Company Name:

_____

TARRANT COUNTY
PURCHASING DEPARTMENT

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VOLUME 2 – TECHNICAL SPECIFICATIONS

RFB NO. 2023-008

PROJECT MANUAL
FOR
SECURITY CAMERA UPGRADES PHASE III

BIDS DUE OCTOBER 20, 2022
2:00 P.M. CST

Technical Specifications Prepared by

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RFB NO. 2023-008

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August 2, 2022

Project: Tarrant County – Security Upgrades at Various County Locations, Phase III
Project Number: 20012-00

Project Scope Summary

The Project's objectives are to upgrade and expand the security video surveillance capabilities at multiple Tarrant County facilities. Facilities included in the project scope include:

1. Subcourthouse in Arlington
2. Subcourthouse at Mansfield
3. Miller Avenue Administration Building & Charles F. Griffin Building
4. Northeast Courthouse
5. Northwest Subcourthouse, Annex & Sheriff Office
6. Plaza Building
7. Dionne Phillips Bagsby Southwest Subcourthouse
8. Tom Vandergriff Civil Courts Building
9. Medical Examiner's Office and Forensic Laboratories
10. Elections Center, Central Garage Facility and Premier Annex / Fire Marshal
11. Plaza Garage
12. Calhoun Garage
13. Taylor Garage

All Bidders shall examine the Contract Documents and visit the sites to ensure a complete understanding of the of the Work required to meet the Project requirements.

The successful Bidder shall furnish all labor, supervision, materials, equipment, expertise and services as required to complete the Project requirements. These include, but are not limited to, the following:

1. Provide and install security cameras as specified in the contract drawings and specifications.
2. Provide and install any camera mounts or mounting accessories required to mount the specified cameras in the specified locations.
3. Provide and install ethernet extenders for any video surveillance camera cable runs that exceed 100 meters.
4. Provide and install all conduit, back boxes and junction boxes as specified in contract drawings and specifications.
5. Install all pull boxes required within conduit runs as required per the specifications, NEC standards or any applicable national or local codes.
6. Provide and install new archival recording servers as per specifications.

7. Provide and install additional hard drive storage in existing archival recording servers as per specifications.
8. Provide spares inventory as per specifications.
9. Inspect and test components, assemblies, and equipment installations, including connections.
10. Provide operation and maintenance manuals and materials as per specifications.
11. Provide owner training as per specifications.

Project work hours:

1. In County Buildings, project work hours will be during normal business hours from 8:00 AM to 5:00 PM, Monday through Friday, excluding observed holidays.
2. In County Parking Garages, project work hours will be during non-business hours from 5:01 PM to 6:30 AM, Monday through Friday, and any time during weekends.

Owner Provided Work:

Tarrant County will contract directly with our Structured Cabling Materials vendor, Able Communications, Inc. A separate PO will be issued to them for this scope of work which will include:

1. Provide and install all cabling required for new and upgraded cameras, including all connectors, terminations, patch panels, patch cables, testing, etc. as specified in the contract drawings and specifications.

End of Scope Summary

SECTION 28 05 14 - CABLING FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work covered by these Specifications includes the design and installation of cabling for the surveillance systems described herein and on the Security drawings (SC-series) including all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools and equipment necessary or used to perform and-complete such construction.

B. Comply with all union jurisdiction requirements for the completion of the project. Questions regarding jurisdiction should be directed to the Tarrant County Facilities Manager (TCPM) Project Manager (PM).

C. Provide and install all cabling infrastructure for video surveillance camera system and other ancillary items as described within this section.

D. Coordinate scheduling of work.

E. Project work hours:
   1. In County Buildings, project work hours will be during normal business hours from 8:00 AM to 5:00 PM, Monday through Friday, excluding observed holidays.
   2. In County Parking Garages, project work hours will be during non-business hours from 5:01 PM to 6:30 AM, Monday through Friday, and any time during weekends.

F. This section does not include the following, which is contained in other Division 26 specification sections:
   1. Provision and installation of all AC power circuits, outlets, power panels and interconnection of power to the equipment racks.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Refer to installation guidelines in the design drawings and the following Sections:
   1. 28 05 29 – Conduits and Back Boxes for Security Systems
   2. SC-Series Drawings

1.3 REFERENCE STANDARDS

A. Design, manufacture, test, and install security cabling networks per manufacturer's requirements and in accordance with state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:

B. ANSI/TIA/EIA Standards
   1. ANSI/TIA/EIA-568-B -- Commercial Building Telecommunications Cabling.
   2. ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces.
   3. ANSI/TIA/EIA-606-A -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

4. ANSI/TIA/EIA-607 -- Commercial Building Grounding and Bonding Requirements for Telecommunications.
5. ANSI/TIA/EIA-758 – Customer-Owned Outside Plant Telecommunications Cabling Standard.
6. ANSI/TIA/EIA TSB-67 -- Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
7. ANSI/TIA/EIA TSB-75 -- Additional Horizontal Cabling Practices for Open Offices.

C. Other Standards
1. NFPA-780 -- For the Installation of Lightning Protection Systems
2. NFPA-70 -- National Electrical Code
3. NESC -- National Electrical Safety Code
4. National Fire Protection Association (N.F.P.A.).
5. American National Safety Institute (A.N.S.I.).
6. National Electrical Code (N.E.C.).
7. Underwriters Laboratories (U.L.)
8. Electronics Industries Association (E.I.A).
9. National Cable Television Association (N.C.T.A.)
10. International Telecommunications Union (I.T.U.-T.)

1.4 SUBMITTALS

A. Scope of Work: Contractor's narrative of services that will be provided to be submitted to Architect before start of any work. Include a time-line, information of on-site techs including their qualifications, and acceptance of this document and all that it entails and references.

B. Product Data: Manufacturer's descriptive literature for each type wire/cable to be used on the project indicating compliance with specified requirements. Any requests for substitutions of materials from manufacturers not represented in the design documents must be submitted and approved prior to submitting the Product data. Only specified or accepted manufacturers or suppliers products shall appear in the Product Data Submittal.

C. Miscellaneous Submittals:
1. Bill of materials, noting long lead time items.
2. Project schedule including all major work components that materially affect any other work on the project.

D. Shop Drawings:
1. Submit shop drawings, product data, and samples with such promptness and in such sequence as to cause no delay in the work or in the activities of separate contractors. Perform no portion of the work requiring submittal and review of shop drawings, product data, or samples until the respective submittal has been approved. Such work shall be in accordance with approved submittals.
2. Shop drawings shall show cable routing and the locations where terminal blocks, splices, telecommunication outlets, furniture feed points are to be installed.
3. Provide schematic and field wiring diagrams.
4. Computer generated shop drawings shall show in plan view the locations where cables are to be routed and plans for excess cable lengths to be left for others to terminate at both ends.
5. By submitting shop drawings, product data, and samples, the contractor represents that he or she has carefully reviewed and verified materials, quantities, field measurements, and field construction criteria related thereto. It also represents that the contractor has checked, coordinated, and verified that information contained

within shop drawings, product data, and samples conform to the requirements of the work and of the contract documents.

6. The Architect's approval of shop drawings, product data, and samples submitted by the contractor shall not relieve the contractor of responsibility for deviations from requirements of the contract documents. The contractor shall continue to be responsible for deviations from requirements of the original contract documents that are issued in writing as contract change directives (i.e. change orders, RFIs, CCDs, etc.)
7. The Architect's review and approval, or other appropriate action upon shop drawings, product data, and samples, is for the limited purpose of checking for conformance with information given and design concept expressed in the contract documents. The Architect's review of such submittals is not conducted for the purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the contractor as required by the contract documents. The review shall not constitute approval of safety precautions or of construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
8. Illegible submittals will not be checked by the Architect.
9. Note: Architect's Revit V2018 model is available to selected contractor, on disk, at no charge upon request.

E. Project record drawings:
   1. Contractor shall provide as-built documentation of complete cable installations by floor as per General Conditions.

1.5 INSTALLER QUALIFICATIONS:

A. Cable installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International.

1.6 GUARANTEE

A. Parts, labor, and travel to replace defective materials and workmanship for a period of one year after final acceptance. The Contractor shall provide a warranty of no less than five years directly to the owner. The direct warranty shall cover all parts of the structured cabling system installed under contract. It is The Contractor's responsibility to acquire all necessary training and certifications to be eligible for installation of cabling systems under these warranties. At job completion, a certificate of warranty shall be provided to the owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide products of manufacturers in compliance with requirements or provide alternative products to be approved by owner.

B. Provide products that meet or exceed TIA/EIA standards and all other standards outlined in section 1.2.

C. The Contractor is required to use riser cable in riser and/or non-plenum areas. In this space all conduits will be home runs to the specified IDF/MDF rooms.

D. The Contractor is required to use plenum-rated cable in all plenum areas. In this space all conduits will be home runs to the specified IDF/MDF rooms.

E. The Contractor shall be responsible for safekeeping own materials and subcontractor's property, such as equipment and materials, on the job site. The owner assumes no responsibility for protection of above-named property against fire, theft, and environmental conditions.

2.2 CABLE AND CONTROL WIRING AND TERMINATIONS

A. Electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper.

B. Refer to section 1.3 for Responsibility and Related Work.

C. Refer to drawing SC drawings for cable and accommodation details.

2.3 VIDEO SURVEILLANCE CAMERA DATA/VIDEO CABLE

A. Installer must be trained in the guidelines of the previously mentioned manufactures' products and must follow strict CAT6 installation guidelines. All exterior Category 6 cable must be gel filled and externally rated with proper lightning protection

B. Copper horizontal cabling for voice/data distribution shall be 100 Ohm Impedance, 23 AWG solid copper conductor, four unshielded twisted pair (4UTP), CMR (riser) or CMP (plenum) rated (depending upon the application) and comply or exceed TIA/EIA-568-B2 specifications for Category-6 cable.

C. The copper horizontal 4UTP cable shall be independently verified Category-6 by E.T.L. or U.L. All shop drawing submittals shall indicate the cable verification.

D. The copper horizontal cable shall provide the following guaranteed channel performance margin over minimum Category-6 specifications:
   1. NEXT: 6.0 dB
   2. PSNEXT: 7.5 dB
   3. Insertion Loss: 5.0%
   4. ELFEXT 6.0 dB
   5. PSELFEXT: 8.0 dB
   6. Return Loss: 4.0 dB
   7. Frequency Range: 1 to 250 MHz
   8. Typical margin represents worst pair minimum average.

E. The copper horizontal cables as follows:
   1. Belden 2400 CAT6 Horizontal data cable:
      a. Provide plenum or riser rated cable as required.
      b. Belden 2412 – Blue Jacket, CMR
      c. Belden 2413 – Blue Jacket, CMP
      d. Or Approved Equal.

F. Printed on the outer jacket shall be the manufacturer's identification and required E.T.L./U.L. markings, cable type, length markings, etc. Cable markings shall be in a clearly defined contrast to the jacket color.

2.4 PATCH PANELS

A. Panels to be modular KeyConnect, standard density, Patch Panels. Provide 1RU and 2RU patch panels as required.

B. Provide 2RU of horizontal cable management below every patch panel.

C. Provide rear cable management bracket and bar. Provide label holder with computer printed LabelFlex label.

D. Part Numbers:
   1. Belden AX103114 – 24 Port, 1RU
   2. Belden AX103115 – 48 Port, 2RU
   3. Or Approved Equal.

2.5 MODULAR JACK

A. Modular jacks shall meet or exceed Category-6 requirements for EIA/TIA-568-B2-1, ISO/IEC-11801 and EN50173-1 and shall offer guaranteed margins over the minimum Category-6/Class E requirements when utilized with the specified horizontal copper cable.

B. Modular jacks to be Blue in color.

C. Provide modular jacks for faceplates and patch panels as required.

D. Part Numbers:
   1. Belden RV6MJKUBL – Blue REVConnect Jacks for Data
   2. Or Approved Equal.

2.6 HORIZONTAL CABLE TERMINATIONS AT FIELD DEVICE

A. Horizontal category cables for cameras will utilize a single-port surface-mount box (a.k.a. “biscuit box”), installed inside an associated, nearby NEMA junction box, at the field device end.

B. Alternately, Horizontal category cables for cameras may utilize a Modular Plug Terminated Link (MPTL) at the field device end. Provide MPTL of sufficient length to reach end device + 24”.

2.7 PATCH CABLES

A. For all terminated modular jacks in equipment rooms, provide one (2) Belden C601106006 – 6’ Cat6 Patch Cord, or approved equal, for patching between the patch panel, 28 23 00 provided surge protection, and the County-provided network switch.

B. For all terminated modular jacks at the field device end, provide one (1) Belden C60110600x – Cat6 Patch Cord, (length as required to reach end device + 24”), or approved equal, for

patching between the single-post surface-mount (biscuit) box and end device. (Not required if MPTL termination is used at field device end.)

PART 3 - EXECUTION

3.1 GENERAL

A. The contractor shall install each cable as an uninterrupted conductor section between the designated termination points, unless otherwise directed by the cable installation specifications. There shall be no splices or mechanical couplers installed between the cable points of origin and termination except as shown on the drawings and/or specified herein.

B. Unless otherwise noted, quantities of blocks, racks, splice boxes and patch panels, etc. shown on the Drawings are illustrative only and are meant to indicate the general configuration of the work. The Contractor is responsible for providing the correct quantities of blocks, racks, patch panels, connectors, etc. necessary to terminate, cross connect and patch the volume of cable described in the system specification sections and on the Drawings. Where less than all of the capacity of a terminal block, patch panel, etc. is used to terminate cables, the Contractor shall provide the Owner with the number of connecting blocks, coupling panels, couplings, etc to completely fill out the terminal block, patch panel, etc.

C. Mount equipment and enclosures plumb and square. Permanently installed equipment to be firmly and safely held in place.

D. The process of acceptance testing the System may necessitate moving and adjusting or re-terminating certain component parts - e.g., fiber patch bays. Provide for and perform such adjustments without claim for additional payment.

E. Cover edges of cable pass-through holes in chassis, racks, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.

3.2 STAFFING

A. Keep a qualified named foreman on-site and in charge of the work at all times. Such foreman shall be approved by the TCFM Project Manager and will be replaced if the TCFM Project Manager finds such foreman to be unsatisfactory.

B. Use craftsmen and installers possessing the necessary licenses and permits and skilled in their trade for all work.

C. Use only skilled, experienced and reliable workers and shall immediately discontinue the services of anyone employed on this project upon written request of the Owner.

D. All crafts personnel shall be fully licensed and qualified to perform the work designated herein and be knowledgeable of the following:
   1. Color coding of standard International telephone cables.
   2. Bonding and grounding of shields.
   3. Testing conductors for electrical continuity and compliance with specifications set forth in this document.

4. Termination of cables on specified termination, patching, and "cross-connect" hardware.

E. Provide installers with the required tools to perform each activity. Installers shall be adequately trained in the use of all tools prior to beginning work. Tools must be maintained in good working order. The TCFM Project Manager reserves the right to review the tool lists and tool maintenance procedure of the Contractor. Tools deemed unserviceable by the TCFM Project Manager shall be replaced immediately.

3.3 PROTECTION OF WORK AND PROPERTY

A. The Contractor shall assume full responsibility for any damage or defacement they cause to any other trades finished work and shall remedy any such damage or defacement at their own expense as required as soon as possible.

B. The Contractor shall perform daily clean-up of their own debris in their work area. All debris shall be placed in the containers and/or locations as directed by the Tarrant County Facilities Manager PM.

C. Coordinate storage and work space requirements with the Tarrant County Facilities Manager PM.

3.4 PRE-INSTALLATION SITE SURVEY

A. Prior to the start of systems installation, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the Tarrant County Facilities Manager PM will be necessary to plan the crucial scheduled completions of the equipment rooms and telecommunications closets.

3.5 INSTALLATION

A. Exercise care in wiring; damaged fiber, cables or equipment shall not be accepted.

B. Leave neatly bundled and positioned service loops of 25' or longer length on both ends.

C. Protect all cable from physical damage. Maintain proper radius per manufacturer's requirements. Support riser cable uniformly per manufacturer's requirements to prevent undue stress on cable or bends.

D. If at any time during the job the cable tag becomes illegible or removed for whatever reason, the Contractor shall immediately replace it with a duplicate pre-printed cable tag at the Contractor's expense.

E. Twisted pair metallic cables: Cable pair twists of Category 6 Cable shall be maintained up to within 1" of the point of termination. Under no circumstances shall cable pairs be untwisted or otherwise altered prior to termination.

F. Twisted pair metallic cables: Do not bend Category 6 station cables to a radius of less than eight (8) times the cable diameter.

G. Cable tags shall be placed as per these specifications. Tags containing a unique cable ID designator shall be placed on both ends of all cables, 6 inches from the connector and/or terminal block. Also label all backbone cables passing through telecommunications rooms.

3.6 TESTING

A. Test all CAT 6 data cables with an approved Qualification Tester (or Certification Tester) to ensure that all runs meet or exceed the required network performance. At a minimum, the tester should test for the following:
   1. Length
   2. Graphical Wire Mapping
   3. Network Capacity
   4. Insertion Loss
   5. Cross Talk
   6. Noise
   7. Open/Shorts
   8. PoE Detection

B. Recommended Cat6 test equipment (obtain approval of TCFM Project Manager and Architect prior to using substitute test equipment):
   1. Fluke CableIQ
   2. Ideal SignalTek II
   3. ByteBrothers Low Voltage Pro

C. In the event that test results are not satisfactory, the contractor shall make adjustments, replacements, and changes as necessary and shall then repeat the test or tests which disclosed faulty or defective material, equipment, or installation method, and shall perform additional tests as the Architect deems necessary. Any faulty cable shall be replaced.

3.7 WARRANTY

A. Upon completion of the testing, issue to the TCFM Project Manager a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with this specification. All labor and materials during the warranty period shall be provided at no expense to the TCFM Project Manager.

- END OF SECTION 28 05 14 -

SECTION 28 05 29 - PATHWAYS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work covered by these Specifications includes the design and installation of conduit and backboxes for the surveillance systems described herein and on the Security drawings (SC-series) including all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools and equipment necessary or used to perform and-complete such construction.

B. Coordinate scheduling of work.

C. Project work hours:
   1. In County Buildings, project work hours will be during normal business hours from 8:00 AM to 5:00 PM, Monday through Friday, excluding observed holidays.
   2. In County Parking Garages, project work hours will be during non-business hours from 5:01 PM to 6:30 AM, Monday through Friday, and any time during weekends.

D. Comply with all union jurisdiction requirements for the completion of the project. Questions regarding jurisdiction should be directed to the Tarrant County Facilities Manager (TCPM) Project Manager (PM).

E. Furnish and install a complete structured cabling hanger, support and containment system including all cable trays, j-hooks, channels, conduits, backboxes, etc. as indicated on the drawings, specified or as otherwise required.

F. Note that the drawings are conceptual. All boxes, fittings, couplings, etc are not necessarily shown. Provide all conduits, fittings, pull boxes, cable support hangers, etc. necessary to meet the requirements of this specification and the Security System design as communicated in the SC-Series drawings as well as comply with the NEC.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Refer to the following design drawings:
   1. SC-series Drawings

PART 2 - PRODUCTS

2.1 PATHWAYS FOR SECURITY CABLING

A. Clear pathways for security cabling shall be provided from all Security Systems wall boxes, and ceiling boxes to the nearest IDF Closet.

B. Conduits shall be provided through walls and across open ceilings to ensure an unobstructed enclosed pathway to the IDF Closet.

C. J-Hooks or other cable hanger systems may be used to route security cabling through inaccessible ceilings, (gypsum board, plaster or other), or enclosed accessible ceilings, (acoustic tile or other), following all applicable federal, state or local codes.

D. In any location where conduits are required to penetrate fire-rated walls, the Contractor shall implement fire-stopping measures following all applicable federal, state or local codes so as to maintain the integrity and fire rating of the wall.

E. Conduits shall be installed per Raceway Specification Section 28 05 29 and project guidelines and instruction for installation of conduit of this specification except as noted. The sizes of conduits shall be as shown on the drawings, minimum size is .75" unless otherwise noted. All conduits shall be reamed and furnished with insulation and/or grounded bushings as required.

F. Flexible Steel Conduit
   1. Flexible steel conduits are not acceptable for Security Systems installations.

G. Rigid and Intermediate Metal Conduit (IMC)
   1. Conduit shall be steel, hot dipped zinc galvanized (min. .0008 in thick) inside and out, with circular cross section, uniform wall thickness, continuously welded seams and chamfered threaded ends. Conduit shall be furnished in ten foot standard lengths.

H. Electrical Metallic Tubing (EMT)
   1. EMT shall be zinc galvanized (min. .0008 in thick) inside and out, with circular cross section, uniform wall thickness and continuously welded seams. EMT shall be furnished in ten foot standard lengths.

I. Electrical Non-Metallic Tubing (ENT)
   1. ENT for use in buildings in accordance with Article 362 of the NEC. ENT shall be provided in standard coil lengths.

J. Liquid-Tight Flexible Steel Conduit
   1. Conduit shall be hot dipped zinc galvanized inside and out and made from one continuous length of high grade steel strip of uniform weight and thickness shaped into interlocking convolutions with smooth interior and exterior surfaces. Conduit shall be provided in standard coil lengths.
   2. Conduit shall have a continuous PVC jacket enclosing it.

K. PVC Conduit
   1. PVC conduit shall be rigid non-metallic Schedule 40 heavy wall.

2.2 BACK BOXES

A. Provide and install Security Systems backboxes as specified in Security Systems Drawing SC0-1.

2.3 PULL BOXES AND FITTINGS

A. Pull boxes shall be constructed of code gauge steel, etched, primed and shall have rust resistant ANSI 61 gray finish and be NEMA 1 construction with screw covers unless noted otherwise. For conduits 1-1/4" and larger terminating in a pull box, the minimum length of pull box shall be 8 times the diameter of the largest conduit terminating in the pull box. Splice boxes shall be sized as per EIA/TIA-569A Table 5.2-3.

B. Pull boxes shall be placed in straight sections of conduit runs and should not be used in lieu of a bend without approval of the Engineer. Pull boxes and/or splice boxes shall be installed in readily accessible locations. Where boxes are installed above suspended ceilings, they shall be located immediately above the suspended ceiling or the ceiling shall have a suitably marked and hinged panel or equivalent to facilitate direct access to the pull box.

C. Location and sizes of pull boxes and splice boxes shall meet the approval of the Owner and Engineer. Condulete type fittings (e.g. LB's, etc.) shall not be used in lieu of pull boxes or bends.

D. Exposed pull boxes in public areas shall be provided with tamperproof screws.

E. Boxes shall be provided without knockouts and shall not have any open or unused knockouts or other openings.

F. Pull boxes for indoor wet or damp locations shall be NEMA 3R Rated with stainless steel screws. Pull boxes 12" x 12" or larger will have hinged covers.

G. Pull boxes for outdoor locations shall be NEMA 4X Rated stainless steel continuous hinges, door clamps and a hasp.

2.4 CONDUIT FITTINGS

A. All rigid, IMC and EMT fittings shall be galvanized malleable iron or steel. Connectors and couplings shall be threaded, setscrew or compression type, concrete-tight.

B. Conduit bodies shall be malleable iron, threaded type. Provide neoprene cover gaskets for conduit body covers exposed to the weather.

C. Expansion fittings shall be O-Z/Gedney Type "AX" for rigid metal conduit and Type "TX" for electrical metallic tubing. For intermediate metal conduit applications, a 15 inch minimum length of rigid metal conduit shall be used with a Type "AX" expansion fitting. Provide O-Z/Gedney Type "BJ" bonding jumpers at all expansion fittings.

D. Rigid and IMC conduit bushings shall be of the insulated type with phenolic thermosetting insulation molded to a hot dipped galvanized malleable iron body of the threaded type.

E. EMT fittings shall be of the insulated throat type. Fittings larger than 2-1/2 inches shall have threaded bushings installed.

F. PVC conduit fittings shall be slip joint type.

G. All conduit sleeves will be fitted with "spillways" to maintain the bend radius of cables passing through the sleeve.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Clear pathways for security cabling shall be provided from all Security Systems wall boxes, and ceiling boxes to the nearest IDF Closet.

B. Conduits shall be provided through walls and across open ceilings to ensure an unobstructed enclosed pathway to the IDF Closet.

C. J-Hooks or other cable hanger systems may be used to route security cabling through inaccessible ceilings, (gypsum board, plaster or other), or enclosed accessible ceilings, (acoustic tile or other), following all applicable federal, state or local codes.

D. In any location where conduits are required to penetrate fire-rated walls, the Contractor shall implement fire-stopping measures following all applicable federal, state or local codes so as to maintain the integrity and fire rating of the wall.

E. Refer to schedules on SC-series drawings for information regarding routing of security system conduits to IDF rooms.

F. Provide continuous conduits across exposed areas. Exposed conduits shall be installed parallel and perpendicular to nearby surfaces and structural members. Exposed conduits shall be painted to match the surrounding surfaces. Coordinate color with Architect. Paths for all exposed conduit runs shall approved by Architect prior to installation.

G. Conduits runs shall have a maximum of two 90° bends.

H. A polyethylene pull string shall be installed in all Security Systems conduits and a pull string will remain in all conduits when the cables under this contract are installed.

I. Furnish and install additional conduit and cable support hangers per specification as required to facilitate the Security Systems cabling installation. The minimum required installation is indicated on the Drawings.

J. Submit 30 days prior to commencement of installation, or as otherwise directed for Owner and Engineer review and acceptance, drawings indicating cable tray, conduit or other raceway routing, size, cable fill, etc. as required to verify that the installation will meet all aspects of the Specification.

K. All power devices and power sources emit a given amount of radio frequency interference (RFI) and/or electro-magnetic interference (EMI). To reduce or eliminate the field effects of RFI/EMI on data traffic on a given cable channel, cable runs shall be kept at the maximum possible distance from such sources. Running cables through the center of the building can reduce the external interference effects of RFI/EMI in the cable tray. Open wiring and non-metallic raceway shall be routed a minimum of twelve (12") inches away from fluorescent fixtures. Special attention shall be given to the routing of such pathways away from lighting ballasts and high intensity discharge devices. The minimum separation distances between data/communication distribution pathways and power wiring of 480 Volts or less shall be per Table-3 herein.

TABLE-3			
SEPARATION OF SECURITY SYSTEMS PATHWAYS FROM ≤480V POWER LINES			
CONDITION	MINIMUM SEPARATION DISTANCE		
	< 2 kVA	2-5 kVA	> 5 kVA
Unshielded power lines or electrical equipment in proximity to open or nonmetal tel/comm pathways.	6 in	12 in	24 in
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to open or non-metallic tel/comm pathways	3 in	6 in	12 in
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit tel/comm pathway.	3 in	6 in	12 in
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit tel/comm pathway.	1/2 the trade Size of the larger conduit	3 in	6 in

L. Whenever possible, raceway routing paths shall follow the logical structure of the building (e.g. follow hallways, aisles and corridors). When rated walls must be breached, cables shall pass through pre-established EZ-Paths ganged together to equal the full capacity of the cable tray. Cables shall enter and/or exit areas at right angles to the structure. Route all Security Systems raceways parallel to or perpendicular to the building structure. No diagonal runs will be permitted unless noted otherwise or pre-approved by the Owner and Engineer. Corridor crossovers shall be kept to a minimum.

M. Restore fire rating and smoke stoppage integrity where all wireways, raceways and cable trays pierce walls, floors and ceilings by sealing with approved means

N. Conduit buried in concrete slab pours shall be full weight rigid galvanized steel or Carlon Schedule 40 PVC. All elbows, stub ups and conduit above ground shall be rigid galvanized steel. All joints and terminations for PVC shall be made according to manufacturer's recommendations using "Carlon Solvent Weld Cement" to insure all joints are watertight.

O. Conduit buried in or beneath building slabs or exterior below grade shall be full weight rigid galvanized steel or Carlon Schedule 40 PVC. The conduit will be encased in 3" concrete envelope or as called for on the Plan Drawings. All elbows and stub ups shall be rigid galvanized steel. All joints and terminations for PVC shall be made according to manufacturer's recommendations using "Carlon Solvent Weld Cement" to insure all joints are watertight.

P. Conduits and cables entering from outside the building shall be sealed water and moisture tight. Seal between conduit and sleeves, conduits and core drilled holes and around conductors inside conduits. Provide cast iron pipe or Schedule 40 galvanized steel conduit sleeves in exterior walls below grade, with intermediate wall stop and anchor collar set in place before concrete pouring. Sleeve shall be a part of the sealing assembly. When the wall opening is core drilled, the wall sleeve may be omitted. A mechanically compressed

rubber sealing assembly equal to Thunderline Corp. "Link-Seal" shall be placed in the annular space between conduit and sleeve or core drilling.

Q. Layout the conduit system to avoid crossing building expansion joints. Where crossings are necessary, use expansion joints.

R. Do not install wall mounted flush boxes back-to-back in opposite sides of a wall, in stud walls, boxes shall be on opposite sides of studs.

S. On campus excavation:
   1. Trenching, digging and other types of excavation on OWNER property requires an "OWNER Dig Permit." Technology Resources must originate "OWNER Dig Permits." Care should be taken by the contractor/installer to include landscaping restoration when bidding jobs.

- END OF SECTION 28 05 29 -

SECTION 28 23 00 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work covered by these Specifications includes the provision and installation of cameras, camera mounts and mounting accessories, transmission equipment and network video recorders for the surveillance systems described herein and on the Security drawings (SC-series) including all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools and equipment necessary or used to perform and-complete such construction.

B. Coordinate scheduling of work.

C. Project work hours:
   1. In County Buildings, project work hours will be during normal business hours from 8:00 AM to 5:00 PM, Monday through Friday, excluding observed holidays.
   2. In County Parking Garages, project work hours will be during non-business hours from 5:01 PM to 6:30 AM, Monday through Friday, and any time during weekends.

D. Comply with all union jurisdiction requirements for the completion of the project. Questions regarding jurisdiction should be directed to the Tarrant County Facilities Manager (TCPM) Project Manager (PM).

E. Furnish and install video surveillance system equipment consisting of cameras, mounts and mounting accessories, network video recorders, and associated equipment.

F. Owner Provided work: Tarrant County will contract directly with our Structured Cabling Materials vendor, Able Communications Inc. A separate PO will be issued to them for this work.

G. Note that the drawings are conceptual. All boxes, fittings, couplings, etc are not necessarily shown. Provide accessories or ancillary equipment necessary to meet the requirements of this specification and the Security System design as communicated in the SC-Series drawings as well as comply with any applicable standards or codes.

H. Any exceptions and inconsistencies in Drawings, Specifications, Addenda, Referenced Material other Contract Documents and site conditions are to be addressed at the Re-Bid in the form of a question or submit a question before the due date. (Reference Volume 1 for Question Deadline and Posting of Questions and Answers.)

1.2 DEFINITIONS

A. IP: Internet protocol.

B. LAN: Local area network.

C. PC: Personal computer.

D. PTZ: Pan-tilt-zoom.

E. RAID: Redundant array of independent disks.

F. TCP: Transmission control protocol - connects hosts on the Internet.

G. UPS: Uninterruptible power supply.

H. WAN: Wide area network.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Wiring Diagrams: For power, signal, and control wiring.
4. Archiver storage calculations: Provide calculations showing anticipated days of storage retention for existing cameras and new cameras.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

1.5 CONTRACT CLOSEOUT SUBMITTALS

A. Comply with all requirements of Specification Division 1.

B. Keep a complete set of approved shop drawings on the job at all times. Non-approved shop drawings will not be allowed on the job site. Note any changes made during installation on a single set of drawings. This set of marked up drawings will not leave the jobsite until after the final system commissioning. All "as-built" drawings to be provided both in electronic form (ACAD 2015 or later) and in hard copy (42"x30").

C. System Reference Manual: Prior to Owner training, furnish 1 copy, in 3 ring binders, sized to hold the material plus 50% excess, with clear vinyl pockets on cover and spine for project title. Provide tabular dividers with permanent legends for the following sections:
   1. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity. This procedure should describe the operation of all system capabilities. Assume the intended reader of the manual to be technically inexperienced and unfamiliar with this facility.
   2. A list of all test results performed on the systems as outlined in Section 3.7, G proving the systems to be in full compliance.
   3. A list of all equipment, indicating manufacturer, model, serial number, and equipment location (i.e. rack/room number). Update following acceptance testing, if changed.
   4. A list of all settings of all semi-fixed controls. Update this document after the final acceptance testing.
   5. All "as-built" drawings to be provided both in electronic form (ACAD 2015 or later) and five sets of hard copy (30"x42"). If asked for, provide one of these in reproducible vellum form. Blueline (or similar diazo process) prints are not acceptable.
   6. Manufacturer's Instruction Manuals for all items of equipment, incorporating or followed by manufacturer's warranty statements. For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item.
   7. Manufacturer's Service Manuals and parts list for all equipment. Photocopies are not acceptable. For custom circuits or modifications, complete schematics and parts lists.
   8. Maintenance Instructions, including Contractor's maintenance phone number(s) and hours; maintenance schedule, description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
   9. A legend of acronyms and abbreviations must accompany all documentation.
   10. Replacement parts lists of major items of equipment.

D. Software Licensing and Manuals. Provide backup computer discs, all software manuals and license certificates for all software loaded on all PC's.

1.6 CODE COMPLIANCE

A. All work and materials shall comply with all applicable codes and regulations to meet or exceed Federal, State, City, and Local Building Codes and Regulations. Advise the Tarrant County Facilities Manager (TCFM) Project Manager (PM) if anything in the Plans or Specifications is out of compliance with codes and/or laws prior to bidding.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
   1. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 32 to 104 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
   2. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of -30 to 122 deg 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. Use NEMA 250, Type 4X enclosures.
4. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use NEMA 250, Type 4X enclosures.
5. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 STANDARD CAMERAS

A. Provide cameras as per the Security Device Schedules on the following drawings:
1. SC1-4
2. SC2-3
3. SC3-3
4. SC4-4
5. SC5-6
6. SC6-4
7. SC7-3
8. SC8-4
9. SC9-4
10. SC10-6
11. SC11-9
12. SC12-8
13. SC13-9

B. Any proposed substitutions for specified camera models are to be address at the Pre-Bid in the form of a question or submit a question before the due date. (Reference Volume 1 for Question Deadline and Posting of Questions and Answers.).

2.3 POWER SUPPLIES

A. All video surveillance cameras will be PoE powered.

B. In location where the cable length is within 100m, PoE power will be provided via network switches provided by the Tarrant County IT Department.

C. In locations where the cable distance exceeds 100m, camera PoE power will be provided by ethernet extenders with dedicated power supplies as specified under Part 2, Article 2.6, Paragraph E below.

2.4 CAMERA-SUPPORTING EQUIPMENT

A. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

B. Mounting Brackets for Video Surveillance Cameras
   1. Provide any necessary mounting hardware that is required as per specific mounting conditions.
   2. Refer to camera mounting details on drawing SC0-1.
   3. Refer to Security Device Schedules on drawings listed under Part 2, Article 2.2, Paragraph A above.

2.5 NETWORK VIDEO RECORDERS

A. Video Management System Software
   1. Provide all required software / camera licensing as per the specified number of video surveillance cameras.
   2. Video Management Software installed must be consistent with the existing Video Management Software installed throughout all other Tarrant County facilities. Existing Video Management Software is FLIR Latitude.
   3. Approved Video Management Software Platforms:
      a. FLIR Latitude.
      b. No substitutions will be accepted.

B. NVR Hardware
   1. As required for FLIR Latitude Video Management Software platform with storage and data throughput adequate for specified quantity and types of video surveillance cameras.
   2. Provide with internal or direct attached RAID 6 storage for continuous recording of all cameras at maximum resolution, 15fps with minimum 45-day retention of recorded video plus 10% additional storage capacity for future growth.
   3. Provide calculations as part of Shop Drawing Submittal show 45 days or more of archival video retention for all existing cameras and additional new cameras.
   4. Approved Manufacturers:
      a. FLIR Latitude USS Enterprise Server.
      b. BCDVideo.
      c. Other upon review/approval.

5. Additional storage added to existing archivers:
    a. Subcourthouse at Mansfield:
        1) Add four additional 4TB hard drives to the existing archiver
    b. Northeast Courthouse:
        1) Add four additional 4TB hard drives to the existing archiver
    c. Northwest Subcourthouse & Annex:
        1) Add seven additional 4TB hard drives to the existing archiver
    d. Dionne Phillips Bagsby Southwest Subcourthouse:
        1) Add four additional 4TB hard drives to the existing archiver
6. New archival recorders to provide fully redundant archival recording:
    a. Subcourthouse in Arlington:
        1) FLIR USS-ENT-48R6-32
    b. Subcourthouse at Mansfield
        1) FLIR USS-ENT-40R6-24
    c. Miller Avenue Administration Building & Charles F. Griffin Building:
        1) FLIR USS-ENT-40R6-24
    d. Northeast Courthouse
        1) FLIR USS-ENT-48R6-32
    e. Northwest Subcourthouse & Annex
        1) FLIR USS-ENT-56R6-40
    f. Plaza Building
        1) FLIR USS-ENT-64R6-48
    g. Dionne Phillips Bagsby Southwest Subcourthouse
        1) FLIR USS-ENT-48R6-32
    h. Tom Vandergriff Civil Courts Building
        1) FLIR USS-ENT-56R6-40
    i. Medical Examiner's Office and Forensic Laboratories
        1) FLIR USS-ENT-48R6-32
    j. Elections Center, Central Garage Facility, Premier Annex / Fire Marshal
        1) FLIR USS-ENT-64R6-48
    k. Plaza Garage
        1) FLIR USS-ENT-64R6-48
        2) Contractor shall reconfigure the existing archiver serving Plaza Garage / Calhoun Garage / Taylor Garage to serve only the Plaza Garage.
    l. Calhoun Garage
        1) FLIR USS-ENT-80R6-64 (Qty: 2)
    m. Taylor Garage
        1) FLIR USS-ENT-96R6-80 (Qty: 2)

2.6 SIGNAL TRANSMISSION COMPONENTS

A. Installed Horizontal Cable:
    1. Provided and installed under Specification Section 28 05 14. Tarrant County will contract directly with our Structured Cabling Materials vendor, Able Communications Inc. A separate PO will be issued to them for this work.

B. Video Surveillance Horizontal Cable Connectors and Terminations:
    1. Provided and installed under Specification Section 28 05 14. Tarrant County will contract directly with our Structured Cabling Materials vendor, Able Communications Inc. A separate PO will be issued to them for this work.

C. Security Network Patch Panels:
   1. Provided and installed under Specification Section 28 05 14. Tarrant County will contract directly with our Structured Cabling Materials vendor, Able Communications Inc. A separate PO will be issued to them for this work.

D. Security Network Patch Cables:
   1. Provided and installed under Specification Section 28 05 14. Tarrant County will contract directly with our Structured Cabling Materials vendor, Able Communications Inc. A separate PO will be issued to them for this work.

E. Point-to-Point Ethernet Over CAT5e/6 Extenders
   1. Where cameras are not within 100m of an IDF Room or the MPOE, point-to-point Ethernet over CAT5e/6 extenders shall be used.
   2. Provide point-to-point Ethernet over CAT5e/6 extenders as required for proposed cameras
      a. Veracity LONGSPAN Long-Range Ethernet and PoE Extender with Veracity Power Supply Unit
      b. AXIS Long-Range Ethernet and PoE Extender with AXIS Power Supply Unit
      c. Or approved equal

F. Lightning Surge Protection for Exterior Cameras
   1. Surge protection will be provided for all exterior cameras.
   2. Surge protection will be installed in the IDF Rooms between the exterior cameras and the facility network switches.
   3. Provide lightning surge protection as required for proposed cameras.
      a. Ditek DTM-RM12POES
      b. Nitek IPPWR16
      c. Or approved equal

2.7 SPARES INVENTORY

A. Cameras.
   1. Provide spare units for each camera model and accessory listed below.
      a. Avigilon 15C-H4A-3MH-180 (Qty: 2)
      b. Avigilon 15C-H4A-3MH-270 (Qty: 2)
      c. Avigilon H4AMH-DO-COVR1 (Qty: 2)
      d. Axis P3717-PLE (Qty: 2)
      e. Axis P3719-PLE (Qty: 2)
      f. Axis P5655-E (Qty: 2)
      g. Axis Q1785-LE (Qty: 2)
      h. Axis Q1786-LE (Qty: 2)
      i. Axis Q1798-LE (Qty: 2)
      j. Axis Q3536-LVE (Qty: 2)
      k. Axis Q3538-LVE (Qty: 2)
      l. Axis Q6010-E Multi-Imager w/(x4) M12 12mm Lens (Qty: 2)
      m. Axis Q6075-E PTZ (Qty: 2)
      n. Hanwha PNM-7002VD (Qty: 2)
      o. Hanwha SLA-2M3600D (Qty: 2)
      p. Hanwha SLA-2M6000D (Qty: 2)
      q. Hanwha PNM-9000VD (Qty: 2)
      r. Hanwha SLA-5M3700D (Qty: 2)
      s. Hanwha SLA-5M4600D (Qty: 2)
      t. Hanwha SLA-5M7000D (Qty: 2)

B. Hard Drives for Network Video Recorders
   1. Provide two 4TB hard drives compatible with network video recorder hardware as specified in Specification 28 23 00, Part 2, Article 2.5, Paragraph B.

C. Point-to-Point Ethernet Over CAT5e/6 Extenders
   1. Provide two (2) transmitter / receiver pairs for Ethernet Over CAT5e/6 Extenders.
      a. Veracity LONGSPAN Long-Range Ethernet and PoE Extender with Veracity Power Supply Unit. (Qty: 2 sets)
      b. AXIS Long-Range Ethernet and PoE Extender with AXIS Power Supply Unit. (Qty: 2 sets)
      c. Or approved equal

D. Lightning Surge Protection for Exterior Cameras
   1. Provide two (2) lightning surge protectors.
      a. Ditek DTM-RM12POES (Qty: 2)
      b. Nitek IPPWR16 (Qty: 2)
      c. Or approved equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

A. Wiring for video surveillance cameras shall be provided by the Division 28 05 14 contractor.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and other associated equipment level and plumb.

B. Install cameras with 84-inch- minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. 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:

    a. Prepare equipment list described in "Informational Submittals" Article.
    b. Verify operation of auto-iris lenses.
    c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    e. Set and name all preset positions; consult Owner's personnel.
    f. Set sensitivity of motion detection.
    g. Connect and verify responses to alarms.
    h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
    a. Remove and replace malfunctioning items and retest as specified above.
    b. Record test results for each piece of equipment.
    c. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

C. Video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions and to optimize performance of the installed equipment. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.

4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

1. Train County's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.
2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
3. Review equipment list and data in maintenance manuals.
4. Conduct a minimum of **six** hours' training to County's employees.

- END OF SECTION 28 23 00 -