoor riser rated applications. Construction shall consist of; all dielectric, indoor/outdoor Riser Rated Tight Buffer Style, flame retardant PVC or PE jacket, rated OFNR, Outer and Inner Layer of Dielectric Strength Yarns with central member constructed of Dielectric Strength Yarns, dry water-blocking compound, and blank fillers as required. Fiber shall be small form factor type fiber for use in

existing conduit and pathways and **shall not exceed an Overall Outside Diameter (OD) of .370"**. Central tube or loose tube type fiber will not be considered equal.

6.1.5 Indoor Riser Fiber Feed Cable Applications - Fiber optic cable shall be rated for indoor riser rated applications. Construction shall consist of; all dielectric, tight buffer with central strength member, flame retardant CMR jacket, rated OFNR and blank fillers as required.

6.1.6 Fiber optic feed cables for the data infrastructure must be installed as follows:

6.1.6.1 Composite Fiber Optic feed cable runs – Fiber optic feed cable containing both Multimode and Single Mode strands shall be installed as a single composite feed cable. Provide a total of 24-strands of fiber, with 12-strands of OM4-Rated Multimode and 12-strands of OS2-Rated Single Mode glass to the IDF locations, unless otherwise directed in the drawings or specifications. Do not provide separate fiber optic cables for each type of fiber to the IDF locations. Feed cables shall be clearly defined and labeled at each junction box or handhole.

6.1.6.2 **Stadium -** Provide composite fiber optic feed cable to the New Mini-IDF Cabinet location for the Stadium Concession Stand/Press Box location. The fiber feed cable shall be provided with all of the same specifications as the standard 24-Strand feed cable, except the fiber feed cable to the Stadium IDF will be a total of 12-strands of fiber, with 6-strands of OM4-Rated Multimode and 6-strands of OS2-Rated Single Mode glass.

6.1.7 Feed cables shall be clearly defined and labeled for each system. Provide color coding designations with a different color marker for the multimode and/or single mode fiber feed terminations in the fiber patch panels.

6.1.8 Additional labeling on the fiber optic patch panel is required to identify which type of fiber is terminated on the bulkheads in the panel. All connectors and bulkheads shall be color coded with Aqua for 50/125um Multimode and Yellow for Single Mode fiber types.

6.1.9 Each fiber optic feed cable shall contain one or all types of the fiber optic glass listed below:

6.1.9.1 Provide Multimode 50/125-micron fiber optic glass, (minimum OM4 laser-optimized grade) for dual mode operation at 850 nm and 1300 nm wave lengths.

6.1.9.1.1 Maximum attenuation at 3.5dB/km @ 850nm and 1.5dB/km @ 1300nm. Minimum 1-gigabit Ethernet distance guarantee of 1040 meters @ 850nm and 600 meters @ 1300nm. Minimum 10-gigabit Ethernet distance guarantee of 550 meters @ 850nm and 300 meters @ 1300nm. Fiber shall be ISO-TIA OM4 rated.

6.1.9.2 Single mode 8.3/125-micron fiber optic glass, (minimum OS2) High Performance grade for dual mode operation at 1310 nm and 1550 nm wave lengths.

6.1.9.2.1 Maximum attenuation at 0.7dB/km @ 1310nm and 0.7dB/km @ 1550nm. Quantity of fibers as per detail drawings.

6.1.10 All fibers in the fiber optic feed cable shall be fully operational within the required performance characteristics as published by the manufacturer. If any individual fiber does not meet the minimum standards, the entire cable must be replaced, end to end, including connectors, without any additional expense to the customer.

6.1.11 All fiber optic strands shall be fully terminated and tested, unless otherwise noted in the drawings or in these specifications.

6.1.12 Refer to drawings for cable types required. Refer to acceptable cables section for additional information and approved manufacturers.

6.1.13 Acceptable cables shall be:

Berk-Tek Multimode —	GIGALITE 10-FB-OM4
Berk-Tek Single Mode —	Enhanced OS2 Single Mode -AB
Commscope Multimode — OM4	(All Brand Names) Systimax LazrSpeed 550
Commscope Single Mode —	(All Brand Names) Systimax TeraSpeed OS2
Superior Essex Multimode —	TeraGain 10G-550-OM4 (Type F)
Superior Essex Single Mode —	TeraFlex G.657 Enhanced OS2 (Type K)
General Cable Multimode —	Clear Curve OM4 (Type BL)
General Cable Single Mode —	SMF-28 Ultra Enhanced OS2 (Type Ax)

(Note; General Cable use Corning glass and Corning descriptions)

Above glass types are an example of product names per manufacturer. Confirm requirements for indoor/outdoor and riser rated fiber cable with riser drawings and site plans. Part numbers for composite style cable will vary greatly. Confirm part numbers with manufacturer.

6.1.14 Contractor shall provide a minimum 20-foot service loop for the fiber optic feed cables to the IDF location, provide the following service loops at each type of IDF application;

6.1.14.1 Inside the IDF cabinet or above the cabinet in the ceiling if there is insufficient space for the service loop in the cabinet. Provide service loop managers as shown in the details and attach securely to the backboard or provide J-hooks or cable saddles in the ceiling to support the service loops at locations that the service can't be placed within or behind the rack or cabinet. Contractor shall provide all support mechanisms and anchoring for service loop storage. Clearly label service loop with fiber optic warning tags and label each fiber with the proper designation.

6.1.14.2 Fiber Optic feed cables being replaced or abandoned - All old fiber feed cables, patch panels, patch cables and the associated materials must be completely removed from the campus MDF and IDF closets and cabinets, unless otherwise noted in the drawings and specifications. The old fiber optic cable shall be completely removed from all conduits, raceways, ceilings and any other pathways. The

Contractor shall dispose of the materials unless otherwise directed by the District IT Department or the Project Engineer. The Contractor shall include the cost of removal and disposal in their bid proposal.

6.2 **Existing Campus Fiber Optic Feed Cable Requirements**

6.2.1 The Contractor shall re-use the existing fiber optic feed cabling to the IDF locations as designated in the drawings and specifications.

6.2.2 All old fiber feed cables to be re-used shall be furnished with the following new components in the IDF location; fiber optic patch panels, fiber bulkheads, fiber connectors, patch cables and all associated materials. The old fiber optic cable shall be re-terminated with SC type connectors and completely re-tested for original operational specifications for the original grade of fiber optic glass. The cable is to be re-terminated on the IDF location end only. The existing connections at the fiber patch panel in the MDF Room will remain as-is.

6.2.3 The existing fiber optic feed cables may include both multimode and single mode fibers. The existing fiber feed cable specifications for each location are shown as follows;

6.2.3.1 For this project, the existing 6-strand, 62.5/125um fiber optic feed cable to the following IDF locations at Murrieta Valley High School shall be re-used and shall not be removed or demoed; IDF-M – Room 829 and IDF-N – Room 507. Contractor shall attempt to retrieve additional cable length from the existing cable run if possible. The existing cable slack is limited and will affect the location of the fiber optic patch panel.

6.2.3.2 For this project, the existing 6mm/6sm strand, 62.5/125um//9/125um fiber optic feed cable to the following IDF locations at Thompson Middle School shall be re-used and shall not be removed or demoed; IDF-C – Room 610. The existing fiber optic feed cable shall be pulled back and re-routed to the new Outdoor IDF Cabinet being provided behind the building. Refer to the drawings for the location of the new Outdoor IDF Cabinet. Re-terminate both multimode and Single Mode fiber at the IDF location.

6.3 **Category-6 Station Cable**

6.3.1 For the purposes of this project the words “drop” or “outlet” shall include all cable, faceplate, colored inserts, blank inserts, labeling, termination and testing. The quantity of ports required for the drop or outlet shall be as designated on the floor plans next to the symbol and as noted on the Legend.

6.3.2 Contractor shall provide a Category-6 UTP cable to each Data, Voice, Audio-Visual Data and IP Camera indicated on the drawings and specifications, unless otherwise noted as existing cabling being re-used. Provide quantity of cables as indicated on the drawings at each location.

6.3.3 **Special Instructions;** These special instructions apply to drop locations being replaced near Audio-Visual Local Origination (“LO”) locations.

6.3.3.1 Raceway was previously installed during the Audio-Visual System Upgrades to a majority of the classrooms and computer labs on the school campus. The input wallplate Local Origination location, shown as “LO” on the floor plans, was provided with a single gang junction box to

be used for future data port outlets. The existing raceway junction box has an existing blank faceplate.

6.3.3.2 The floor plans show the locations of new cable drops to be provided in each of the rooms. For either new drop locations or cables being provided to replace existing drop locations; if the location shown on the plans is within 3-feet of the “future” empty Audio-Visual System “LO” data junction box, the cable shall be routed to the junction box next to the AV input wallplate.

6.3.3.3 Route the cable to the junction box via the existing raceway. Field verify the locations that will have the ability to use the existing raceway and junction box prior to installation of the cabling.

6.3.4 Provide one Category-6, 4-pair, unshielded twisted pair (UTP) cable from the nearest MDF or IDF location to each RJ45 data outlet port indicated on the drawings. Dual port outlets will require two such cables. Four port outlets will require four cables. Refer to the drawing details for jacket color requirements for each type of connection. Color of cable jacket for each type of connection shall be determined by the drawing details. Confirm color of cable jackets prior to ordering with the District IT Director. Contractor shall be responsible for providing the correct jacket color per the drawings per District Standards.

6.3.5 Unless otherwise shown in drawing details, the color of the Category 6 UTP cables shall be blue, shall be copper wire, individually insulated and color coded.

6.3.6 The cables shall be UL or ETL rated and UL verified in compliance Category-6 EIA/TIA standards. Approved cables for Network Infrastructure System;

Commscope (AMP Netconnect)	— TE620R
Superior Essex	— NextGain Cat 6eX - #54-246-xA
Berk-Tek	— LANMARK 2000 – 10167477
General Cable	— GigaSpeed 6500 71339XX

6.3.7 Where data cables are indicated to run underground, Contractor shall use a Category-6 OSP-rated cable. Approved cables for Network Infrastructure System;

Commscope (AMP Netconnect)	— TE620OSP
Superior Essex	— UV Resistant CMR/CMX - #77-246-E1
Berk-Tek	— LANMARK 1000 OSP – 11072213
General Cable	— GigaSpeed 6 OSP 7136100

6.3.8 Manufacturer names and part numbers are shown as a point of reference and do not specifically designate required packaging or color for the cable. Contractor shall verify colors and packaging options shall be determined by Contractor preferences.

6.3.9 Definition of “Enhanced Category-6 Rated” cable – Since there is no official EIA/TIA rating level determined to be “Enhanced Category-6”, the provision of any cable shall be based on the manufacturer’s performance claims for the product.

6.4 **Augmented Category-6 Station Cable**

6.4.1 Contractor shall provide an Augmented Category-6 UTP cable to each Wireless Access Point location indicated on the drawings and specifications. Provide quantity of cables as indicated on the drawings at each location.

6.4.2 The new Augmented Category-6 UTP cables will replace the existing Category-6 UTP cabling to each of the existing Wireless Access Point locations. Terminate the new cables at the existing WAP location and reconnect the WAP to the new cable infrastructure.

6.4.3 Provide one Augmented Category-6, 4-pair, unshielded twisted pair (UTP) cable from the nearest MDF or IDF location to each RJ45 data outlet port indicated on the drawings. Dual port outlets will require two such cables. Four port outlets will require four cables. Refer to the drawing details for jacket color requirements for each type of connection. Color of cable jacket for each type of connection shall be determined by the drawing details. Confirm color of cable jackets prior to ordering with the District IT Director. Contractor shall be responsible for providing the correct jacket color per the drawings per District Standards.

6.4.4 Unless otherwise shown in drawing details, the color of the Augmented Category 6 UTP cables shall be blue, shall be copper wire, individually insulated and color coded.

6.4.5 The cables shall be UL or ETL rated and UL verified in compliance with Augmented Category-6 EIA/TIA standards. Approved cables for Network Infrastructure System;

Commscope (AMP Netconnect) — TE640R
Superior Essex — 10 Gain XP - #6H-246-xA
Berk-Tek) — LANMARK 10G2 – 10137700 (Part Number for different color jackets for Berk-Tek cables varies
General Cable — GenSpeed 10,000 71338XX

6.4.6 Where data cables are indicated to run underground, Contractor shall use an Augmented Category-6 OSP-rated cable. Approved cables for Network Infrastructure System;

Commscope — Category-6A OSP – 1592A

6.4.7 Superior Essex and General Cable do not offer an OSP Rated Augmented Cat-6 product. Contractor shall provide the Commscope OSP shielded cable for a these Network Infrastructure solutions. Contractor shall provide shielded termination products for all drop locations and termination panels and shall ground all products per manufacturer's instructions and warranty requirements. The shielded cables will require a separate patch panel at the IDF location for any WAPs requiring OSP cable.

6.4.8 Commscope Brand Name Augmented Category-6 OSP Cable - Cabling installed for Outside Plant applications is available in shielded type construction only for these structured cabling systems. Contractor shall provide shielded termination products for all drop locations and termination panels and shall ground all products per manufacturer's instructions and warranty requirements.

6.5 **Category-6 Outlets**

6.5.1 Unshielded twisted pair Category-6 outlets shall be an RJ45 Enhanced performance type 8-position / 8 conductor modular jacks, and shall comply with Category-6 performance requirements. Provide single port, dual port, four port or quantity as indicated on the floor plans at each outlet location. All outlets shall be wired in an EIA/TIA 568B configuration.

6.5.2 Provide Category-6 inserts, wired for EIA 568B. Provide installation kits for all locations furnished with Category-6 UTP cabling.

6.5.3 Refer to the detail drawings for color of the Category-6 outlets required. Contractor shall be responsible for confirming all color requirements prior to ordering.

6.5.4 Provide the following Category-6 UTP data connector per Network Infrastructure warranty requirements;

6.5.4.1 Leviton eXtreme Cat6+ Quick Port Series 61110-R

6.5.4.2 AMP NetConnect (Commscope) SL 110 Series 1-1375055

6.5.4.3 Ortronics Clarity 6 Tracjack Series OR-TJ600

6.5.4.4 Panduit MiniCom TX6 Plus Series CJ688TG

6.6 **Augmented Category-6 Outlets**

6.6.1 Unshielded twisted pair Augmented Category-6 outlets shall be an RJ45 Enhanced performance type 8-position / 8 conductor modular jacks, and shall comply with Augmented Category-6 performance requirements. Provide single port, dual port, four port or quantity as indicated on the floor plans at each outlet location. All outlets shall be wired in an EIA/TIA 568B configuration.

6.6.2 Provide unshielded Augmented Category-6 inserts, wired for EIA 568B. Provide unshielded installation kits for all locations furnished with Augmented Category-6 UTP cabling.

6.6.3 For outlet locations cabled with OSP-rated Augmented Category-6 cable, provide shielded Augmented Category-6 inserts, wired for EIA 568B. Provide shielded installation kits for all locations furnished with OSP-rated Augmented Category-6 UTP cabling. Cable connections must be grounded at the patch panel location.

6.6.4 Refer to the detail drawings for color of the Category-6 outlets required. Contractor shall be responsible for confirming all color requirements prior to ordering.

6.6.5 Provide the following unshielded Augmented Category-6 UTP data connector per Network Infrastructure warranty requirements;

6.6.5.1 Leviton Atlas-X1 Cat-6A Series 6AUJK-R

6.6.5.2 AMP NetConnect (Commscope) AMP Twist SL Series 1-1933476

6.6.5.3 Ortronics Clarity 6 Tracjack Series OR-TJ600

6.6.5.4 Panduit MiniCom TX6 Plus Series CJ688TG

6.6.6 Provide the following shielded Augmented Category-6 UTP data connector for OSP-rated cable ports per Network Infrastructure warranty requirements;

6.6.6.1 Leviton Atlas-X1 Cat-6A Shielded Series 6ASJK-R

6.6.6.2 AMP NetConnect (Commscope) AMP Twist SL Shielded Series 2153000-1

6.6.6.3 Ortronics Clarity 6A Tracjack Shielded Series OR-TJ6A

6.6.6.4 Panduit MiniCom TX6A 10Gig Shielded Series CJ6X88TG

6.7 Outlet Faceplates

6.7.1 Provide a two-port faceplate for all one and two port outlet locations. Provide blanks for all unused openings.

6.7.2 Provide a four-port faceplate for all three and four port outlet locations. Provide blanks for all unused openings.

6.7.3 Provide a six-port faceplate for all five and six port outlet locations. Provide blanks for all unused openings.

6.7.4 Locations requiring a quantity beyond six ports shall be required on an “as needed” basis. The Contractor shall notify the Project Engineer and District Project Manager of the intent to use an outlet location in excess of six ports contained in a single junction box and faceplate. Port quantities of 7 to 12 ports shall be provided in a single dual gang junction box and faceplate. Provide the appropriate size faceplate and quantity of inserts and blank fillers as required. Depending on the manufacturer chosen by the Contractor for installation, the series type may not offer a solution up to 12 ports in a single faceplate.

6.7.5 All fax/modem locations shall be provided as single port outlets. Requirements shall be the same as a single port data outlet as shown on the Technology Legend.

6.7.6 For single port voice outlet locations intended for wall telephone connections, a wall telephone type faceplate with attachment studs shall be provided. The wall telephone jack shall be 8-pin, RJ45 type and use IDC wire terminations only. Provide Category-6 insert, within stainless steel wall plate faceplate. Provide faceplate from the approved manufacturers listed in the specifications.

6.7.7 Provide single port or dual port Surface mount small surface mounted outlet box for IP Camera data outlets in the J-Box for the camera locations. Provide surface mount box by Leviton QuickPort Series 41089-xxx or equal by one of the approved manufacturers. The location shall also be furnished with a blank weather-tight faceplate to protect the data termination until the cameras are installed.

6.7.8 Wireless Access Point data connections for ceiling mounted WAPs shall be terminated above the accessible ceiling at the wireless access point (WAP) location. Refer to the drawing details for additional requirements.

6.7.9 Wireless Access Point data connections for surface mounted WAPs shall be terminated at the WAP location. Provide surface mount box by Leviton QuickPort Series 41089-xxx or equal by one of the approved manufacturers. The location shall also be furnished with a blank inserts for the unused ports. Label the cables and faceplate the same as standard data outlets.

6.7.10 All faceplates and surface mount outlet boxes shall be furnished with label windows. All labeling shall be installed within the label window.

6.7.11 Confirm color of all faceplates prior to ordering. All data outlet faceplates shall have a unique sequential identification number applied to faceplate. Hand written labels are not permitted. All color schemes shall be approved by the customer prior to installation.

6.7.12 Colored inserts are required for this project. Refer to the detail drawings for the exact color scheme to be provided. Inserts submitted that do not follow the color and identification requirements will be rejected. Inserts installed that do not follow the color coding as shown in the detail drawings will be replaced at the Contractor's expense.

6.7.13 All labels will be installed under label windows. Labels adhered to the surface of the faceplate will not be accepted. Contractor must provide clear laminating type of cover material over the surface mounted labels where used.

6.7.14 Reference the drawings for special outlet configurations or plate requirements

6.7.15 All data outlet faceplates shall have a unique sequential identification number applied to faceplate. Refer to the detail drawings for labeling requirements. Hand written labels are not permitted. Faceplates, with the exception of wall telephone outlets, shall include color coded port inserts. All color schemes shall be approved by the District prior to installation.

6.7.16 Reference the drawings for special outlet configurations or plate requirements.

PART 7 – EXISTING CONDITIONS REQUIREMENTS

7.1 Contractor shall provide installation work regarding the existing site conditions as shown in the project drawings and specifications. Each site will have different requirements based on the existing data equipment and electronics, structures and site infrastructure conditions.

7.2 Existing WAP Locations; The wireless access points (WAPs) are existing in the classrooms, offices and other spaces. The WAPs shall be retained to be reused with the new Augmented Category-6 infrastructure cabling. The Contractor shall route the new cables to the existing WAP locations where shown on the drawings.

7.2.1 Each WAP location shown on the drawings with an "(EX)" next to the symbol shall be furnished with (1) Augmented Cat-6 UTP cable. Cable shall be terminated in the same manner as the cable run for a new WAP location. Refer to the drawing details for the installation requirements.

7.2.2 The existing UTP cable to the existing WAP location shall be demoed by the Contractor, after the new Augmented Cat-6 cabling has been installed and activated on the network switch, unless otherwise noted. The existing WAP location shall not lose network connectivity. Downtime shall be coordinated with the District and shall occur after normal school hours only.

7.2.3 Existing wireless access points providing exterior coverage are mounted on the interior of the building. Contractor shall route the new data cabling to the access point location. Replace the existing data drops where shown on the drawings.

7.3 All new fiber optic feed cables shall be installed in existing pathways unless otherwise shown on the drawings. The Contractor shall be responsible for confirming the final routing of the fiber feed cables and confirming space is available in the existing pathways. Riser rated Inner duct shall be provided through accessible ceilings and shall be a minimum of 1-inch in diameter. The Inner duct shall be tagged and labeled per the provisions in the specifications. All pathways shall be left with a ¼" pull rope after the cable has been installed. Provide any support that may be required to properly install the Inner duct.

7.4 Existing site conduits that are currently empty and that will be used for the installation of the any new fiber optic feed cable, shall be purged completely by the Contractor of all debris, water, abandoned cable or any other obstruction. The Contractor is required to run a mouse through the conduit to completely clean it out prior to installing any new cable. If there is no existing pull rope, the Contractor shall install one and leave a new pull rope, as directed by the specifications, after the new cable has been installed.

7.5 The Contractor shall confirm with the District the ability to remove old cable from an existing conduit, that can be removed and used to install a pull rope to prepare the conduit for new cable installation. The old cable removed shall be disposed of by the Contractor.

7.6 Any conduit pathways found to be broken or damaged, shall be reported immediately to the Project Engineer. If there is no alternate path for the cable, the Contractor shall provide a proposed solution with pricing to the Project Engineer and the District Project Manager, within 1 week of the discovery, so that the issue may be resolved. Contractor shall include pictures with the proposed fix and pricing. All damaged or broken conduits shall be noted on the final as-built drawings.

7.7 All existing ports shown on the drawings to be replaced with the same quantity of new cable ports, shall utilize the existing pathways unless other wised noted on the drawings. The existing pathways are not shown on the drawings and may be raceway or conduit.

7.7.1 The Contractor shall furnish new cable, faceplates, port inserts and labeling as shown in specifications for new cable ports. Terminate the new cables on the new patch panels at the MDF/IDF location. The Contractor shall provide cable support in the accessible ceilings. All new cabling shall include the cost for support systems.

7.7.2 The Contractor shall furnish cable support for all new cables that are replacing existing cabling. If existing support systems are in place and can be reused, the Contractor must bring the existing support systems up-to-date to match the requirements shown in the drawings and specifications for all new cable installations.

7.7.3 The existing sleeves shall be reused for new cabling if possible. If the existing sleeves do not have the required capacity for the new cables, based on a fill rate not to exceed 54% of the conduit's capacity, the Contractor shall provide additional sleeves to comply with the fill rate. The fill rate of the existing sleeves must be field verified by the Contractor to determine the existing conditions.

7.8 Provide all sleeves and raceways within buildings and between buildings as shown on the drawings.

PART 8 – ADDITIONAL PROJECT REQUIREMENTS

8.1 The Contractor shall include in the bid proposal to furnish and install (10) additional 2-Port Category-6 UTP data drops (outlets), with surface mount boxes, using existing surface raceway per the requirements shown on the Legend.

8.1.1 The 2-Port data drops shall include the cost of all labor and materials, including but not limited, cable, jacks, faceplates, patch panel costs, support systems, labeling, testing, etc. Cable distance for the locations shall be based on an average length of 200 feet, but actual length for the drop shall be based on the existing site conditions.

8.1.2 The additional data drops shall be used for adds, changes or any other purpose determined by the District. The exact locations of the data drops shall be determined during the installation phase of the project by the District Project Manager and the Project Engineer.

8.1.3 Any remaining un-installed drops shall be credited back to the District at the line item pricing value shown in the original bid proposal. The Contractor shall be responsible for tracking the quantity of drops installed under this provision and provide updates for review at the regularly scheduled construction meetings.

8.1.4 The Contractor must have written approval, in the form of an RFI, for the distribution and location of these drops from either the District Project Manager or the JCE Project Engineer. The Contractor shall not take direction from the local site Administration or Teachers regarding additional data outlet disposition.

8.1.5 **Provide add/delete pricing for a 2-Port Cat-6 UTP data outlet, on a per unit basis, in the bid proposal. The Line Item Add/Delete pricing shall be clearly shown on the bid form.**

8.2 The Contractor shall include in the bid proposal to furnish and install (5) additional 1-Port Augmented Category-6 UTP data drops (outlets) for WAP locations, with conduit or surface raceway and boxes per the requirements shown on the Legend.

8.2.1 The 2-Port data drops shall include the cost of all labor and materials, including but not limited, cable, jacks, faceplates, patch panel costs, support systems, labeling, testing, etc. Cable distance for the locations shall be based on an average length of 200 feet, but actual length for the drop shall be based on the existing site conditions.

8.2.2 The additional data drops shall be used for adds, changes or any other purpose determined by the District. The exact locations of the data drops shall be determined during the installation phase of the project by the District Project Manager and the Project Engineer.

8.2.3 Any remaining un-installed drops shall be credited back to the District at the line item pricing value shown in the original bid proposal. The Contractor shall be responsible for tracking the quantity of drops installed under this provision and provide updates for review at the regularly scheduled construction meetings.

8.2.4 The Contractor must have written approval, in the form of an RFI, for the distribution and location of these drops from either the District Project Manager or the JCE Project Engineer. The Contractor shall not take direction from the local site Administration or Teachers regarding additional data outlet disposition.

8.2.5 **Provide add/delete pricing for a 1-Port Cat-6A UTP data outlet for a WAP, on a per unit basis, in the bid proposal. The Line Item Add/Delete pricing shall be clearly shown on the bid form.**

8.3 The Contractor shall include a separate line item price for the provision of (10) additional 2" conduit sleeves.

8.3.1 The sleeves may be either the EMT type penetrating an interior fire rated barrier or the flexible type, used to transition between portable buildings, per the detail drawing requirements. The sleeves shall include firestopping materials as shown in the drawing details. The pricing shall be all inclusive and will not differentiate based on the type of sleeve provided.

8.3.2 The additional 2" Conduit sleeves shall be used for adds, changes or any other purpose determined by the District. The exact locations of the sleeves shall be determined during the installation phase of the project by the District Project Manager and the Project Engineer.

8.3.3 Any remaining un-installed sleeves shall be credited back to the District at the line item pricing value shown in the original bid proposal. Contractor shall be responsible for tracking the quantity of sleeves installed under this provision and including it for review at the regularly scheduled construction meetings.

8.3.4 The Contractor must have written approval, in the form of an RFI, for the distribution and location of these sleeves from either the District IT Director or the JCE Project Engineer.

8.3.5 **Provide add/delete pricing for a 2" Conduit Sleeve, on a per unit basis, in the bid proposal. The Line Item Add/Delete pricing shall be clearly shown on the bid form.**

PART 9 – DEMOLITION WORK

9.1 Contractor shall provide modifications that are required to be made to the space to fit the new IDF cabinet or rack as shown on the floor plans. Some locations may require Architectural changes to the existing building space such as the removal of shelves, built-in cabinets, bookcases, etc. The Architectural modifications shall be provided by the Contractor as shown on the drawings.

9.2 The District shall be responsible for moving any existing materials, supplies or office equipment to make room for the new cabinet/rack or to make room for any architectural changes to the existing building.

9.3 The Contractor shall delete or demolition any of the existing voice cabling, ports, faceplates, outlets and termination blocks associated with the IDF locations in the project. Demolition any of the existing CATV outlets, CATV cabling or components that can assist with the installation of the new network cabling will be allowed. CATV cables will not be allowed to be partially removed.

9.4 The Contractor shall not delete or demolition any of the existing data cabling, ports, faceplates, outlets or connections to any existing irrigation controllers, HVAC Controllers, security system cabinets or any other control equipment device connected to the network, without coordinating the disconnection with the District IT Department or the District Facilities Department. The Contractor shall document all of these connections, if they exist, and shall provide a new data cable drop to each of these locations. Confirm the locations of the devices and the new cable requirements with the Project Engineer.

The Contractor shall confirm that connections to these types of system controllers are provided with new data cable drops. The cable count shall be assessed from the spare Category-6 data cables listed in the specifications.

9.5 Contractor shall coordinate with the District Facilities and Maintenance Departments to confirm what types of system devices are connected to the network. Provide new data connections to these devices when the IDF/MDF is being relocated or when the existing cabling is being updated or replaced.

9.6 The Contractor shall include in the bid proposal to provide the demolition and removal of all existing cable ports being replaced with new cabling and associated materials. In addition, the Contractor shall include an Add/Delete price for a single data port demolition as a line item. Cost shall include all labor and materials required to complete the task.

9.6.1 The demolition of each cable port shall consist of the removal of the data outlet insert and faceplate; removal of the existing UTP cable completely from all raceway, conduit, ceiling and open pathway; removal from all IDF or MDF locations; provision of a blank faceplates for all unused conduit and/or raceway junction boxes along the path of the cable run and disposal of all materials once they are removed.

9.6.2 In addition, Contractor shall remove or demolition any patch panels that are completely void of any cable terminations after the removal of the cables associated with the patch panel. If any ports are to remain active locations, the patch panel shall remain in place.

9.6.3 The Contractor shall be required to keep a log of all cable ports removed and demolished during the course of the project. Each school shall be shown separately and the total for each one shall be updated throughout the course of the project to insure that all locations on the drawings being replaced are accounted for.

9.7 Contractor shall document all existing cable ports that are shown as “Existing to Remain” on the project drawings. Provide the following information on the “Existing to Remain” locations;

9.7.1 The existing labeling, as shown on the faceplate, shall be shown on the As-Built documentation. Contractor shall show the labeling information exactly as shown on the faceplate.

9.7.2 The existing cable ports associated with the “Existing to Remain” outlets that are not shown to be re-terminated at a MDF/IDF location, shall still be tested as though it was re-terminated.

9.7.3 The existing cable ports associated with the “Existing to Remain” outlets that are shown to be re-terminated at a MDF/IDF location being relocated or replaced, shall be tested.

9.7.4 All existing cable ports that are shown as “Existing to Remain” on the project drawings, shall be shown on the final As-Built drawing submittal with a symbol that differs from any new locations or locations that have been replaced in the project. The symbol must be clearly different, not just a modification of the symbol shown on the As-Builts for the new voice/data outlets.

9.8 For bidding purposes, demolition of an existing IDF cabinet or rack shown as “Existing IDF Be Eliminated” on the drawings with the keynote or in the project specifications, are

to be completely removed from the classroom or other space by the Contractor. Demolition of the IDF location shall include but not be limited to;

9.8.1 Remove all of the existing components and accessories from the existing IDF cabinet or rack. Box up all network infrastructure related items in the existing IDF location except patch panels (both fiber and copper) and Enhanced Category-5 patch cords (or lower grade). The patch cords and patch panels shall be disposed of by the Contractor.

9.8.2 Existing wire managers shall be disposed of by the Contractor, unless otherwise noted on the drawings.

9.8.3 Remove the cabinet or rack, plywood backboard, and grounding connections. The IDF cabinet, grounding and backboard shall be disposed of by the Contractor.

9.8.4 The existing power outlet, or outlets, associated with the existing rack or cabinet, shall be removed, unless otherwise noted on the drawings. Coordinate with the Division 26 Contractor to have the existing electrical outlet safed off. The existing conduit and junction box is to remain and be provided with a blank cover. If the outlet is installed inside the existing IDF cabinet, the existing junction box shall be relocated outside of the footprint of the cabinet and power safed off. The blank cover shall be labeled with the existing circuit number and panel ID for future use.

9.8.5 Existing Category-6 UTP patch cables shall be boxed up separately from other equipment and delivered to the District IT Department, unless otherwise instructed by the District IT Department.

9.8.6 All network electronics removed from the IDF location shall be boxed up, labeled with the site name, IDF Room and Building where it originated, and delivered to the District IT Department, unless otherwise directed by the District.

9.9 Coordinate with the District IT Department for the disposition of the existing network electronics. Some of the switches are scheduled may be re-used and some may be removed from service by the District. The District shall be responsible for the provision and installation of any new network electronics equipment.

9.10 The installation, relocation and provision of the network electronic switches shall be the responsibility of the District IT Department.

9.10.1 The Infrastructure Contractor shall not remove, disconnect or power down any network electronics without the support of the District IT Department.

9.10.2 The infrastructure Contractor shall coordinate with the District IT Department for assistance when MDF or IDF locations are required to be brought on-line or shut down and moved.

9.10.3 The Contractor shall be responsible for coordinating with the District IT Department and shall be responsible for scheduling the demolition, installation, relocation and activation of the network electronics with the District IT Department to insure that the Schools are not off-line for more than three hours, unless otherwise previously approved by the District. All down time shall be approved by the District and shall occur after normal business hours, unless otherwise instructed by the District IT Department.

9.10.4 All cable testing, at the MDF or IDF location must be completed prior to demolition of the existing switches or installing new switches in the closet or cabinet. The new cabling shall be completely tested prior to the replacement of any network electronics at the MDF or IDF closet.

9.11 Existing CATV distribution equipment and cabling, in IDF locations that will be eliminated and demoed, shall be demoed as well. The existing distribution equipment such as amplifiers and splitters, will be removed and disposed of by the Contractor. In addition, the existing coaxial cable shall be cut back to a location within the nearest accessible ceiling, unless otherwise directed by the District. Mark the coaxial cable with a type written label showing the words “Abandoned” and “Dead” near the cut end of the cable. Cable shall be secured so as to not be lying on the ceiling tiles. **Show location of cut or abandoned coaxial cables on the “As-Built” drawings**.

PART 10 - SITE SPECIFIC WORK AT SCHOOL

10.1 **Murrieta Valley High School**

10.1.1 Changes/Updates to the MDF Room – Contractor shall provide the following items in the existing MDF Room: Terminate new fiber optic feed cabling in the existing MDF racks. Provide new fiber optic patch panel and service loop manager in the MDF Room. Provide all other requirements associated with the provision of new fiber feed cabling. The remainder of the MDF Room shall remain as-is. See details and drawings for additional installation requirements.

10.1.2 Provide fiber optic feed cabling as follows;

10.1.2.1 Provide (1) new 24-Strand composite fiber optic feed cable from the existing MDF Room to the new Outdoor IDF Cabinet location, where shown on the drawings.

10.1.2.2 Provide (1) new 12-Strand composite fiber optic feed cable from the existing IDF-O in the Locker Room area to the new Mini IDF Cabinet location in the Concessions Stand/Stadium Press Box equipment closet, where shown on the drawings. The cable shall be routed through the existing conduit marked by the District IT Department.

10.1.2.3 Re-use existing fiber optic feed cable in IDF-M – Room 829 and IDF-N – Room 507. Re-terminate the existing fiber optic feed cabling as directed in the specifications. The existing fiber will be provided with the same materials and equipment as a new fiber run in the IDF Rack or Cabinet.

10.1.2.4 Refer to the detail drawings and specifications for the termination requirements at the MDF and IDF locations.

10.1.3 Provide new CAT-6 and CAT-6A UTP cable drops as required by the specifications. See drawings and specifications for each IDF location’s instructions. Existing cabling will be completely demoed where shown on the drawings and specifications.

10.1.4 Refer to the drawings for the area of coverage to be serviced by each IDF location. The IDF locations that are being eliminated shall have all of the existing cabling replaced and routed to another IDF location. See individual IDF provisions for requirements.

10.1.5 IDF locations to be eliminated – Quantities of existing cabling for these locations is shown as an approximation. All of the existing cabling will be demoed as part of the project scope of work. Existing outlet locations are shown on the floor plans, since we are replacing them at a one for one basis (unless otherwise noted), but the exact routing of the cabling from each outlet to the associated IDF location is unknown since existing labeling in inconsistent. Refer to the floor plans for quantities of existing outlets in the area of the existing IDF location.

10.1.6 Provide work at (6) IDF locations for this site. Provide the following work for each IDF location;

10.1.6.1 IDF- K 'Room 806'– All existing cabling to this IDF cabinet will be replaced and new cabling will be routed to the new outdoor IDF cabinet. Remove the switches, panels and accessories from the existing wall mounted cabinet and remove the cabinet. Demo the existing plywood backboard and restore the wall to original condition. All power conduit and boxes shall be removed to a place above the accessible ceiling. Safe off power above ceiling, following directions as contained in the specifications. Demo all existing cabling and associated materials from this IDF location. Cable count for this IDF is approximately 145 drops.

10.1.6.2 IDF- L 'Room 823'– All existing cabling to this IDF cabinet will be replaced and new cabling will be routed to the new outdoor IDF cabinet. Remove the switches, panels and accessories from the existing wall mounted cabinet and remove the cabinet. Demo the existing plywood backboard and restore the wall to original condition. All power conduit and boxes shall be removed to a place above the accessible ceiling. Safe off power above ceiling, following directions as contained in the specifications. Demo all existing cabling and associated materials from this IDF location. Cable count for this IDF is approximately 100 drops.

10.1.6.2.1 The existing HVAC network controller shall be moved outside of the cabinet and relocated near the fire alarm panel. Provide a 2-Port data drop to the new HVAC controller location.

10.1.6.2.2 Existing telephone voice feed cable, lightning protector and any other telephone punch blocks in the IDF cabinet are to be completely demoed.

10.1.6.3 IDF- M 'Room 829'– Replace the existing Freestanding Enclosed IDF Cabinet with (2) new freestanding Enclosed IDF Cabinets and move it with a 6" gap to the side wall, measured from the side of the cabinet. Place the cabinets in the location shown on the floor plans. The front of the cabinets shall be placed facing towards center of the room.

10.1.6.3.1 Coordinate with the District for the removal of the editing desk currently occupying the space where the cabinets are to be placed. The District will be responsible for removal of the desk and all associated equipment and cables.

10.1.6.3.2 Demo the existing IDF cabinet currently serving the area that the new cabinet will serve, in the classrooms,

per the instructions in the drawings and specifications. Remove the existing switches, patch panels and accessories from the existing IDF cabinet. Remove all of the old UTP cables completely, including all data outlets. Refer to the Demo instructions. Coordinate with the District IT Department for equipment to be re-used.

10.1.6.3.3 The new IDF location shall be provided with plywood backboard and new power outlets as shown on the floor plans.

10.1.6.3.4 District shall install the new switches, switches being reused and UPS in the IDF cabinets. Provide additional cable runway and conduit sleeves to the cabinets from the ceiling as shown on the drawings and details. Provide all additional components as shown in the specifications and drawing details for a Freestanding Enclosed IDF Cabinets. Do not install cabinets with side panels between the cabinets.

10.1.6.3.5 The existing fiber optic feed cable will be re-used for the new IDF Cabinets. The cable shall be re-terminated and re-tested. The existing fiber cable shall be provided with the same materials and equipment as shown in the drawings and specifications for a new fiber optic cable run. Provide fiber optic patch panel, fiber optic patch cables and all other required components.

10.1.6.3.6 Contractor shall attempt to get some slack on the existing fiber feed cable, as there is only about 4-feet of length in the existing cabinet. The fiber optic patch panel shall be placed at the top of the first cabinet, next to the wall, to insure the cable will reach.

10.1.6.3.7 Run new CAT-6 and CAT-6A UTP cables to each outlet shown on the drawings. Install new conduit sleeves for the UTP cables being installed as shown on the floor plans. Contractor shall provide cable support in the ceiling as shown in the details and specifications. Cable support must also be installed across the open ceiling of the Robotics Lab to accommodate large bundles of cables.

10.1.6.3.8 Provide new cables to the existing WAP and camera locations and reconnect WAPs and cameras.

10.1.6.4 IDF- N ‘Room 507’– Book Storage Room - All existing cabling to this IDF cabinet will be replaced and new cabling will be routed to the new IDF rack location in the adjacent Tech Room 600. Remove the switches, panels and accessories from the existing wall mounted cabinet and remove the cabinet. Demo the existing plywood backboard and restore the wall to original condition. All power conduit and boxes shall be removed to a place above the accessible ceiling. Safe off power above ceiling, following directions as contained in the specifications. Demo all existing cabling and associated materials from this IDF location. Cable count for this IDF is approximately 190 drops.

10.1.6.5 New IDF- N ‘Room 600’– Tech Room - Provide a new 4-post rack for the new IDF location in the Tech Room and move it within 6” of the side wall, measured from the side of the vertical cable manager, not the side of the rack. Place the rack in the location shown on the floor plans. The front of the rack should be facing towards the door to the Book Storage Room.

10.1.6.5.1 Contractor to move the existing quad power outlet on the CATV backboard to the new IDF rack, where shown on the drawings. If the electrical outlet is a dedicated circuit, label the electrical panel accordingly, to indicate that the circuit is for the new IDF rack location.

10.1.6.5.2 The new IDF location shall be provided with plywood backboard and new power outlets as shown on the floor plans.

10.1.6.5.3 Coordinate with the District IT Department for which equipment to that was demoed from IDF – ‘N’ Room 507 is to be re-used in the new IDF rack location. The equipment will be given back to the IT Department for installation in the new rack.

10.1.6.5.4 Provide cable runway and conduit sleeves to the rack from the ceiling as shown on the drawings and details. Provide all additional components as shown in the specifications and drawing details for a 4-Post rack.

10.1.6.5.5 The existing fiber optic feed cable will be re-used for the new IDF Rack location. The existing fiber optic cable shall be re-routed to the new IDF location. The existing fiber feed cable is currently routed through the ceiling of the Tech Room. Insure that as much slack as possible is available and route the cable via the shortest route possible to insure the cable will make it to the rack and be able to be re-terminated. The cable shall be re-terminated and re-tested. The existing fiber cable shall be provided with the same materials and equipment as shown in the drawings and specifications for a new fiber optic cable run. Provide fiber optic patch panel, fiber optic patch cables and all other required components. Provide a fiber optic service loop manager on the backboard and save the available slack as shown in the details.

10.1.6.5.6 Run new CAT-6 and CAT-6A UTP cables to each outlet shown on the drawings. District shall install the new switches, switches being reused and UPS in the IDF rack. Install new conduit sleeves for the UTP cables being installed as shown on the floor plans. The cables shall be routed through the soffit in the Library. Access panels are shown on the floor plans. Contractor shall provide cable support in the soffit. Provide new cables to the existing WAP and camera locations and reconnect WAPs and cameras.

10.1.6.5.7 Demo the existing CATV cable and equipment from the backboard in the Tech Room. Paint the existing backboard to match the new backboard being provided for the IDF. The new backboard shall be installed butted up against the existing backboard and the two shall combine to make a single backboard. All of the old CATV cable and gear shall be disposed of by the Contractor.

10.1.6.6 IDF- O 'Gym' – Route new fiber feed cable from the new Mini IDF location at the Stadium to the existing IDF Cabinet location in the Locker Room.

10.1.6.6.1 The cable routes through the existing Communications Closet, Room 121, down the hall from the IDF location. Provide conduit as shown on the floor plans for fiber feed cable.

10.1.6.6.2 Terminate new fiber optic cable to the mini-IDF location in the closet near the Stadium Concession Stand. The new fiber cable will be provided with the same materials and equipment as shown for new fiber optic feed runs. Provide fiber optic patch panel, service loop manager, fiber optic patch cables and all other required components. Coordinate connection of the fiber feed cable with the District IT Department.

10.1.6.7 New Mini-IDF 'Stadium' – Provide a new 42" high, 10" deep wall-mounted vertical Mini-cabinet in the hallway outside the existing Comm./Sound Closet where shown on the floor plans.

10.1.6.7.1 Install the cabinet on the wall with a new plywood backboard. Confirm door swing prior to ordering. Mount next to the existing fire alarm cabinet. Provide conduits from the cabinet to the existing Communications Closet as shown on the floor plans.

10.1.6.7.2 The new Cabinet location shall be provided with new power outlet as shown.

10.1.6.7.3 Route new fiber optic feed cable from the Locker IDF Cabinet, in the Main Building, to the new Stadium IDF Cabinet. The fiber optic service loop shall be stored in the Communications Closet at a convenient location. The new fiber cable will be provided with the materials and equipment as shown in the drawings and specifications. Provide fiber optic patch panel, service loop manager, fiber optic patch cables and all other required components. The service loop manager for the fiber optic cable shall be separate from the one for the data cables to the Press Box.

10.1.6.7.4 **Provide new Cat-6A cable drops to the future WAP location in the Press Box**. Provide a 4-Port data outlet in the press Box for future WAP locations. Mount the outlet in the center of the Press Box, 6" below the ceiling. The data cables must be routed to the new IDF

Cabinet through the existing Communications Closet. The conduit from the Press Box shall be routed to the existing Communications Closet. The Contractor shall provide a 40-foot service loop on the data cables, neatly stored in the existing Communications Closet on a fiber optic service loop manager by Leviton Model #48900-FR at a convenient location on the wall. Label the cables on the service loop manager as “Press Box WAP Cables”.

10.1.6.8 IDF- ‘Room 824’– All existing cabling to this IDF cabinet will be replaced and new cabling will be routed to existing the IDF location, IDF-M-Room 829. Remove the switches, panels and accessories from the existing wall mounted cabinet and remove the cabinet. Demo the existing plywood backboard and restore the wall to original condition. All power conduit and boxes shall be removed to a place above the accessible ceiling. Safe off power above ceiling, following directions as contained in the specifications. Demo all existing cabling and associated materials from this IDF location. Cable count for this IDF is approximately 45 drops.

10.1.6.9 New Outdoor IDF- ‘Room 807’– Provide new exterior IDF cabinet with the sizes and quantity of conduits to the relocatable classrooms and to the permanent building as shown on the drawings. New Outdoor IDF Cabinet shall be provided per the drawings, details and specifications.

10.1.6.9.1 Coordinate with the District for the removal or relocation of the storage container currently occupying the space where the cabinet is planned to be located. The District will be responsible for removal or relocation of the storage container.

10.1.6.9.2 Provide new 24-strand fiber optic feed cable from the existing MDF Room to the new Outdoor IDF Cabinet. The new fiber cable will be provided with the materials and equipment as shown in the drawings and specifications. Provide fiber optic patch panel, service loop manager, fiber optic patch cables and all other required components.

10.1.6.9.3 Demo the existing IDF cabinets currently serving the area that the new cabinet will serve, in the classrooms, per the instructions in the drawings and specifications. Remove the existing switches, patch panels and accessories from the existing IDF cabinet. Remove all of the old UTP cables completely, including all data outlets. Refer to the Demo instructions. Coordinate with the District IT Department for equipment to be re-used.

10.1.6.9.4 District shall install the new switches, switches being reused and UPS in the IDF rack. Provide all additional components as shown in the specifications and drawing details for an External Outdoor IDF Cabinet.

10.1.6.9.5 Provide power to the new load center on the Outdoor IDF Cabinet, as shown on the drawings.

10.1.6.9.6 Run new CAT-6 and CAT-6A UTP cables to each outlet shown on the drawings. Install new conduit sleeves for the UTP cables being installed as shown on the floor plans. Contractor shall provide cable support in the ceiling as shown in the details and specifications.

10.1.6.9.7 Provide new cables to the existing WAP and camera locations and reconnect WAPs and cameras.

PART 11 - INSTALLATION

11.1 Upon completion of 10% of the cabling installation, the Contractor shall notify the Project Engineer for an inspection of the methods and types of materials used on the project. The Contractor shall give a minimum of 72 hours notification to the Project Engineer for the scheduling of the inspection. The Contractor will be given a written review of the findings, so if adjustments are required, they can be done before the project proceeds. The Contractor shall be responsible for adhering to the findings and a follow-up inspection will not be provided.

11.2 Pull strings shall be provided with all cable runs including but not limited to; conduit stub ups, conduit sleeves, cable trays, open wiring routes, innerduct, and point-to-point conduits. Pull strings shall be free from cable bundles in open wiring routes. Pull strings shall not be substituted for pull ropes for the exterior site conduits.

11.3 Contractor shall furnish and install the surface mounted raceway for the new data locations as shown on the drawings. The surface raceway shall be provided with the following;

11.3.1 The surface raceway must be anchored to the wall with a minimum of #8, 1-1/4" screws and anchors, every 2 feet. Surface mount junction boxes must also be anchored to the wall with a minimum of (3) screws and anchors. Surface raceway installed with only the adhesive backing will be rejected and the Contractor will be required to add screws and anchors.

11.3.2 Provide sizes of raceway as shown in the detail drawings. Size of raceway provided at each location, or tying together multiple locations shall be determined by the quantity of cables routed through the raceway.

11.3.3 Furnish smaller raceway (shown as Panduit LDPH10 in the drawings), for cable quantities of 1 to 6 cables.

11.3.4 Furnish medium sized raceway (Shown as Panduit T-45 in the drawings), for cable quantities of 7 to 18 cables.

11.3.5 Furnish large sized raceway (Shown as Panduit T-70 in the drawings), for cable quantities of 19 to 35 cables.

11.3.6 All surface raceway shall be provided with wire retainers and a pull string. Provide ceiling transition fitting where raceway enters the accessible ceiling. Provide all fittings (corners, T-fitting, end caps, etc.) as required to complete the run.

11.3.7 Contractor shall use the existing conduit or raceway for the new data cables if the existing conduit or raceway is within 2-feet of the location shown on the floor plans. If new junction boxes are required, the junction boxes must match the type

and color of the existing raceway. All cable runs shall be provided with a pull string for future use.

11.4 Velcro cable management straps are required on all Category-6 cable bundles, the last 20 feet or upon entry into equipment closet, a maximum of 12" apart. Cable bundles shall also be routed through cable management or “D” rings in the equipment closet.

11.5 Data Contractor shall supply protective bushings or slide on rings at the ends of all exposed conduits used for the data system cabling. This is to include all conduits installed for any future data cabling requirements. Contractor shall submit planned protection bushings prior to installation of cabling for approval.

11.6 Velcro cable management straps are required on the cabling in the rear section of the vertical managers on the equipment racks. Straps shall be a maximum of 12" apart. At a minimum, Velcro straps shall be provided at each point the cables are routed to the patch panels from the main bundle.

11.7 Every fiber in every fiber optic cable must be terminated at both ends on a fiber patch panel in the MDF/IDF closet or cabinet location. Termination shall be accomplished using the correct style of connectors as directed by the District with a strain relief boot. All connectors shall be of the same manufacture to ensure compatibility. Polarity of fiber strands must be observed at all times.

11.8 Labeling

11.8.1 Each cable run shall be permanently labeled at each end with a unique sequential number which corresponds to a similar number provided for each data outlet and patch panel point. A printed label shall be placed at each of the following locations;

11.8.1.1 On the cable at the rear of the patch panel or termination block. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

11.8.1.2 On each cable in the j-box behind the faceplate location. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

11.8.1.3 On the cable at the terminal strip prior to termination point. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

11.8.1.4 On the face of the patch panel, provide a 3/4" by 3/4" label with a letter or number identifying the patch panel designation. For special purpose data connections such as WAP, Audio-Visual, IP Page and IP Camera ports, the label shall be designated with colored label icon or marker.

11.8.1.5 On the face of the faceplate in the label holder window. The label shall be clearly defined with a minimum #10 font size.

11.8.2 Hand written labels are not permitted. Where cable ID includes room number identification, the Contractor shall obtain written verification of final room

numbers prior to beginning labeling (numbers on plans do not always match final room numbers). Cable pulling cross reference lists will not be accepted with final documentation.

11.8.3 Each patch panel port shall be identified with a unique sequential labeling scheme. Port identification labeling pattern shall be consistent throughout the project.

11.8.4 All faceplates shall be identified with permanent printed labels. Labels must not be subject to removal by incidental contact. Contractor shall be responsible for replacing defective labeling for a period of one year from date of final sign-off of project.

11.8.5 All fiber optic and UTP feed cables shall be identified with a permanent, water resistant, printed labels. Labeling information shall include closet identifications, quantity of conductors (UTP) or strands (fiber) and house pair designations (UTP). Cables shall be labeled in the IDF/MDF closets at the site conduit entrance point, Riser conduit entrance point and prior to entering either punch blocks or patch panels. Labels for fiber and copper feeds shall include both the name of the origination point and the destination point, house pair or house fiber strand count, cable composition (ie:12-Strand MM 50/125 LO; 6-Strand SM). See details for additional requirements.

11.8.6 Labeling will follow recommended EIA/TIA standards or as requested by the customer. Contractor will confirm labeling pattern prior to final identification or testing. All test results will be identified by the final labeling scheme. Contractor shall be required to have the labeling scheme approved in writing by the District IT Director prior to manufacture or installation of the labeling.

11.8.7 All fiber optic cables and/or innerduct shall be tagged with fiber optic warning tags in every manhole or pullbox. Fiber warning tags shall also be placed at each end of the cable in the termination closets in clear view. A minimum of (3) tags are required at each end, with a label tag on each cable in the service loop. Fiber warning tags shall be placed on fiber optic cable and/or innerduct routed through open ceiling environments at increments no less than 15 feet apart.

11.8.8 Refer to detail drawings for additional labeling requirements.

11.9 Where open wiring cables are run through the ceiling space (only permitted where specifically noted on the drawings), the wire shall be bundled together and supported above the ceiling.

11.10 All cables must be fastened to the building structure via “j-hooks” or an approved Category 6 suspension system, and not directly in contact with ceiling system. For “j-hooks” maximum fill capacity is as follows: 1-5/16" hooks – 35 cables; 2" hooks - 60 cables; 4" hooks - 120 cables. For quantities beyond 120 cables use a sling support system such as “Erico Cable Cat” or equal. Maximum fill capacity 200 cables. D-rings, “Caddy #WMX cable hangar”, “Caddy Bridle Rings”, drive rings or any other type of wire ring support is not allowed.

11.11 All new cabling shall include the support systems (J-hooks, saddles, Velcro ties, etc.) regardless if the outlets are shown as new locations or existing locations where the cables are to be replaced.

11.12 Where cables pass through a fire-resistant portion of the structure, conduit sleeves shall be provided to maintain the rating of the wall penetrated. Sealing of all penetrations with

an approved fire barrier is required. Conduits and sleeves must remain accessible for future use. Permanent sealants may not be used to seal sleeves and conduits.

11.12.1 The 27 10 00 Contractor shall be responsible for fire-stopping all unused conduit sleeves in the ceiling or through rated walls. The Electrical Contractor shall be responsible for fire-stopping around the conduit or sleeve, unless the sleeve is installed by the 27 10 00 Contractor, in which case, the 27 10 00 Contractor shall be responsible for all fire-stopping requirements.

11.12.2 Expanding foam is not an acceptable sealant for any conduit opening. Contractor shall be responsible for complete replacement of the conduit and cabling in any conduit filled with expanding foam used as a sealant.

11.13 Fiber optic feed cables connecting to equipment racks from the MDF Room or from an adjacent IDF location, shall be installed with not less than a 20-foot service loop between the rack and mounted on the backboard. See drawings for fiber optic service loop requirements.

11.14 Provide 6 inches of cable slack at computer data system outlets inside conduit box.

11.15 In an accessible ceiling area, provide a 10-foot (stored in a Figure-8 configuration) service loop above the all data/voice outlet locations. Service loop must be securely tied up off of ceiling tiles or ceiling surface and supported at two opposite points. Neatly coil cable without exceeding minimum bend radius limitations. Do not provide length in excess of 15 feet, as it may cause improper test results and errors.

11.16 Do not provide a service loop in the MDF/IDF Room on the UTP cables, unless otherwise noted. Cables shall be neatly routed around the perimeter of the room to the cable runway from the point of entrance into the room.

11.17 The minimum bending radius for all cables and the maximum pulling tension shall not exceed manufacturer's recommendations.

11.18 Cables installed in manholes and pullboxes shall be supported with Velcro ties or loosely fitted UV rated tie wraps, on wall mounted cable support racks. The cables shall be clearly labeled in the manhole or pullbox.

11.19 Provide a full 360-degree loop of slack cable around manhole and pullbox interiors. Cables entering handholes from the bottom, shall not be allowed to touch the bottom of the cover when closed and shall not be pinched or crushed in any way.

11.20 Cable pulling shall use a split mesh grip over the cable jacket. Connection directly to optical fibers and copper wire conductors shall not occur.

11.21 When pulled through conduits, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the manufacturer.

11.22 Where cables are pulled through or pulled from a center of run, pull without splices or terminations, lead out the cables at all manholes, pullboxes, and conduits, taking care to feed them in again by hand for the next run.

11.23 For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves, etc., shall be used to ensure proper cable pulling tensions and side wall pressures. Cables shall not be pulled directly around a short right-angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified

minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space, shall be provided in all situations, to ensure the minimum possible cable sidewall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.

11.24 Cable lengths over 250 feet shall be machine pulled, not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum pulling speed shall be greater than 15 feet per minute.

11.25 A pull string shall be placed with all UTP and paging station cables at the time of installation. Conduit runs and surface raceway for station cabling shall be furnished with a minimum 2-Ply spiral wrap style, pull string rated for 240 ft/lbs. pulling strength, such as manufactured by Greenlee #431 or approved equal. Includes all conduit stubs and cables routed through open ceilings and cable trays. Pull strings shall be tied off in the junction box and in the ceiling. Provision for the installation of the pull string shall apply to all empty and spare conduits as well. Single ply type pull string will not be accepted as a substitute for the 2-ply pull string.

11.26 A measuring pull tape shall be placed with all feed cables at the time of installation. Indoor riser and Outdoor conduit runs between buildings designated for feed cabling, in excess of 150 feet shall be provided with a minimum ½" polyaramid style, measuring true tape pull string annotated with footage increments rated for 2500 ft/lbs. pulling strength, such as manufactured by Greenlee #39245 or approved equal. Conduit runs less than 150 feet shall be furnished with a ¼" polyaramid style, measuring true tape pull string annotated with footage increments rated for 1250 ft/lbs. pulling strength, such as manufactured by Greenlee #39243 or approved equal. Provision for the installation of the measuring pull tape shall apply to all empty and spare conduits as well. Standard twine style pull strings and standard nylon or polypropylene style pull ropes will not be accepted as a substitute for the polyaramid measuring tape type pull string.

11.27 When pulling cable through conduit, cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to the reel.) Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pullbox during this operation. Cables shall be pulled directly from cable reels.

11.28 All cables shall be new and extend continuous from each MDF or IDF backboard or rack to all outlet locations.

11.29 Where cables are not installed in a conduit or other raceway system, they shall not be routed parallel with other line voltage equipment or wiring (120 volt and above) within 36" or within 12" of line voltage equipment or wiring where crossing.

11.30 Where OSP-Rated UTP cables or OSP-Rated fiber optic cables are routed exposed through ceilings for more than 50'-0", Contractor shall install the cable in innerduct or EMT conduit in the ceiling. Innerduct installed in the accessible ceiling space shall be a minimum of riser rated and a minimum of 1" in diameter. Innerduct shall be supported a minimum of every 3-feet to the structural members.

PART 12 - TESTING

12.1 All Category-6 cables shall be point to point (link) tested after installation/termination, and verified to operate at minimum 1000Mbps. Performance of installed cables shall satisfy all current addendums to the EIA/TIA 568A standard for Category-6 wiring. In addition,

testing shall satisfy all proposed amendments to the existing ISO/IEC requirements. The wiring shall support all specified communication protocols. Testing shall support the Category-6 requirements by the EIA/TIA.

12.2 All Augmented Category-6 cables shall be point to point (link) tested after installation/termination, and verified to operate at minimum 10000Mbps. Performance of installed cables shall satisfy all current addendums to the EIA/TIA 568A standard for Augmented Category-6 wiring. In addition, testing shall satisfy all proposed amendments to the existing ISO/IEC requirements. The wiring shall support all specified communication protocols. Testing shall support the Augmented Category-6 requirements by the EIA/TIA.

12.3 Upon completion of testing cable links for both copper and fiber optic cabling, the Contractor shall supply a copy of the original database files downloaded from the tester in original format on a USB Flash Drive. Contractor shall provide with the testing database files, an original copy of the tester's manufacturer software program (included in original cost) for record management and archiving, in a Windows format (i.e.; Fluke Linkware software program)

12.3.1 The manufacturer's software program will be used by the Project Engineer to review all test results, and then turned over to the District to keep as their record copy with the final approved test results. Provide (3) copies of tests on USB Flash drive. Do not submit test results for review in Excel or PDF file formats, as the submittal will be rejected and not reviewed.

12.4 Contractor will repair or replace cable runs or connecting hardware that do not meet specified criteria.

12.5 Multimode fiber optic cables shall be tested bi-directionally at 850nm and 1300nm. Single mode fiber optic cable shall be tested bi-directionally at 1310nm and 1550nm. All fiber strands shall be tested with an OTDR (Optical Time Domain Reflectometer). All fiber test results shall contain final source and destination information that matches IDF or MDF labeling shown on the fiber optic patch panels and final documentation. OTDR test results shall be included with the copper test results and submitted with the tester's software for review. Do not submit test results for review in Excel or PDF file formats, as the submittal will be rejected and not reviewed.

12.6 Test procedures shall comply with EIA/TIA 526-14 Method B. Test results shall meet the minimum following criteria:

12.6.1 Fiber optic test results shall not exceed 2db total attenuation loss in addition to inherent loss published by manufacturer tested at minimum 2000 Mhz for 850nm and 500 Mhz for 1300nm for the fiber optic cable.

12.6.2 Test all data cables minimum Category-6 UTP cable to test results for "Channel Testing" requirements @ 250 Mhz per current EIA/TIA requirements. Any cables which do not meet these minimum requirements shall be replaced or repaired at no cost to the District.

12.6.3 Test all data cables minimum Augmented Category-6 UTP cable to test results for "Channel Testing" requirements @ 500 Mhz per current EIA/TIA draft requirements. Any cables which do not meet these minimum requirements shall be replaced or repaired at no cost to the District.

12.7 End to end attenuation testing shall be performed with a temporary test jumper cable at each end of the installed fiber cable. The test jumper utilized shall be the same fiber core

size and grade of glass as the installed cable. The measured attenuation of the test jumpers, test connectors, and test interconnection sleeve between the two test jumpers shall be less than 1dB as calibrated at the time of the test at indicated wave lengths and frequencies. Test jumpers shall be “zeroed out” before testing of fiber strands begins.

PART 13 – CLOSE-OUT DOCUMENTATION

13.1 Final As-Built Drawing Submittals - Provide (1) hard bound copy of “E-size” As-Built drawings and (3) copies on USB Flash Drive in AutoCAD (2014 or newer version) format. A Hand marked-up copy of the original construction drawings will not be accepted as the final As-Built drawing submittal. Final As-Builts shall include copies of the floor plan drawings of each building, detailed elevations of each MDF or IDF locating all equipment, quantities outlets and speaker locations, locations of all sleeves and identification of all final cable routes. In addition, the drawings shall include all outlet locations with cable identification numbers.

END OF SECTION