

SECTION 27 1116 – RACKS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Specification Sections:
 - 1. 27 0000 – General Technology Requirements
 - 2. 27 1000 – General Cabling Requirements
 - 3. 27 1300 – Backbone Cabling
 - 4. 27 1500 – Data and Voice Horizontal Cabling
 - 5. 28 2300 – Video Surveillance

1.2 SUMMARY

- A. This section includes specifications and requirements for racks and cabinets to be used throughout the technology project.
- B. Refer to appropriate drawings and specification sections for cabinet types, quantities, and locations.

1.3 DEFINITIONS

- A. Unless noted otherwise, “cabinet” refers to cabinets, relay racks, etc.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.
 - 1. Cabinet
 - 2. Wire Management
 - 3. Cabinet Accessories
- B. Shop Drawings: Include dimensioned plan and elevation views of telecommunications equipment rooms, with each individual component labeled. Show cabinet assemblies, workspace requirements, and access requirements.

1.5 COORDINATION

- A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

- B. Provide a new server cabinet in the MDF of Burger Baylor. Provide a full height cabinet equipped to handle the weight and dimensions of the video surveillance servers and UPS unit(s).
- C. Coordinate telecommunication room and cabinet layouts with related contractors.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. All materials shall be installed with matching color and quality to ensure a high-quality finished installation. Unless noted otherwise or approved in writing by Technology Designer, all materials shall have a black finish.
- B. Provide side panels for the ends of bolted cabinet rows.
- C. All lockable cabinets are to be keyed alike. Contractor to coordinate keying with Technology Designer.
- D. Provide black 1U, 2U, 4U, or 8U standard EIA filler panels to infill blank space within cabinets (not necessary for relay racks).
- E. For each cabinet or rack section:
 - 1. Provide two rack mounted surge suppression outlet power strips and/or vertical power strip as needed.
 - 2. Provide rack-grounding termination.

2.2 RACKS

- A. General Requirements:
 - 1. Racks shall be high-grade black anodized-aluminum with front and back standard 19" EIA mounting screw holes.
 - 2. Minimum height 84".
 - 3. Contractor will provide 6" wide, duct-style vertical wiring management with removable protective covers on both sides of each rack.
- B. Manufacturer:
 - 1. Hubbell
 - 2. Ortronics
 - 3. Panduit
 - 4. Approved Equal

2.3 SERVER CABINET

- A. General Requirements:
 - 1. Cabinets are to be certified for server installation.

2. Cabinets to be steel with removable and lockable doors. Front door shall be perforated steel. Rear door to have a vented steel opening.
3. Top panel to be steel to match.
4. Unit Height: Between 80 and 84", with 42U of racking space within the unit.
5. Unit Depth: sized appropriately to accept VMS servers and UPS.
6. Each cabinet section to be minimum 16-gauge steel.
7. Rails to be minimum of 10-gauge with .375" square holes and tapped holes for both locking cage nuts and standard screws for both front and rear mounting rails.
8. Each cabinet section shall have front and rear leveling legs.
9. Provide a minimum of 20 cage nuts, 20 plastic washers, and 20 6M nuts per section.
10. Provide a cage nut driver tool for each section of rack.
11. Each cabinet section to be provided with 19" rack mounted 6-outlet power outlet plug strip.
12. Cabinet Color: Cabinet color shall be black.

B. Acceptable Manufacturer:

1. APC
2. Dell
3. Hewlett Packard
4. Rack Solutions
5. Rittal
6. Tripplite
7. Winsted

2.4 RACK AND CABINET COMPONENTS

A. Outlet Strip

1. Manufacturer standard nine (9) minimum outlet or greater receptacle strip rated at 20A with surge suppression plug, and circuit breaker. Contractor to supply proper power strip for voltage supplied.
2. Unit shall be provided with rack bolting.

B. Cable Ties

1. Cable ties shall be plenum rated.
2. Cabinet and rack ties shall be Velcro-type ties

PART 3 - EXECUTION

3.1 EXAMINATION

- A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether such items are specifically mentioned in the plans and specifications.
- B. The Contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification, manufacturer's specifications, and within standards of generally accepted workmanship.
- C. The contractor shall protect equipment and components during installation and clean all equipment before owner acceptance using methods and materials recommended by the manufacturer.
- D. All units shall be aligned and perpendicular to adjacent walls.
- E. Racks and cabinets are to be properly installed and secured to handle equipment load. The racks shall be bolted to floor, cable tray, and/or wall for added rigidity. Adjacent cabinets shall be bolted together at the top and bottom at both the front and rear of the units.
- F. Provide independent circuit grounding recommended by manufacturer. Grounding is to be consistent with ANSI/TIA/EIA 607 and NEC requirements as a minimum. Each contractor to connect their cabinets to a single-point ground which is connected to the building ground system via #6 AWG green insulated copper grounding conductor.
- G. Contractor to adjust side mounting rails to optimize front and rear cabinet clearances. No less than three inches of clearance must be provided between the equipment and the cabinet door for cabling.
- H. Equipment Mounting Positions (From Top):
 - 1. WAN fiber panel (where applicable)
 - 2. LAN fiber panel
 - 3. Alternating patch panels and switches
 - 4. Power Strip
 - 5. UPS

END OF SECTION 27 1116

SECTION 27 1300 – BACKBONE AND OUTDOOR CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Specification Sections:
 - 1. 27 0000 – General Technology Requirements
 - 2. 27 1000 – General Cabling Requirements
 - 3. 27 1116 – Racks and Cabinets
 - 4. 27 1500 – Data and Voice Horizontal Cabling

1.2 SUMMARY

- A. Extent of the cabling systems work is indicated by the drawings and schedules, and is hereby defined to include, but not by of limitation, the provisions of:
 - 1. Backbone cables between the telecommunication rooms.
 - 2. All termination blocks, outlets/jacks, patch panels, patch cords, etc.
 - 3. Termination, cross connect, and patching.
- B. The data cabling infrastructure shall compliant with EIA/TIA standards under T568B-2.1. Campus voice, fiber optic, data and video infrastructure shall be implemented compliant with applicable standards.
- C. Data and POE voice cables shall be routed so as not to exceed 90 meters in length. Notify the Technology Designer before bid period question deadline, established at the pre-bid meeting, should any changes in bid documents be required to conform to this limitation. After entering into Contract, Contractor shall provide Technology Designer-approved solution to meet the 90-meter requirement without additional expense to the Owner.
- D. Provide and install twelve (12) strands of single-mode fiber optic cabling between each TR and MC.
- E. Contractor shall review all underground segments with the Owner. Contractor will register all underground segments with the MISS DIG system and facilitate the agreement between MISS DIG and the Owner.
- F. Provide coordination and installation in accordance with standards, rules, regulations and requirements of utilities, ROW owners, state, county, cities, villages, townships, municipalities, and any other authority having jurisdiction.
- G. Patching:
 - 1. This Contractor is responsible for patching to switches or equipment provided by others.

2. Patch cables shall be the minimum lengths necessary to patch one-for-one while utilizing the wire management. Technology Designer to approve patching method before installation.

1.3 DEFINITIONS

- A. AHJ: Authority Having Jurisdiction
- B. ER: Equipment Room
- C. HH: Handhole
- D. MC: Main Cross-connect [Applies to references to MDF]
- E. MMF: Multimode fiber
- F. SMF: Single-mode fiber
- G. TR: Telecommunication Rooms [Applies to references to IDF]
- H. TP: Transition point

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.
 1. Cable
 2. Terminations (Patch panels, punchdown blocks, etc.)
 3. Patch cables (Identify lengths, colors, and quantities)
- B. Qualification Data:
 1. Include written confirmation from the manufacturer that the bidder is a certified installer for the cable plant solution.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have on-staff personnel certified by the cable solution manufacturer and BICSI.
- B. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
- C. Installation Supervision: Installation and testing shall be performed by BICSI Registered Installers or manufacturer certified installers, with a consistent supervisor who shall be present at all times when work of this section is performed.

1.6 COORDINATION

- A. Coordinate cables installed in this section with the Owner.

1.7 WARRANTY

- A. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. The cable plant shall be covered by the manufacturer's warranty (eg. Panduit Certification Plus System Warranty, Hubbell Premise Wiring Mission Critical Warranty and System Performance Guarantee, etc.).

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Coordinate the features of materials and equipment so they form an integrated system complying with TIA/EIA standards. Match components and interconnections for optimum future performance.
- B. Contractor is to use plenum rated cable and cabling accessories throughout this installation.

2.2 MANUFACTURERS

- A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any deviations must be approved in writing by the Technology Designer before installation.
 - 1. Indoor/Outdoor UTP Voice/Data Cable
 - a. Berk-Tek
 - b. Belden
 - c. Commscope
 - d. General
 - e. Hitachi
 - f. Lucent
 - g. Mohawk
 - h. Superior Essex
 - 2. Fiber Optic Cable
 - a. Berk-Tek
 - b. Belden
 - c. Commscope
 - d. Draka Comteq
 - e. General
 - f. Legrand Infinium Quantum
 - g. Lucent
 - h. Siecor
 - i. Tyco
 - 3. Patch Panels, Faceplates, Station Terminations, Jacks, other Accessories
 - a. Hubbell
 - b. Panduit
 - c. Ortronics

2.3 INDOOR/OUTDOOR DATA/VOICE STATION CABLING

A. Cable Standards:

1. Cable is to be continuous, Category 6 compliant UTP cable rated for indoor and outdoor underground in-duct installations.
2. Plenum-rated required when cabling indoors extend beyond 50' from the building entry location.
3. Cable shall have an UV-resistant sheath and a core of solid-copper conductors, dual insulated with foam skin and plastic, surrounded by a gel-filling compound.
4. Cabling shall be certified as a complete system with other components required herein to achieve manufacturer's cabling system extended warranty.

B. Manufacturer:

1. Hitachi Cable Drybit Category 6 Indoor-Outdoor Cable
2. Approved equivalent

C. Termination standards:

1. Contractor shall install lightning protectors in telecommunication room for each data/voice cable.
2. Terminate at station location in "biscuit box" or as recommended by station equipment manufacturer.

2.4 FIBER OPTIC CABLING BACKBONE

A. Cable Standards:

1. Indoor backbone cable is to be continuous, armored, plenum-rated, tight-buffered ITU G.652D single-mode fiber optic cable.
 - a. Cabling must be armored, no loose strand innerduct will be accepted.
2. Each fiber must be individually jacketed.
3. Cable shall have EIA/TIA -598 color coding for fiber optic cable.
4. All pig tails and patch cables are to match the type of fiber optic cable installed.
5. All fiber is to be fusion spliced; no field terminations or mechanical splices will be accepted.
6. Indoor cable sheath and accessories are to follow the following color designation:
 - a. Singlemode Yellow

B. Termination Standards:

1. Provide 19" rack mounted (sized as necessary, 72-port maximum) optical fiber termination panels with cable strain relief and slack storage. Provide breakout and storage of 5' of cable. Size the patch panel for an additional space for 12 future terminations.
2. LC terminations are to be used, or as required by the equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Contractor shall be familiar and install in accordance with all applicable codes and standards, including FCC, NEC (NFPA 70), EIA/TIA 568, 569 and 606, BICSI (Customer-Owned Outside Plant Design Manual, current edition), BICSI (Telecommunications Distribution Methods Manual, current edition), federal, state, and local building/fire codes.
- B. Installation must be in accordance with applicable utility company standards.
- C. Contractor to follow the applicable grounding and bonding requirements.
- D. Contractor to provide additional cabling coiled above ceiling at both the workstation locations and in telecommunication rooms. The additional lengths of cable shall be included in distance calculations. Cable routing within the telecommunication closet is to be approved by the Owner's Representative before beginning termination.
- E. Fiber optic cables shall be marked with warning labels every twenty feet (20').

3.3 AERIAL BUILDING ENTRANCE REQUIREMENTS

- A. Contractor may use an aerial entry into buildings identified on the drawings. Contractor must obtain written permission before aerial entrances are used at any other buildings.
- B. Service drop into the building shall utilize a minimum 3" rigid galvanized steel conduit with weather head securely attached to the building. The installation shall comply with the National Electric Code (NFPA 70).
- C. Provide conduit and sealed junction box at all exterior wall penetrations designed to maintain the required bend radii. All entrances into the building will be properly water and fire stopped. Penetrations through exterior walls will be core or drilled hole and mortared and finished with adequate seal and weatherproofing. Chiseling of bricks or portions of bricks is not acceptable. Filling penetrations with expanding foam insulation is not acceptable.
- D. Contractor will provide strain relief on all service entrances to avoid cable overloading.

3.4 UNDERGROUND INSTALLATION AND BUILDING ENTRANCE REQUIREMENTS

- A. Prior to beginning any underground work, Contractor shall contact MISS DIG, local utility survey staff, and utility companies for the location of all existing underground services and provide, if requested, documentation of such contact to Barton Malow Company. If necessary, Contractor shall pay for appropriate layout and locating of all existing utilities, and stake said utilities.

- B. Contractor to install new underground pathway and conduit between the building(s) and outdoor equipment location.
- C. Provide conduit and sealed junction box at all exterior wall penetrations designed to maintain the required bend radii. All entrances into the building will be properly water and fire stopped. Penetrations through exterior walls will be core or drilled hole, and finished with adequate seal and weatherproofing. Chiseling of bricks or portions of bricks is not acceptable. Filling penetrations with expanding foam insulation is not acceptable.
- D. Provide a minimum 2" conduit (or as shown on the drawings) with material appropriate to the installation. All joints shall be cleaned, coupled, connected, and sealed to prevent infiltration of water.
- E. Provide and install a trace wire in each underground segment.
- F. Provide underground handholes where required. The top of the handhole shall be stamped or etched "Communication" or manufacturer's equivalent. Install the handholes with ¼ inch of the final ground level, at a distance of no greater than 300' apart. Handholes shall also be installed whenever the combination of elbows and bends totals greater than 180 degrees. Handhole sizes shall be based on NEC Article 314.16 and Article 315.28; however larger than 4'x4'x4' shall not be used without written approval.
- G. Contractor may utilize a directional bore or trench to install the conduit. Conduits to be installed to a minimum of 36" below grade. Installation shall follow OSHA requirements.
- H. Compact all backfilled materials and level site. Restore remainder of topsoil for grass installations and re-sod restored excavation. Any concrete or asphalt damage shall be restored. Backfill excavation and trenches with compacted sand to 1' below grade and provide warning tape. Restore remainder of topsoil for grass installations. Compact crushed stone/sand for concrete/asphalt installations and restore to original condition.
- I. Any installation in a public right of way, easement, or public roadways or other property not owned by the Owner shall be restored in accordance with property owners' or governing agency regulations and requirements. If no regulations govern, as a minimum restore to a condition similar to pre-installation quality.
- J. Utilities and/or other services which are identified, or not identified but encountered, shall be protected by the Contractor from any damage arising or resulting from work, unless or until they are abandoned. If the utilities or services are damaged from Contractor's work, Contractor shall notify the Technology Designer immediately. Contractor shall repair any damage and restore the utilities and services to an equal or better condition than that which existed prior to the damage within four (4) hours. If the Contractor does not repair the work or the Owner or Barton Malow considers the damage unresolved in a timely manner, repairs will be made at Contractor expense.
 - 1. Contractor shall photograph and document the environment immediately before beginning work, upon exposing any utilities, and after work and/or repair is completed. Barton Malow shall review the work and/or repairs before any work is buried.
 - 2. Contractor will be responsible for all liabilities, damages, expenses, lawsuits or claims arising or resulting from such damage and will defend, hold harmless and indemnify Owner and Barton Malow Company from any claims or law suits or other expenses.
- K. Contractor shall provide and maintain proper shoring and bracing during its excavation, to protect from collapse or movement, or other type of damage until such time as they are to be

removed, incorporated into the new Work or can be properly backfilled upon completion of the work and inspections.

- L. Unless specifically noted on the drawings as a direct-buried installation, underground installations shall be in conduit.

3.5 HANDHOLE REQUIREMENTS

- A. Provide underground handholes as needed to facilitate the installation and future servicing of the backbone cables.
- B. Provide Quazite underground handhole enclosures rated to 15,000 lbs.
- C. The top of the handhole shall be stamped or etched "Fiber Optic Cabling" or manufacturer's equivalent.
- D. Install the handholes at final ground level, at a distance of no greater than 1,000' apart. Handholes shall also be installed whenever the combination of elbows and bends totals greater than 180 degrees.
- E. Handhole sizes shall be based on NEC Article 314.16 and Article 315.28; however larger than 2'x2'x2' shall not be used without written approval.
- F. Conduits are to sweep up through the bottom of the handhole with the handhole bottom filled with gravel.
- G. Install a ground rod in each vault or handhole and connect to wire electrode.

3.6 INSIDE CABLE INSTALLATION

- A. Contractor is to follow the requirements established in section 27 1000.
- B. If the termination location is greater than 50' from the building point of entrance, or as required by applicable codes, cable will be fusion spliced to plenum rated cable in a wall-mounted fiber optic splice enclosure. Point of entrance is the point within the building where the cable emerges from an external wall, from a concrete floor slab, or from rigid metal conduit or intermediate metal conduit connected to an electrode by a grounding conductor in accordance with NEC 2014 800.100 and 800.2.
- C. Due to field conditions or other situations, installation locations may have to be relocated a reasonable distance from the plan location. Unless relocations, modifications and reengineering are consistently or substantially unfavorable to either the contractor or the owner, there will be no additional charge or credit for this work.
- D. The contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification and within standards of generally accepted workmanship.
- E. Fiber optic cable shall be installed in orange, plenum-rated innerduct. Maximum fill is 40%. If armored cabling is used, innerduct requirement does not apply.
- F. Ensure all cables within cable trays are arranged to avoid individual cables supporting the weight of the cable bundle. Cable trays shall have appropriate bend radii for cable and fiber.

Provide elbows, supports, and ties to assist in offloading the weight of the cable and adequately support the tray.

3.7 IDENTIFICATION

- A. In addition to requirements in this Article, comply with TIA/EIA-606-A
- B. Label patch panels/punchdown blocks for voice tie cables as "Voice Tie Cable to [LOCATION]"
- C. The cable run shall be machine labeled or legibly hand labeled with indelible ink within 1" of termination. Final termination at the distribution frame is also to be appropriately tagged. All cabling and fiber optics are to be tagged in a consistent manner.
- D. Fiber Optic Safety Installation. Label all fiber optic junction boxes and termination points with "fiber-optic cable - lasers in-use - possible eye injury" warnings inside and outside of the location.
- E. At junction boxes, label with a description of the cable, termination location, and strand count.

3.8 FIELD QUALITY CONTROL

- A. The UTP installation is to be tested to the current EIA/TIA TSB Channel Performance Testing Standard, or equivalent as approved by the Technology Designer.
 - 1. Cables are to be tested with a Fluke OmniScanner2, or equivalent by Agilent or Wavetek, using the correct software version and adapter for the cable installation or as required for manufacturers warranty program.
 - 2. Cables are to be tested consistently with the tester in the MC, and the injector at the remote TR.
- B. Document for each pair as well as the worst margin the following test results:
 - 1. Cable identification (Building and Circuit ID)
 - 2. Test date
 - 3. Cable length (ft.)
 - 4. Wiremap
 - 5. Delay (ns)
 - 6. Skew (ns)
 - 7. Resistance (Ohms)
 - 8. Attenuation
 - 9. NEXT
 - 10. ELFEXT
 - 11. Return Loss
 - 12. PSNEXT
 - 13. PSELFEXT
- C. Optical Time Domain Reflectometer (OTDR) testing is required on all terminated fiber optic cables. The operator of the test equipment must be properly trained and have experience in the operation of this equipment and interpreting and certifying test results. While preterminated, factory-certified cables may be installed; the contractor must provide a field verifiable method of determining attenuation, continuity, bandwidth, etc. Contractor is to provide an OTDR test of each fiber spool before installation to verify fiber is not damaged upon delivery.

- D. Any cables that do not meet the minimum performance criteria established by the standards or manufacturer shall be corrected or replaced at no additional cost to the Owner. If the copper backbone cable contains more than one (1) percent bad pairs, remove and replace entire cable.

3.9 DEMONSTRATION

- A. Contractor shall train the Owner on the layout of the backbone cabling system including the pathways, termination methods, and interconnections.

3.10 DOCUMENTATION

A. As-Built Documentation:

1. Include scaled drawings documenting the final installation, including final location of all telecommunication rooms, cable paths, etc.
2. Drawings shall be created in AutoCAD format. Hand written drawings shall be accepted for draft or working copies only.
3. Include photographs of the completed fiber splice trays for each telecommunication closet location.

B. Cable Testing

1. Cable test results are to be provided electronically (PDFs) organized by building and telecommunication room.
2. Contractor is to review fiber/OTDR test results with Owner and annotate a sample test result indicating key indicators.

C. Underground Conduit Labeling

1. For each underground conduit used, Contractor is to label both ends of the conduit identifying where the conduit runs (e.g. "Fiber to Pressbox")

D. Warranty

1. Provide certificate of manufacturer's extended warranty for the cabling system.

END OF SECTION 27 1300

SECTION 27 1500 – DATA AND VOICE HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Specification Sections:
 - 1. 27 0000 – General Technology Requirements
 - 2. 27 1000 – General Cabling Requirements
 - 3. 27 1116 – Racks and Cabinets
 - 4. 27 1300 – Backbone Cabling

1.2 SUMMARY

- A. This Section includes general cabling requirements for contractors installing structured data or voice cabling within their scope of work.
- B. The cabling infrastructure shall be implemented as a data and voice solution compliant with EIA/TIA standards under T568B-2.1. Campus voice, fiber optic, data and video infrastructure shall be implemented compliant with applicable standards.
- C. Extent of the cabling systems work is indicated by the drawings and schedules, and is hereby defined to include, but not by of limitation, the provisions of:
 - 1. Horizontal cables to the telecommunication rooms.
 - 2. All termination blocks, outlets/jacks, patch panels, patch cords, etc.
 - 3. Termination, cross connect, and patching.
- D. Data and voice cables shall be routed so as not to exceed 90 meters in length. Notify the Technology Designer before bid period question deadline, established at the pre-bid meeting, should any changes in bid documents be required to conform to this limitation. After entering Contract, Contractor shall provide Technology Designer-approved solution to meet the 90-meter requirement without additional expense to the Owner.
- E. Color Coding:
 - 1. All structured cabling related to the video surveillance cameras shall be **green** in color **category 6**.
- F. Patching:
 - 1. This Contractor is responsible for patching to all switches. Switches will be provided, by others, equal to the number of data ports. Provide **Category 6** patch cables. Quantity shall match the total number of data cables installed.

2. Patch cables shall be the minimum lengths necessary to patch one-for-one while utilizing the wire management. Technology Designer to approve patching method before installation.
3. Patch cables shall NOT have boots
4. Patch cable manufacturer shall be consistent with the patch panel and jack manufacturer.

1.3 DEFINITIONS

- A. ER: Equipment Room
- B. MC: Main Cross-connect [Applies to references to MDF]
- C. TR: Telecommunication Rooms [Applies to references to IDF]
- D. PoE: Power over Ethernet

1.4 SUBMITTALS

- A. Prior to ordering, confirm colors of horizontal cables, patch cables, and jacks.
- B. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.
 1. Cable
 2. Faceplates
 3. Terminations (Patch panels, jacks, etc.)
 4. Patch cables (Identify lengths, colors, and quantities)
- C. Samples:
 1. Faceplate with proposed labeling format.
 2. A minimum one-foot sample of each proposed cable-type to be used on this project with labeling.
- D. Qualification Data:
 1. Include written confirmation from the manufacturer that the bidder is a certified installer for the cable plant solution.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Contractor must be certified by the manufacturer of the solution being installed and be BICSI certified.
- B. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
- C. Installation Supervision: Installation and testing shall be performed by BICSI Registered Installers or manufacturer certified installers, with a consistent supervisor who shall always be present when work of this section is performed.

- D. Comply with EIA/TIA 568B-2.1, EIA/TIA 569, and EIA/TIA 606.

1.6 WARRANTY

- A. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. The cable plant shall be covered by the manufacturer's warranty for a minimum of fifteen (15) years (e.g. Panduit Certification Plus System Warranty, Hubbell Premise Wiring Mission Critical Warranty and System Performance Guarantee, etc.).

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Coordinate the features of materials and equipment so they form an integrated system complying with TIA/EIA-568-B. Match components and interconnections for optimum future performance.
- B. One manufacturer must be used for all termination jacks, patch panels, and patch cables.
- C. Contractor is to use plenum rated cable and cabling accessories throughout this project.
- D. All Category 6A cables will be UL limited power (LP) rated.

2.2 MANUFACTURERS

- A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any deviations must be approved in writing by the Technology Designer before installation.
 - 1. Voice and Data Cable
 - a. Berk-Tek
 - b. Belden
 - c. Commscope
 - d. General
 - e. Liberty Wire & Cable
 - f. Lucent
 - g. Mohawk
 - h. Superior Essex
 - i. Approved Equal
 - 2. Patch Panels, Faceplates, Station Terminations, Jacks, other Accessories
 - a. Hubbell
 - b. Panduit
 - c. Ortronics
 - d. Leviton
 - e. Approved Equal

2.3 DATA CABLE AND TERMINATIONS

A. Cable Standards:

1. Cabling shall be contiguous, plenum rated **Category 6**, four-pair UTP cable compliant with EIA/TIA 568B-2.1 standards.
2. Cable shall be solid copper.
3. Cabling shall be certified as a complete system with other components required herein to achieve manufacturers cabling system extended warranty.

B. Termination Standards:

1. Terminations shall be **Category 6** compliant modular, T568B RJ-45 jacks.
2. Video surveillance, wireless access point, or other equipment terminations shall be modular T568B RJ-45 jacks in a plenum-rated biscuit box located near the end device or a modular plug terminated link (i.e. direct connect) that meets the ANSI/TIA-568-C.2 clause 6.3 requirements. If a modular plug terminated link (MPTL) is used, testing must be performed with the appropriate channel adapter.

C. Surge Suppression: Provide and install in-line surge protection for any cables used for outdoor devices (eg. wireless access points, video surveillance cameras, entry intercoms, etc.).

2. Surge protector is to be rated for 10Gb bandwidth, PoE+, and HiPoE
3. Surge suppression is not required if the equipment is protected by a minimum 6' overhang (e.g. not required for an entry intercom under an entry canopy).
4. Verify with Owner if they prefer surge protector to be installed at the equipment end or telecommunication room end.
 - a. If preference is telecommunication room end, contractor to use 4-channel, 12-channel, etc. where possible to minimize equipment.
5. Manufacturers:
 - a. Ditek DTK-MRJPOES (for single cable)
 - b. Ditek DTK-DTK-WM4EXTS (for 4-channel locations)
 - c. Approved equivalent

2.4 INDOOR/OUTDOOR DATA/VOICE STATION CABLING

A. Cable Standards:

1. Cable is to be continuous, Category 6 compliant UTP cable rated for indoor and outdoor installations between two environmentally protected points, including underground pathways.
2. Use in areas with thermal or chemical exposure.
3. Plenum-rated required when cabling indoors extend beyond 50' from the building entry location.
4. Cable shall have an UV-resistant sheath and a core of solid-copper conductors, dual insulated resistant to chemical, moisture, and thermal exposure.
5. Cabling shall be certified as a complete system with other components required herein to achieve manufacturer's cabling system extended warranty.

B. Manufacturer:

1. Hitachi Cable Drybit Indoor-Outdoor Cable
2. Super Essex with FEP Jacket CMP Indoor/Outdoor
3. Approved equivalent

C. Termination standards:

1. Contractor shall install lightning protectors in telecommunication room for each data/voice cable.
2. Terminate at station location in “biscuit box” or as recommended by station equipment manufacturer.

2.5 PATCH PANEL DISTRIBUTION FRAME TERMINATIONS

A. Standards:

1. Patch panels must be Category 6, 19”, 48-port patch panels with T568B terminations.
2. Provide patch panels for all cables installed plus eight (8) open ports in each telecommunication room for future use.
3. Patch panels shall have a rear strain relief bar to organize cables and maintain appropriate bend radius.
4. Data cables shall be terminated sequentially. If terminated on the patch panels, cables installed for building systems (fire alarm phone line, security phone line, pay phones, etc.) shall be terminated together in the last patch panel positions and its use labeled on the patch panel.

2.6 FACEPLATES AND MODULE FRAMES

- A. Faceplates shall be sized to accommodate the raceway, back box, or floorbox for each location with adequate modules for the required jacks.
- B. All faceplates shall be Decora style stainless steel. Utilize smooth metal 302/304 stainless steel for all faceplates. Blank plates shall be sized to fit box without Decora cutout.
 1. Exception: Plastic module frames shall be used where necessary to match installation of other contractors.
- C. Faceplate labels shall be secured to the faceplate (loose or removable labels on the screw covers are not permanent and not acceptable).

2.7 PATCH CABLES

- A. Provide Category 6 8-conductor patch cables for use within telecommunication rooms. Provide one for every data cable installed throughout the project. Patch cables shall be the minimum lengths necessary to patch while utilizing the wire management. Technology Designer to approve patching method.
- B. In addition to the patch cables to be used in the telecommunication rooms, provide Category 6 8-conductor patch cables for the owner’s use at the station end. Patch cables shall be **green**.
- C. Fiber optic patch cables. Provide duplex fiber optic patch cables in the following quantities:

<u>Min. Length</u>	<u>Terminations</u>	<u>Quantity</u>	<u>Type</u>	<u>Color</u>
3 ft	LC-LC	8	single mode	yellow
10 ft	LC-LC	8	single mode	yellow

- D. Patch cable manufacturer shall be consistent with the patch panel and jack manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Review all closet layouts with Technology Designer prior to installation.
- B. Contractor shall be familiar and install in accordance with all applicable codes and standards, including FCC, NEC (NFPA 70), EIA/TIA 568, 569 and 606, BICSI (Telecommunications Distribution Methods Manual, current edition), federal, state, and local building/fire codes.
- C. Contractor shall limit cable bundles for cable runs, cables in telecommunication rooms, and penetrations to:
 - 1. Cat 5e 52 cables
 - 2. Cat 6 64 cables
 - 3. Cat 6A 74 cables
- D. Contractor to provide additional cabling coiled above ceiling at both the workstation locations and in telecommunication rooms. The additional lengths of cable shall be included in distance calculations. Cable routing within the telecommunication closet is to be approved by the Owner's Representative before beginning termination.
- E. At station locations, terminate all 8 conductors on all jacks, regardless of data or telephone use.
- F. Ensure all cables within cable trays are arranged to avoid individual cables supporting the weight of the cable bundle. Cable trays shall have appropriate bend radii for cable and fiber. Provide elbows, supports, and ties to assist in offloading the weight of the cable and adequately support the tray.
- G. Service loops for Cat 6A cables are to be installed in an S-configuration and not a circular loop.

3.3 IDENTIFICATION

- A. In addition to requirements in this Article, comply with TIA/EIA-606-A.
- B. Each termination module shall be labeled with a white, wrap-around self-adhesive label. Use Panduit MINI-COM® Module Port Identification Self-Adhesive Labels, or equivalent.
- C. Each label shall identify the telecommunication room, patch panel and patch panel port. For example: 1-A-34 would refer TR-1, patch panel A, port 34.
- D. Data cable patch panels shall be labeled sequentially with letter designations A, B, C, etc. Voice cable patch panels shall be labeled sequentially with a V designation (V1, V2, etc. if more than one).

- E. Patch panel ports used for mounted devices (wireless access points, surveillance cameras, displays, etc.) will be labeled with the device name (e.g. WAP-09 for access point 9).
- F. In addition to the faceplate label, each cable is to be labeled behind the faceplate and patch panel with a machine generated wrap-around self-adhesive label that matches the port label on the patch panel and faceplate.

3.4 FIELD QUALITY CONTROL

- A. The installations must be tested and certified as compliant for Category 6 Gigabit connectivity. The installation is to be tested to the current EIA/TIA TSB Channel Performance Testing Standard, or equivalent as approved by the Technology Designer. For workstation locations without a patch cable, use a 10' cable at for testing purposes.
 - 1. Cables are to be tested with a Fluke Versiv Cable Certifier, or equivalent by Agilent or Wavetek, using the correct software version and adapter for the cable installation or as required for manufacturers warranty program.
 - 2. Cables are to be tested consistently with the tester in the telecommunication room, and the injector at the workstation termination locations.
 - 3. Testing will be performed after faceplates have been secured to the raceway/wall/floorbox.
- B. Document for each pair as well as the worst margin the following test results:
 - 1. Cable identification (Building and Circuit ID)
 - 2. Test date
 - 3. Cable length (ft.)
 - 4. Wiremap
 - 5. Delay (ns)
 - 6. Skew (ns)
 - 7. Resistance (Ohms)
 - 8. Attenuation
 - 9. NEXT
 - 10. ELFEXT
 - 11. Return Loss
 - 12. PSNEXT
 - 13. PSELFEXT
- C. Any cables that do not meet the minimum performance criteria established by the standards or manufacturer shall be corrected or replaced at no additional cost to the Owner.

3.5 DEMONSTRATION

- A. Contractor shall train the Owner on the layout of the cabling system including the pathways, termination methods, and interconnections.

3.6 DOCUMENTATION

- A. As-Built Documentation:

1. Include scaled drawings reflecting all changes between the bid documents and the final installation, including final location of all telecommunication rooms, equipment, cable paths, outlets, etc.
2. Drawings shall include all cable routing, outlet locations, and outlet labels.
3. Drawings shall be created in AutoCAD format. Handwritten drawings shall be accepted for draft or working copies only.

B. Cable Testing

1. Cable test results are to be provided in hard copy format as well as a PDF organized by building and telecommunication room.

C. Warranty

1. Provide certificate of manufacturer's extended warranty for the structured cabling system.

END OF SECTION 27 1500

SECTION 28 2300 – VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Specification Sections:
 - 1. 27 0000 – General Technology Requirements
 - 2. 27 1000 – General Cabling Requirements
 - 3. 27 1116 – Racks and Cabinets
 - 4. 27 1300 – Backbone (and Outdoor) Cabling
 - 5. 27 1500 – Data and Voice Horizontal Cabling

1.2 SUMMARY

- A. This Section includes the following major components related to the security system:
 - 1. Servers and Storage
 - 2. Video Management System (VMS)
 - 3. Surveillance Cameras
- B. Related work to be performed by this contractor:
 - 1. Fiber optic cabling
 - 2. Low voltage data cabling
- C. Related work provided by others:
 - 1. Electrical System
 - 2. Network Equipment
- D. Network Infrastructure:
 - 1. Wayne RESA's Burger Baylor school is utilized by Garden City School district for student programming. The building has an administrative wing occupied by RESA staff, but there is practically no RESA network infrastructure in place.
 - 2. As part of this project, the contractor is to install new single-mode fiber between the network closets to be used for network switches to create a local network for the camera traffic back to the building MDF.
 - 3. The camera server(s) are to be located in the MDF of Burger Baylor.
 - 4. New network switches are being deployed throughout the building and this paired with the new fiber will provide a 10GB connection to each closet and 1GB connection to the edge. All of the network switches provided for this contractor's use will be PoE+.
 - 5. This contractor is responsible for installing the new fiber and copper cabling required for the video surveillance cameras.

E. New Video Surveillance System Summary

1. The Contractor is responsible to provide an enterprise level video surveillance system configured for a potential multi-site deployment, including all licensing required for the features and functions described in this specification.
2. The Contractor is responsible for providing, installing, patching, wire managing, labeling, configuration, and interconnecting video surveillance equipment as required to provide a complete turn-key video surveillance system.
3. Coordinate with the Owner's designee to create an IP scheme, and coordinate IP addressing and camera naming on the system.
4. Configure all analytics according to the Owner's needs.
5. Provide all required end user and administrative training.

1.3 DEFINITIONS

- A. B/W: Black & White
- B. DAS: Direct-Attached Storage
- C. DVR: Digital Video Recorder
- D. FBO: Furnished By Owner
- E. FCC: Federal Communication Commission
- F. FF: Fixed Focus
- G. IR: Infrared
- H. ISM: Information Security Management
- I. LAN: Local Area Network
- J. MPEG: Moving Picture Experts Group
- K. NAS: Network Attached Storage
- L. NAT: Network Address Translation
- M. NTP: Network Time Protocol
- N. NTSC: National Television System Committee
- O. NVR: Network Video Recorder
- P. PD: Powered Device
- Q. PoE: Power over Ethernet, IEEE 802.3af standard
- R. PoE+: Power over Ethernet, IEEE 802.3at standard
- S. PSE: Power Source Equipment
- T. PTZ: Pan/Tilt/Zoom
- U. PDU: Power Distribution Unit
- V. QoS: Quality of Service
- W. RF: Radio Frequency
- X. SAN: Storage Area Network
- Y. TR: Telecommunication Room
- Z. UPS: Uninterruptible Power Supply
- AA. UTP: Unshielded Twisted Pair
- BB. VLAN: Virtual Local Area Network
- CC. VMS: Video Management System
- DD. WAN: Wide Area Network

1.4 GENERAL REQUIREMENTS

- A. The VMS shall offer centralized management of all devices, servers and users, and offer a rule-based system driven by schedules and events.

1. Servers shall be located in the Burge Baylor MDF. The servers must be configured according to the Owner's needs to be accessible and manageable offsite at the Wayne RESA main administration building.
- B. The video surveillance contractor is responsible for all cabling including the data cabling to each camera.
- C. The Contractor will be required to procure and install building signage/decals to notify users entering the building that the premise is under video surveillance. The required text of the signage/decals is as follows: "Warning: video surveillance system in use."
1. The signage/decals shall be installed on doors of the main building entrance to each building and primary entrances used for after-school activities such as athletic events and performing arts.
 2. Provide an additional 25 signs for the owner's use.
- D. The intent of this project is to install a new surveillance system for the buildings and locations identified in the drawings and specifications. The general requirements include:
1. The new "turnkey" video surveillance system will be IP-based.
 2. High quality images enabling the owner to clearly identify individuals.
 3. Minimum of 35 days of video storage on all cameras.
 4. Designated staff members will be able to view the IP surveillance system from their networked workstations. In addition, the awarded contractor will be required to setup and configure the VMS so that staff members will be able to view both individual cameras and the created "shared" views via an iOS and Android device within the District and from outside the District. The awarded contractor will be required to setup the server(s) so that "shared" views will be accessible outside the District. Furthermore, the awarded contractor will work in conjunction with the Owner's technical staff in setting up any firewall rules to accommodate the inbound and outbound network traffic.
 5. Cameras should capture color images in normal light and black & white images in low light.
 6. As applicable, the contractor will include any required separate power supplies and cabling for the heater/blower utilized by exterior cameras. Place these power supplies in telecommunication closets unless noted otherwise or agreed upon in writing during the pre-install walkthrough.
- E. Bid Submission: In addition to the requirements established by the bid proposal form, include the following with the bid submission:
1. Provide any equipment rack, space, and electrical requirements for the servers, UPS, etc.
 2. Describe how the proposed solution functions utilizing Microsoft Windows-based computers, Apple-based computers, iOS devices, Android devices, and through a web-browser. Note whether the integrations for the VMS are limited for various devices or web browsers. Please explain in detail. In addition, please include the hardware specifications required to utilize the VMS client.
 3. Provide the number of Gigabit Ethernet connections that are required for the recording servers and storage solution. The number of connections should be denoted on the schematic design.
 4. Provide the calculations used for their proposed storage requirements.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.
 - 1. Servers and storage components
 - 2. Video Management Software
 - 3. Surveillance Cameras (including applicable camera mounts and housings)
- B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
 - 1. Schematic Diagram: Provide an updated schematic detailing the overall equipment and interconnections of the surveillance system. Show equipment locations, manufacturer/model, and cable types.
 - 2. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
- C. Equipment List: Include every piece of equipment by model number, manufacturer, location, and date of original installation.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NECA 1.
- C. Comply with NFPA 70.
- D. Electronic data exchange between video surveillance system with an access control system shall comply with SIA TVAC.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Products must withstand the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
 - 1. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick.
 - 2. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.

1.8 COORDINATION

- A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.
- B. Coordinate layout and installation of surveillance or display equipment and suspension system components with other construction that penetrates ceilings or walls or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.
- D. Coordinate requirements and installation with the Owner's technical staff regarding firewall, proxy server, network address translation (NAT), network time protocol (NTP), Quality of Service (QoS), IP addressing, etc.
- E. The awarded contractor will work with the Owner to evaluate and devise a proper VLAN quality of service (QoS) strategy. These strategies will be deployed during this Project. Deployment of the applicable VLANs and QoS settings will be configured/deployed by an Owner's representative.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following are acceptable VMS manufacturers for general equipment within this section, unless noted otherwise for any product.
 - 1. Avigilon
 - 2. Approved Equivalent
- B. The following are acceptable camera manufacturers for general equipment within this section, unless noted otherwise for any product.
 - 1. Avigilon
 - 2. Approved Equivalent
- C. The following are acceptable server/storage manufacturers for general equipment within this section, unless noted otherwise for any product.
 - 1. Avigilon
 - 2. VMS Manufacturer
- D. Any substitutions must be demonstrated to the Owner and Technology Designer for approval in writing before installation.

2.2 SYSTEM REQUIREMENTS

- A. Provide the most current release of software and patches at the time of implementation. Include costs of all software updates throughout the warranty period. At the end of the warranty period the Owner will be on the latest release of the software.

- B. Protect signal cables and connected components against transient-voltage surges by suppressors and absorbers designed specifically for the purpose.
- C. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads.
 - 1. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements as recommended by manufacturer for type of line being protected.
 - 2. Surveillance contractor will provide and install all Exterior cameras with surge protection at the camera end.

2.3 VIDEO MANAGEMENT SYSTEM (VMS)

- A. General Requirements:
 - 1. Provide users the ability to view video from multiple devices without VPN.
 - a. Smartphone App
 - b. Web-based
 - c. Thick client
 - d. Any required licensing to be included.
 - 2. System must allow video searching by time, event, motion, and analytics applicable (when the design calls for cameras with analytics enabled).
 - 3. Software must have an unlimited number of licenses for administration and use of the system.
 - 4. System should have central administration of all servers from a single user login. Systems with multiple servers will be managed and viewed as one by the end user.
- B. Video Management System Architecture
 - 1. The VMS must have a distributed fault-tolerant, failover database architecture. The distributed server architecture allows for each subsystem to operate in an independent mode, without affecting video recording or live viewing.
 - 2. The Contractor to provide servers as required for central administration, recording, storage, and remote access.
 - 3. The VMS shall include support for alarm management. The VMS shall continuously monitor the operational status and event-triggered alarms from system servers, cameras, and other external devices.
 - 4. The solution shall include video motion detection natively. This operation can be executed by the edge device or the IP camera. Enabling motion detection shall be performed either:
 - a. On a continuous basis
 - b. Scheduled for particular times, dates, days, months, etc.
 - c. Defined areas of interest through an easy-to-use user interface using simple editing tools
 - d. At a defined level of sensitivity
 - 5. The VMS must support use of multiple network interface cards (NICs) per server and provide a connection to the edge devices on a network separate from the viewing client.
 - 6. The VMS shall include “dual streaming,” if the edge devices support this functionality.
 - a. One stream shall be utilized for “live” streaming and the “other” shall be utilized for recording/playback purposes.
 - b. The VMS shall be able to define different resolutions, compression formats, resolutions, and frame rates for each individual stream.
 - 7. The VMS shall support full two-way audio between viewing clients/web viewing clients and remote cameras/devices if supported by the cameras.

8. The VMS shall leverage Microsoft® Active Directory for user accounts, groups and security permissions.
9. The VMS shall provide a utility where certain regions within each camera view, shall be disabled to avoid detection of irrelevant motion.
10. The VMS shall support either or both unicast or multicast over the enabled network.

C. Video Management System Functions

1. Export video to digital media output device such as an SD card or USB drive.
 - a. The VMS shall allow users to select video to be exported and from a precise start time and end time.
 - b. The VMS shall create AVI files or export/save an image in JPEG format at variable compression settings.
 - c. The VMS shall export in native database format, including a standalone “recording viewer” application for viewing by authorities.
2. The VMS shall support attachment of video to documents such as incident reports and ease retrieval of reports and associated video.
3. The VMS shall authenticate video to enable users to verify that the video has not been modified since it was recorded.
4. The VMS shall allow the administrator to configure access rights for different user groups. It will be possible to restrict the operations that are available to a user in “Review.” It shall restrict or enable the following functionality:
 - a. Live Video
 - b. PTZ Control
 - c. Camera Menu
 - d. Recorded Video
 - e. Export Video
 - f. Investigation Management
 - g. Alarm Notification
5. The VMS shall allow the user to access a third-party camera menu:
 - a. Allow a user to access the internal menu of a camera directly
 - b. Menu will be available for any of the supported protocols
6. The VMS shall allow scheduled or event-driven camera and output actions with numerous options, including support for time based profiles.
7. The VMS shall automatically distribute live and recorded video to video walls and computers across dispersed user locations in a bandwidth-efficient manner.

D. Video Recording

1. The VMS shall perform the following tasks simultaneously:
 - a. Digitizing and compressing video and calculating digital signatures for video authentication
 - b. Writing video to files on local hard disks and maintaining an accurate index of the stored video files
 - c. Deleting older video files as needed, to free up space to record newer video files.
 - d. Selectively transferring recorded video to long-term storage media
2. The VMS shall enable system administrators to schedule recordings to:
 - a. Establish a recording schedule based on hours of the day and days of the week, with separate schedules for weekdays, weekends, user-established holidays, etc.
 - b. Specify the times during which each camera will be recorded, along with the recorder settings to be used during each period, including the frame rate, resolution, and quality settings.

E. Video Storage Management

1. The VMS shall store video on high performance iSCSI, SCSI, SAS, or SSD disk drives. In addition, SATA drives can be utilized for long-term storage.
2. The VMS shall manage online storage. Storage shall be intelligently managed so that the video that is most likely to be requested by users will be retained online.

3. The VMS shall include event recording and selective online storage.
- F. Bookmarking
1. The VMS shall support bookmarking, allowing users to mark incidents on live and/or on the playback of video streams.
 2. Bookmarks shall be set from the client and stored on the server.
- G. Alarms Support
1. The VMS shall support camera alarms if resident on the surveillance cameras such as:
 - a. Camera block fully or partially (active tampering)
 - b. Out of focus. If the surveillance camera image becomes blurred because of the camera being defocused
 - c. Loss of network connectivity
 2. The various alarms shall appear within the client's alarm list and shall, if relevant, be integrated with the map functionality.
- H. Maps
1. The Contractor shall implement VMS mapping where digital maps are used to represent the physical location of cameras and other devices throughout the surveillance system.
 2. The map functionality shall support common image file formats such as .bmp, .gif, .jpg, .jpeg, .png, .tif, etc.
 3. Maps shall have hyperlinks to create a hierarchy of interlinked maps.

2.4 SERVER / STORAGE

A. General Requirements:

1. The solution must meet the VMS manufacturers recommended performance configuration requirements for throughput, storage, reliability, processing, etc.
2. Each server will utilize separate 1 GB NICs for recording and user traffic.
3. Solution shall have storage calculated to record thirty-five (35) days of video from each camera. Recording calculations should be based on:
 - a. Compression: H.264 or H.265 using 30% compression
 - b. Frame Rate: 12 fps average
 - c. Recording: Servers are to be sized configured for continuous recording at a reduced frame rate of 1-2 FPS and reduced resolution using enhanced compression methods.
4. Size servers for 15% camera growth, both in performance and storage requirements. Base growth on an equal percentage of each camera type as described.
 - a. Future growth percentage is based on the highest MP camera requested.
5. Hard Drives:
 - a. Provide 15K RPM SAS Hot-plug Hard Drives, configured as a RAID 1 volume for the server operating system and VMS software.
 - b. Configure the remaining onboard hard drives as a RAID volume or volumes to provide storage reliability. The video management system shall support the proposed RAID level(s).
6. Configure servers to maintain recording, viewing, and searching functionality in the event of a single hard drive failure.
7. The VMS must be configured to use N+1 failover when using more than one server. In the event of a failure on the network video recorder, designated cameras will failover to the second server. The owner will specify what cameras are critical. Surveillance contractor to work with the owner and must fit into the allowed growth space allotted for future cameras.
8. Each server must have hot-swappable redundant power supplies.

9. The proposed storage system must be all inclusive of all connectivity components, i.e. network interface cards (NICs), controller cards, direct-attached cables, patch cables, etc.
10. All server/storage equipment shall be located in telecommunication rooms, unless noted otherwise.
11. Service and Support: Five (5) Years of support with NBD on-site Service
12. Chassis Type: Rack Mountable

2.5 UNINTERRUPTABLE POWER SUPPLY (UPS)

- A. Provide rack-mountable UPS (minimum 1 hour) protection for all servers in the system.
 1. Provide appropriate power for server configuration proposed.
 2. UPS shall use 120V NEMA 5-20 outlet configuration.
 3. Manufacturers:
 - a. APC
 - b. Approved Equal

2.6 SURVEILLANCE CAMERAS

- A. General Camera Requirements: Dome camera, assembled and tested as a manufacturer unit, containing dome assembly, camera, zoom lens, receiver/driver.
 1. Comply with UL 639.
 2. Compression: H.264, H.265 or Motion JPEG
 3. Cameras shall produce usable images in low-light conditions to 1 lux (color) and .2 lux (B&W)
 4. Cameras should capture color images in normal light and black & white images in low light.
 5. Selectable modes for backlight compensation or normal lighting.
 6. Camera bases to be cast aluminum with polycarbonate housings.
 7. Provide and install adequate power supplies and cabling for camera requiring power beyond POE+
 8. Camera bases to be cast aluminum, with security screws and polycarbonate dome housings.
 9. Unless noted otherwise, all cameras should be equipped with a varifocal lens.
 10. Camera Management Application/Tool
 - a. The camera manufacturer must offer a management application/tool to manage their cameras.
 - b. The camera management application/tool will allow for the following features:
 - 1) Discovering of new devices (cameras)
 - 2) Providing unit status
 - 3) Device configuration
 - 4) Device management
 - 5) Firmware upgrades
 - 6) Cameras will be allowed to be tagged or grouped by physical location/building
- B. General Lens Requirements: Optical-quality coated optics, designed specifically for video surveillance applications, and matched to specified camera. Provide color-corrected lenses with color cameras.
 1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.

2. Fixed Lenses: With calibrated focus ring.
 3. Zoom Lenses: Motorized, remote-controlled units, rated as "quiet operating." Features include the following:
 - a. Electrical Leads: Filtered to minimize video signal interference.
 - b. Motor Speed: Variable.
 - c. Lens shall be available with preset positioning capability to recall the position of specific scenes.
- C. Exterior Camera Requirements: Provide the appropriate mount for each installation type. Multi-lens camera.
1. Multi-lens cameras shown on the building exterior must include a corner mount, attachment accessories, and flexible outdoor conduit as necessary to complete the installation.
 2. Multi-lens cameras shown mid-way on an exterior wall must include the required mount to provide horizontal installation to optimize the use of the cameras lens capabilities.
 3. Single-lens cameras on the building exterior must include accessory sunshield (if available) or utilize a 90 degree mount to provide appropriate shielding from direct sunlight, weather, and UV exposure.
- D. General Requirements
1. Day/Night IR capability
 2. Minimum resolution is identified on the drawings.
 3. Wide Dynamic Range (WDR)
 4. Vandal-resistant housing
 5. H.264 and H.265 compression
 6. Onvif compliant
 7. Remote focus and zoom for all lenses.
 8. Bandwidth reduction enabled.
 9. Multi-sensor models shall require a single IP address and license unless otherwise noted.
- E. Types:
1. Camera Type "A" – single sensor
 2. Camera Type "B" – two sensor providing a 180 degree viewing area. Camera Type "C" – three sensor providing either 180 degree or 270 degree viewing area. Camera Type "D" – four sensor providing 360 degree viewing area. Camera Type "E" – specialty camera – see drawings for specific model information.
 - a. Continue defining specialty requirements
 6. Camera Type "F" – single sensor 360 degree viewing area
 7. Camera Type "LP" – License Plate Camera
 8. See drawings for specific model numbers and further details.

2.7 CAMERA-SUPPORTING EQUIPMENT

- A. General Requirements:
1. Alignment Provisions: Camera mounting allows for easy camera aiming and permits removal and reinstallation of camera-lens unit without disturbing camera alignment.
 2. Rated for load in excess of the total weight supported times a minimum safety factor of two.
 3. Outdoor Units: Rated for a wind load of 100 mph (160 km/h).
 4. Camera Viewing Window: Polycarbonate lens aligned with camera lens.

- B. Mounting Brackets for Fixed Cameras: Type matched to the items supported and mounting conditions. Include manual pan-and-tilt adjustment.
- C. Protective Housings for Fixed and Movable Exterior Cameras:
 - 1. Steel or vandal resistant polycarbonate dome, dustproof exterior enclosures with internal camera mounting and connection provisions that are matched to camera/lens combination and mounting and installation arrangement of camera to be housed.
 - 2. Include built-in thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
 - 3. Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the installed environment.

2.8 POE EXTENDERS

- A. General Requirements:
 - 1. Where cables will exceed 100m, contractor may use a PoE extender.
 - 2. Extender must be compatible with 802.3af and 802.3at.
- B. Manufacturers
 - 1. Axis T8129 for interior use
 - 2. Axis T8129-E for exterior use
 - 3. Approved equivalent

2.9 SPARE CAMERAS

- A. Surveillance contractor to supply two of each model camera used on this project as spares cameras to be delivered as shelf stock to the Owner. Include two category 6 patch cables for each camera (one 1' and one 3') matching the designated color specified in the cabling requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.
- B. The Contractor shall meet and work with the Owner's staff and Technology Designer to coordinate the system operation, camera locations, camera focal areas, and integration.
- C. Prior to installation, perform a site survey to determine equipment placement. Any issues with the systems, design, or installation must be brought to the attention of the Technology Designer before the bid is submitted.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install and configure the system according to the manufacturer's sequence and guidelines as well as generally accepted standard practices.
- B. Contractor must configure and deploy the client software, smartphone app, etc. Provide six (6) installments of each.
 - 1. Contractors are responsible for the configuration of any contractor provided computers and devices.
 - 2. Owners will load the software on any additional district owned devices (their computers, smartphones, etc.)
- C. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.
- D. The Contractor shall protect equipment and components during installation until final acceptance of the project, and clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.
- E. Surveillance Cameras
 - 1. The contractor shall carefully follow instructions in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operate system.
 - 2. All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation to provide the maximum field of view and security.
 - 3. All firmware found in the products shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by the provider of the video management system. If in the event that a newer firmware revision is released by the manufacturer, during the project but prior to "final" acceptance, the awarded contractor will be required to deploy the latest firmware to the components/products (i.e. surveillance cameras).
 - 4. All equipment requiring users to log on using a password shall be configured with user/site-specific password(s). No system/product default passwords shall be allowed.
 - 5. The awarded contractor will be responsible for configuring each surveillance camera with a name chosen by the Owner along with its applicable configuration settings. The naming convention of the surveillance cameras will be discussed in the design meetings.
 - 6. Review all exterior cameras with the owner and configure motion masking where the following conditions occur in the view:
 - a. Tree branches and leaves
 - b. Unwanted street traffic
 - c. Activity on neighboring private properties
 - 7. Review all cameras with the owner and create privacy masking on computer screens and other areas deemed necessary.
 - 8. Contractor shall configure pre/post event triggers for 10 seconds on all cameras.
- F. Interior Surveillance Cameras
 - 1. When utilizing lay-in ceilings, the contractor is to install a security cable between each camera and the building structure or ceiling tile bridge so the camera is supported independent of the ceiling tile.
 - 2. The structured data cabling system may not be visible after the surveillance camera has been securely mounted.
 - 3. Some locations will require the surveillance camera to be mounted on a wall. In this case, the awarded contractor shall utilize Wiremold® V700® or equivalent metal raceway.

4. The Wiremold® V700® metal raceway shall consist of the raceway, appropriate fittings (i.e. mounting clips and straps, bushings, etc.) and device boxes for a complete installation.
5. Due to the width of the interior hallways and stairwells, the field of view/camera image may have to be rotated so that the optimal field of view is deployed. The awarded contractor should account for the necessary time to account for this task.

G. Exterior Surveillance Cameras

1. External mounts shall be sealed to prevent any water or environmental condition from entering the surveillance camera.
2. The structured data cabling system may not be visible at any time after the surveillance camera has been securely mounted.
3. During the initial walkthrough, the awarded contractor will review the proposed mounting locations and determine the optimal height of each surveillance camera. The height of each surveillance camera shall provide that camera with the best quality of picture.
4. All exterior cameras are to be installed with surge protectors at the camera end.

H. Video Management System

1. Servers must be configured and fully installed before any internal or external cameras are mounted. Cameras are to be integrated and brought online as they are installed.
2. Clients must be fully loaded on all designated computers prior to installation of any internal or external cameras.
3. The awarded contractor shall carefully follow instructions in documentation provided by the manufacturer to ensure all steps have been taken to provide a reliable, easy-to-operate system.
4. All equipment shall be tested and configured in accordance with instructions provided by the manufacturer.
5. The awarded contractor shall meet with the Owner and Technology Designer, prior to installation, to discuss all aspects of the VMS and its storage component(s) (including recording, storage, archiving, retention, etc.)
6. The awarded contractor will be required to configure each of the surveillance cameras' properties (i.e. resolution, frame rate, sensitivity to motion, etc.) within the VMS.
7. Each server or storage component must be labeled with the applicable component name and IP address.
8. All firmware, including device packs, found in the VMS equipment and software shall be the latest and most-up-to-date provided by the manufacturer, or of a version as specified by the provider of the VMS.
9. All equipment requiring users to log on using a password shall be configured with user accounts from Microsoft® Active Directory. No system/product default passwords shall be allowed. In addition, the service accounts and system administrator shall utilize different passwords. As a direct result, if the system administrator password is modified, the various services will not be affected.
10. All permission levels, as directed by the Owner, will be configured by the awarded contractor. In addition, the awarded contractor will be required to link the Microsoft® Active Directory user groups within the VMS.
11. Each building will have its' own folder within the directory of buildings. The awarded contractor will be required to create all of the various folders. The names of the folders will be discussed within the initial design meetings. In addition, the awarded contractor will be required to create all default views within each building. All network cameras must be included in at least one default view. The default views must not contain a high number of cameras where the view slows down the various workstations or laptops. As a rule, eight (8) network cameras is the greatest number of cameras per view.
12. The awarded contractor shall include six (6) installations of the VMS client software within each building.

13. The awarded contractor will be required to implement the interactive mapping function of the VMS to enable users with the ability to preview a camera by “mousing over” a camera icon. In addition, all the exterior doors are labeled with number for life safety purposes. The contractor will include the door numbers on the mapping software. The number on each door will be provided by the Owner. Real-time updates of system components shall be displayed directly on the map. All building maps/images will be provided by an Owner’s representative, except district level maps that will be created using satellite imagery by the contractor.
 - a. Create a hierarchy of interlinked maps, starting from a broad view of the district, hyperlink to each site view for exterior cameras.
 - 1) Contractor to create an overview of the district utilizing satellite imagery with target hyperlinks at each precise building location.
 - b. Create multi-layer hyperlinks at each site.
 - 1) Hyperlink from each site’s exterior view to an interior view of each level of the building.
 - 2) Each level of the building will have its own hyperlinked map. Create an on-screen button to hyperlink between levels.
 14. All interior and exterior cameras are labeled with a number for life safety and troubleshooting purposes. The surveillance contractor will work with the owner on a labeling scheme. Surveillance Contractor will label all cameras prior to installation. These numbers will be required to be transferred to the interactive mapping function. All labels must be rated for external conditions. Any labels that fall off during the warranty period are to be replaced at no cost to the Owner. The awarded contractor will be required to create a rule, within the VMS solution, that will notify the District administrators that a surveillance camera has lost its network connection. This particular rule must be applied to all surveillance cameras.
 15. The “camera tampering” alert shall also be enabled within each network camera. In addition, the VMS must recognize the condition and alert the Owner if this condition is met. The contractor is to configure the alerts based on the Owner’s preference.
 16. The VMS shall direct all cameras to obtain their time from a District specified NTP (Network Time Protocol) server. If the Owner doesn’t have an existing NTP server, the contractor shall configure the NTP on one of the security servers or through a third party.
 17. Load balance each building’s cameras across multiple servers. If a server fails, the entire building will not suffer due to a camera outage.
 18. Load balance all servers to prevent video loss due to over buffering (exceeding the processing limits of any single server).
- I. Camera Management Application/Tool
1. Contractor to discover all network cameras and import them into the management application.
 2. Each building will have its own folder. Within each building folder, each installed model will have its own folder.
 3. Populate each camera within the appropriate folder to allow for simpler future camera management.

3.3 FIELD QUALITY CONTROL

- A. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video surveillance equipment for acceptance and operational testing as follows:
1. Verify operation of auto-iris lenses.
 2. Work with Owner and to set all varifocal lenses.

3. Set and name all preset positions; consult Owner's personnel.
4. Set sensitivity of motion detection.
5. Connect and verify responses to alarms.
6. Verify operation of control-station equipment.

3.4 DEMONSTRATION

- A. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
- B. Develop site specific training modules and materials for the following:
 1. Use of the viewing software
 2. Viewing via web access
 3. Administering passwords
 4. Administering user privileges
 5. Archiving video to network or optical writer
 6. Backup and restore procedures
 7. Modifying camera names
 8. Modifying and adding camera views
 9. Modifying any building maps
 10. Modifying programmed PTZ settings
 11. Modifying network settings (IP address, etc.)
 12. How to modify the license file to due to MAC addresses changing
- C. The Contractor's trainer will supply system documentation and training aids customized to this installation. Documentation shall be tailored for system administrators and typical users.
 1. Include (2) two-hour user training sessions for knowledge transfer for the administrators at each building.
 2. Include three (3) two-hour administration training sessions for knowledge transfer regarding the administration of the video management system and video servers in addition to shoulder-to-shoulder training provided throughout the implementation.

3.5 SYSTEM ADJUSTMENTS

- A. Before customer sign off takes a place, a walkthrough with the awarded contractor, Owner and Architect/Technology Consultant will take place to approve field of views and focus of all surveillance cameras. The awarded contractor will have at least a total of three (3) personnel onsite to make changes during walkthrough for approval. One (1) staff member viewing the cameras and two (2) staff members making any necessary adjustments.
- B. Six (6) months after initial setup and substantial completion, Contractor is to include one trip to each building to review VMS usage with building administrators and to adjust any individual camera's viewing angle, etc.

3.6 DOCUMENTATION

- A. Drawings for each building:

1. Letter or tabloid sized composite floorplan drawing of each building indicating server and camera locations, type, and descriptive title. In addition to copies included in the as-built submission, provide one copy to each building office.

B. As-Built Documentation:

1. All of the items below must be included in a three-ring binder that will be presented to the Owner during the “close out” meeting. The following items are to be a minimum:
 - a. Awarded Contractor’s Contact Information
 - b. Contractor’s Guarantee/Warranty
 - c. Microsoft Licensing Information
 - d. VMS Licensing Information
 - e. Operations & Maintenance Manuals/CDs
 - f. Spreadsheet with relevant network data
 - 1) MAC address and serial number
 - 2) IP address
 - 3) Installed location (building) and name
 - 4) Data cable number, closet location
 - 5) Network port information
 - g. Additional Instructions, if applicable
 - h. Additional Documentation, if applicable
2. A set of drawings showing locations of all equipment locations and approximate cable paths.
3. Inventory spreadsheet that includes the following information on the pieces of equipment that cost \$500 or more...
 - a. Manufacturer
 - b. Model Number
 - c. Description
 - d. Serial Number
 - e. Location (Building Name/Building Number)
 - f. Asset Tag Number
 - g. IP address (if applicable)
4. Documentation (including contact information) on the equipment warranties, technical support, and applicable software assurance(s)
5. Manufacturer specification/cut sheets for the systems and equipment installed.
6. Installation and programming manuals for all hardware and software components.
7. Digital maps
 - a. As stated previously within this section, digital maps will be used to represent the physical location of cameras and other devices throughout the IP video surveillance system.
 - b. The digital maps shall have the ability to contain hyperlinks so as to create a hierarchy of interlinked maps
 - c. All interior and exterior cameras are labeled with number for life safety purposes. The surveillance contractor will work with the owner on a labeling scheme. Surveillance Contractor will label all cameras prior to installation. These numbers will be required to be transferred to the interactive mapping function. All labels must be rated for external conditions. Any labels that fall off during the warranty period are to be replaced at no cost to the owner.

3.6 WARRANTY

- A. The following warranties shall be provided by the awarded contractor at no additional cost to the Owner.
 - a. Surveillance Cameras - The surveillance cameras shall be warranted with a five (5) year

complete warranty. The warranty period will start on the date of substantial completion. The awarded contractor will be required to replace any defective product at no additional cost, including labor. The warranty shall cover defects in workmanship and material.

- b. Servers/Storage Device(s) - Due to the nature of the video management system, the servers and storage device(s) shall contain an 8x5xNBD enterprise-type warranty. The warranty shall include any firmware/product/software updates as part of the warranty.
- c. Video Management System -The video management system shall be warranted for a period of five (5) years.
 - i. The warranty shall include software assurance including patches and updates/upgrades for both major and minor releases throughout the warranty period.
 - ii. Contractor is to install critical firmware updates during the warranty period.
 - iii. Contractor is to provide an annual "health check" on the system with corresponding report noting items corrected and suggested maintenance or configuration changes.
 - iv. Contractor is to provide an overview of non-critical updates and version upgrades as they become available.
 - v. Owner will decide which version upgrades they wish to implement.
 - vi. Contractor to install maximum of three (3) major version upgrades throughout warranty period. Contractor is to make configuration changes on the equipment and provide administrative training session on the new features and system administration, but Contractor is not required to perform any work on individual devices or computers.

B. Final payment shall not relieve the awarded contractor of these obligations.

END OF SECTION 28 2300