STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

STANDARD LOW BID PROJECT – INVITATIONAL

March 18, 2010

MILL CREEK YOUTH DETENTION CENTER SECURITY UPGRADE

YOUTH CORRECTIONS

OGDEN, UTAH

DFCM Project Number
09253430

Spectrum Engineers
Russ Naegle
324 South State St.
Salt Lake City Ut.
801-328-5151

TABLE OF CONTENTS

Current copies of the following documents are hereby made part of these contract documents by reference These documents are available on the DFCM web site at http://dfcm.utah.gov/StdDocs/index.html "Standard Documents" – "Reference Documents I" – "Item 6. Supplemental General Conditions" or are available upon request from DFCM:

DFCM Supplemental General Conditions dated July 1, 2009 *
DFCM Supplemental General Conditions dated July 15, 2008
DFCM General Conditions dated May 25, 2005
DFCM Application and Certification for Payment dated May 25, 2005.

*** NOTE: THE NEW SUPPLEMENTAL GENERAL CONDITIONS EFFECTIVE JULY 1, 2009 ADDRESSING HEALTH INSURANCE AND IMMIGRATION ARE REFERENCED AT THE LINK ABOVE.**

The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at http://dfcm.utah.gov

INVITATION TO BID

Only firms that have been invited to submit bids on this project are allowed to bid on this project.

Sealed bids will be received by the Division of Facilities Construction and Management (DFCM) for:

MILL CREEK YOUTH DETENTION CENTER SECURITY UPGRADES
YOUTH CORRECTIONS – OGDEN, UTAH
DFCM PROJECT NO: 09253430

Company	Contact	Fax
PST	Dave Lasig	801-255-5039
Prizm Automation Systems	Gordon Cummings	gcummings@prismautosys.com
A-1 Security	Terry Cavering	801-394-2941

Bids will be in accordance with the Contract Documents that will be available on **March 18, 2010** and distributed in electronic format only on CDs from DFCM, 4110 State Office Building, Salt Lake City, Utah and on the DFCM web page at http://dfcm.utah.gov. For questions regarding this project, please contact Tim K Parkinson DFCM, at 801-450-2478. No others are to be contacted regarding this bidding process. The construction estimate for this project is $ 90,000.00.

A **mandatory** pre-bid meeting will be held at **10:00 AM on March 24, 2010** at Mill Creek Detention Center 790 West 12th, Street Ogden Utah 84404. All bidders wishing to bid on this project are required to attend this meeting.

Bids will be received until the hour of **2:00 PM on April 7, 2010** at DFCM, 4ll0 State Office Building, Salt Lake City, Utah 84114. Bids will be opened and read aloud in the DFCM Conference Room, 4110 State Office Building, Salt Lake City, Utah. NOTE: Bids must be received at 4110 State Office Building by the specified time.

A bid bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's bid bond form, shall accompany the bid.

The Division of Facilities Construction and Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of DFCM.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
Joanna Reese, Contract Coordinator
4110 State Office Building, Salt Lake City, Utah 84114

PROJECT DESCRIPTION

Contractor will be responsible for the upgrade of existing Security System. Current drawings provide extensive upgrades on the existing inoperative Surveillance and PLC system. The Contractor shall provide the upgrade and expansion of the existing integrated security systems as indicated in the drawings and specifications. The contractor shall conduct a complete point by point review and documentation of the existing system and also modify the programming to achieve the upgraded expanded system functions as indicated on Drawings and Specifications.

PROJECT SCHEDULE

PROJECT NAME: **MILL CREEK YOUTH DETENTION CENTER SECURITY UPGRADES YOUTH CORRECTIONS – OGDEN, UTAH**
DFCM PROJECT NO. 09253430

Event	Day	Date	Time	Place
Bidding Documents Available	Thursday	March 18, 2010	1:00 PM	DFCM 4110 State Office Bldg SLC, UT and the DFCM web site *
Mandatory Pre-bid Site Meeting	Wednesday	March 24, 2010	10:00 AM	Mill Creek Detention Center 790 West 12th, Street Ogden Utan 84404
Last Day to Submit Questions	Tuesday	March 30, 2010	8:00 AM	Tim K Parkinson– DFCM E-mail tparkins@utah.gov Fax 801-538-3267
Addendum Deadline (exception for bid delays)	Monday	April 5, 2010	1:00 PM	DFCM web site *
Prime Contractors Turn In Bid and Bid Bond	Wednesday	April 7, 2010	2:00 PM	DFCM 4110 State Office Bldg SLC, UT
Sub-contractor List Due	Thursday	April 8, 2010	2:00 PM	DFCM 4110 State Office Bldg SLC, UT Fax 801-538-3677
Substantial Completion Date	Monday	June 14, 2010	5:00 PM	Onsite

* **NOTE: DFCM's web site address is http://dfcm.utah.gov**

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the "Instructions to Bidders", in compliance with your invitation for bids for the **Mill Creek Youth Detention Center Security Upgrade – Youth Corrections – Ogden, Utah – Project #09253430** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by June 14 2010, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **$250.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in the Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract.

The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable l00% Performance and Payment bonds are not delivered within the time set forth.

Type of Organization:

_____
(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

_____

Respectfully submitted,

_____
Name of Bidder

ADDRESS:

_____

_____

_____
Authorized Signature

INSTRUCTIONS TO BIDDERS

1. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Invitation to Bid.

2. Bids

Before submitting a bid, each contractor shall carefully examine the Contract Documents, shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Invitation to Bid prior to the deadline for submission of bids.

A bid bond properly signed by a qualified surety, as indicated on the DFCM Bid Bond form provided along with this Instruction to Bidders, in the amount of 5% of the bid, shall accompany the bid submission to DFCM. THIS BID BOND MUST BE ON THE DFCM BID BOND FORM PROVIDED WITH THIS INSTRUCTION TO BIDDERS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID unless only one bid is received by DFCM, or the failure to comply with the bid bond requirements is determined by the Director of DFCM to be nonsubstantial based on the following:

(a) the bid bond is submitted on a form other than DFCM's required Bid Bond form and the bid bond meets all other requirements including being issued by a surety firm authorized to do business in the State of Utah and be listed in the U.S. Department of the Treasury Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies for an amount not less than the amount of the bond to be issued. A co-surety may be utilized to satisfy this requirement; and

(b) the contractor provides a bid bond properly signed by a qualified surety and on the required DFCM Bid Bond form by the close of business of the next succeeding business day after the DFCM notifies the bidder of the defective bid bond.

3. Contract and Bond

The Contractor's Agreement will be in the form found in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the contract sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for subcontractors will be specified in the Supplementary General Conditions.

4. Listing of Subcontractors

Listing of Subcontractors shall be as summarized in the "Instructions and Subcontractor's List Form", which are included as part of these Contract Documents. The Subcontractors List shall be delivered to DFCM or faxed to DFCM at 801-538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contracts for a period of up to three years.

5. Interpretation of Drawings and Specifications

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Project Manager a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addenda posted on DFCM's web site at http://dfcm.utah.gov. Neither the DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

6. Addenda

Addenda will be posted on DFCM's web site at http://dfcm.utah.gov. Contractors are responsible for obtaining information contained in each addendum from the web site. Addenda issued prior to the submittal deadline shall become part of the bidding process and must be acknowledged on the bid form. Failure to acknowledge addenda may result in disqualification from bidding.

7. Award of Contract

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

8. DFCM Contractor Performance Rating

As a contractor completes each DFCM project, DFCM, the architect/engineer and the using agency will evaluate project performance based on the enclosed "DFCM Contractor Performance Rating" form. The ratings issued on this project will not affect this project but may affect the award on future projects.

9. Licensure

The Contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

10. Permits

In concurrence with the requirements for permitting in the General Conditions, it is the responsibility of the Contractor to obtain the fugitive dust plan requirements from the Utah Division of Air Quality and the SWPPP requirements from the Utah Department of Environmental Quality and submit the completed forms and pay any permit fee that may be required for this specific project. Failure to obtain the required permit may result in work stoppage and/or fines from the regulating authority that will be the sole responsibility of the Contractor. Any delay to the project as a result of any such failure to obtain the permit or noncompliance with the permit shall not be eligible for any extension in the Contract Time.

11. Right to Reject Bids

DFCM reserves the right to reject any or all Bids.

12. Time is of the Essence

Time is of the essence in regard to all the requirements of the Contract Documents.

13. Withdrawal of Bids

Bids may be withdrawn on written request received from bidder prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

14. Product Approvals

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E's written approval will be in an issued addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

15. Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors

Contractors shall respond promptly to any inquiry in writing by DFCM to any concern of financial responsibility of the contractor, subcontractor or sub-subcontractor.

16. Debarment

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by DFCM as part of the requirements for award of the Project.

BID BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of $_____ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____ Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____ .

Principal's name and address (if other than a corporation):

_____

_____

By: _____

Title: _____

Principal's name and address (if a corporation):

_____

_____

By: _____

Title: _____

(Affix Corporate Seal)

Surety's name and address:

_____

_____

STATE OF _____)
) ss.
COUNTY OF _____)

By: _____
Attorney-in-Fact (Affix Corporate Seal)

On this ____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.
My Commission Expires: _____
Resides at: _____

_____
NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, based on the following:

DOLLAR AMOUNTS FOR LISTING

PROJECTS UNDER $500,000: **ALL FIRST-TIER SUBS $20,000 OR OVER MUST BE LISTED**
PROJECTS $500,000 OR MORE: **ALL FIRST-TIER SUBS $35,000 OR OVER MUST BE LISTED**

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- If there are no subcontractors for the job that are required to be reported by State law (either because there are no subcontractors that will be used on the project or because there are no first-tier subcontractors over the dollar amounts referred to above), then you do not need to submit a sublist. If you do not submit a sublist, it will be deemed to be a representation by you that there are no subcontractors on the job that are required to be reported under State law. At any time, DFCM reserves the right to inquire, for security purposes, as to the identification of the subcontractors at any tier that will be on the worksite.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A.Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

GROUNDS FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for

such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

(1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
(2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
(3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
(4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
(5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
(6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONTRACTOR LICENSE #
ELECTRICAL	ABCD Electric Inc.	$350,000.00	123456789000
LANDSCAPING	"Self" *	$300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	$298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: $350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

* Bidders may list "self", but it is not required.

PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.

SUBCONTRACTORS LIST

FAX TO 801-538-3677

PROJECT TITLE: _____

Caution: You must read and comply fully with instructions.

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #

We certify that:

1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____ SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR OWNER'S REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY OWNER. ATTACH A SECOND PAGE IF NECESSARY.

CONTRACTOR'S AGREEMENT

FOR:

_____
_____
_____

THIS CONTRACTOR'S AGREEMENT, made and entered into this ____ day of _____, 20__, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of _____ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at _____ _____.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 and Supplemental General Conditions dated July 15, 2008 and July 1, 2009 ("also referred to as General Conditions") on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____ _____ DOLLARS AND NO CENTS ($_____.00), which is the base bid, and which sum also includes the cost of a 100% Performance Bond and a 100%

Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete by _____. Contractor agrees to pay liquidated damages in the amount of $_____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Invitation to Bid, Instructions to Bidders/ Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the Contractor requests payment and agrees to

safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contractor's Agreement on the day and year stated hereinabove.

CONTRACTOR: _____

_____
Signature Date

Title: _____

State of _____)
)
County of _____) _____
Please type/print name clearly

On this ____ day of _____, 20____, personally appeared before me, _____, whose identity is personally known to me (or proved to me on the basis of satisfactory evidence) and who by me duly sworn (or affirmed), did say that he (she) is the _____ (title or office) of the firm and that said document was signed by him (her) in behalf of said firm.

_____
Notary Public

(SEAL)

My Commission Expires _____

APPROVED AS TO AVAILABILITY OF FUNDS:

_____
David D. Williams, Jr. Date
DFCM Administrative Services Director

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT

_____
Lynn A. Hinrichs Date
Assistant Director Construction Management

APPROVED AS TO FORM:
ATTORNEY GENERAL
July 1, 2009
By: Alan S. Bachman
Asst Attorney General

APPROVED FOR EXPENDITURE:

_____
Division of Finance Date

PERFORMANCE BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee, " in the amount of _____ _____ DOLLARS ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ _____ Dollars ($_____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20_____.

WITNESS OR ATTESTATION:

_____

PRINCIPAL:

_____

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____

Attorney-in-Fact (Seal)

STATE OF _____)

) ss.

COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My commission expires: _____

Resides at: _____

_____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

PAYMENT BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____ _____, a corporation organized and existing under the laws of the State of _____authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ Dollars ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ _____ Dollars ($_____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, l953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

_____

PRINCIPAL:

_____

By: _____ (Seal)

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____ (Seal)

Attorney-in-Fact

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20_____, personally appeared before me _____ _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My commission expires: _____

Resides at: _____

_____
NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT _____ PROJECT NO: _____

AGENCY/INSTITUTION _____

AREA ACCEPTED _____

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM - (Owner) accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at _____ (time) on _____ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

_____

_____

The Owner acknowledges receipt of the following closeout and transition materials:

As-built Drawings O & M Manuals Warranty Documents Completion of Training Requirements

A list of items to be completed or corrected (Punch List) is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof. The amount of _____(Twice the value of the punch list work) shall be retained to assure the completion of the punch list work.

The Contractor shall complete or correct the Work on the list of (Punch List) items appended hereto within _____ ____calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: $_____. If the list of items is not completed within the time allotted the Owner has the right to be compensated for the delays and/or complete the work with the help of independent contractor at the expense of the retained project funds. If the retained project funds are insufficient to cover the delay/completion damages, the Owner shall be promptly reimbursed for the balance of the funds needed to compensate the Owner.

_____ by: _____

CONTRACTOR (include name of firm) (Signature) DATE

_____ by: _____

A/E (include name of firm) (Signature) DATE

_____ by: _____

USING INSTITUTION OR AGENCY (Signature) DATE

_____ by: _____

DFCM (Owner) (Signature) DATE

4110 State Office Building, Salt Lake City, Utah 84114 cc: Parties Noted
telephone 801-538-3018 • facsimile 801-538-3267 • http://dfcm.utah.gov DFCM, Director

STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

General Contractor Performance Rating Form

Project Name:		DFCM Project#	
Contractor: (ABC Construction, John Doe, 111-111-1111)	A/E: (ABC Architects, Jane Doe, 222-222-2222)	Original Contract Amount:	Final Contract Amount:
DFCM Project Manager:		Contract Date:	
Completion Date:		Date of Rating:	

Rating Guideline	QUALITY OF PRODUCT OR SERVICES	COST CONTROL	TIMELINESS OF PERFORMANCE	BUSINESS RELATIONS
5-Exceptional	Contractor has demonstrated an exceptional performance level in any of the above four categories that justifies adding a point to the score. Contractor performance clearly exceeds the performance levels described as "Very Good"			
4-Very Good	Contractor is in compliance with contract requirements and/or delivers quality product/service.	Contractor is effective in managing costs and submits current, accurate, and complete billings	Contractor is effective in meeting milestones and delivery schedule	Response to inquiries, technical/service/ administrative issues is effective
3-Satisfactory	Minor inefficiencies/errors have been identified	Contractor is usually effective in managing cost	Contractor is usually effective in meeting milestones and delivery schedules	Response to inquires technical/ service/administrative issues is somewhat effective
2-Marginal	Major problems have been encountered	Contractor is having major difficulty managing cost effectively	Contractor is having major difficulty meeting milestones and delivery schedule	Response to inquiries, technical/service/administrative issues is marginally effective
1-Unsatisfactory	Contractor is not in compliance and is jeopardizing achievement of contract objectives	Contractor is unable to manage costs effectively	Contractor delays are jeopardizing performance of contract objectives	Response to inquiries, technical/service/administrative issues is not effective

1. Rate Contractors quality of workmanship, management of sub contractor performance, project cleanliness, organization and safety requirement.	Score
Agency Comments:	
A & E Comments:	
DFCM Project Manager Comments:	

2. Rate Contractor administration of project costs, change orders and financial management of the project budget.	**Score**
Agency Comments:	
A & E Comments:	
DFCM Project Manager Comments:	

3. Rate Contractor's performance and adherence to Project Schedule, delay procedures and requirements of substantial completion, inspection and punch-list performance.	**Score**
Agency Comments:	
A & E Comments:	
DFCM Project Manager Comments:	

4. Evaluate performance of contractor management team including project manager, engineer and superintendent also include in the rating team's ability to work well with owner, user agency and consultants.	**Score**
Agency Comments:	
A & E Comments:	
DFCM Project Manager Comments:	

5. Rate success of Contractor's management plan, completion of the plans mitigation of project risks and performance of value engineering concepts.	Score
Agency Comments:	
A & E Comments:	
DFCM Project Manager Comments:	

Signed by:	Date:	Mean Score

Additional Comments:

State of Utah
Department of Administrative Services

Division of Facilities
Construction & Management
4110 State Office Building
Salt Lake City, Utah 84114
Phone: (801) 538 - 3018
Fax: (801) 538 - 3267

www.dfcm.utah.gov

MILL CREEK YOUTH CENTER
SECURITY UPGRADE
DFCM#09253430

790 WEST 12TH STREET
OGDEN, UTAH 84404

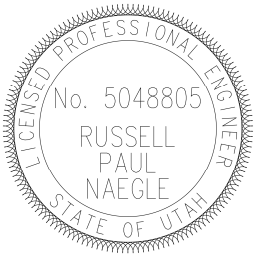

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Table of Contents

SECTION 078400 - THROUGH-PENETRATION FIRESTOP SYSTEMS

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.

1.2 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Sections include the following:
   1. Division 16 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

   1. Fire-resistance-rated walls including fire walls fire partitions, fire barriers, and smoke barriers.
   2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.

B. Rated Systems: Provide through-penetration firestop systems with appropriate ratings for application determined per UL 1479:

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1.4 SUBMITTALS (Not Used)

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.

B. Installation Responsibility: Assign installation of through-penetration firestop systemsin Project to a qualified installer.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
   1. Grace, W. R. & Co. - Conn.
   2. Hilti, Inc.
   3. Johns Manville.
   4. 3M; Fire Protection Products Division.
   5. Tremco; Sealant/Weatherproofing Division.
   6. USG Corporation.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
   1. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

C. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

D. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

E. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

F. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 078400

SECTION 099100 - PAINTING

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.

1.2 SUMMARY

A. This Section includes surface preparation and field painting of exposed raceways and boxes and exposed painted surfaces that are damaged by the contractor during construction.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.5 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore).
2. PPG Industries, Inc. (Pittsburgh Paints).
3. Sherwin-Williams Co. (Sherwin-Williams).
4. Kwal Paint.
5. Pratt & Lambert Paint.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. Colors: Match existing paint colors.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Use factory-formulated high-performance latex block fillers.

2.4 INTERIOR PRIMERS

A. Interior Concrete and Masonry Primer: Use factory-formulated alkali-resistant acrylic-latex interior primer matching existing interior application.

B. Interior Gypsum Board Primer: Use factory-formulated latex-based primer matching existing interior application.

C. Interior Plaster Primer: Use factory-formulated latex-based primer matching existing interior application.

D. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.

2.5 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Use factory-formulated flat acrylic-emulsion latex paint matching existing interior flat acrylic-emulsion latex paint application.

B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.

C. Interior Semigloss Acrylic Enamel: Use factory-formulated semigloss acrylic-latex enamel matching existing interior semigloss acrylic-latex enamel application.

D. Interior Full-Gloss Acrylic Enamel: Use factory-formulated full-gloss acrylic-latex interior enamel for matching existing interior full-gloss acrylic-latex enamel application.

E. Interior Semigloss Alkyd Enamel: Use factory-formulated semigloss alkyd enamel matching existing interior semigloss alkyd enamel application.

F. Interior Full-Gloss Alkyd Enamel for Gypsum Board and Plaster: Use factory-formulated full-gloss alkyd interior enamel matching existing full-gloss alkyd interior enamel application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical

or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Determine paint colors, surface treatments, and finishes to match existing painted surfaces.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. Sand lightly between each succeeding enamel or varnish coat.

B. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.

C. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

D. Electrical Work: Painting of electrical work is limited to items exposed in occupied spaces.

E. Electrical items to be painted include, but are not limited to, the following:

1. Raceways and boxes.

F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

G. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

H. Completed Work: Match existing paints for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

A. Protect surrounding surfaces and equipment against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Engineer.

1. Provide "Wet Paint" signs to protect newly painted finishes.

END OF SECTION 099100

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

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.

1.2 SUMMARY

A. This Section includes the following:
   1. Supporting devices for electrical components.
   2. Permits and Fees.

1.3 COORDINATION

A. Coordinate communication service connections to components furnished by communication utility companies.
   1. Coordinate installation and connection of exterior underground and overhead utilities and services.
   2. Comply with requirements of authorities having jurisdiction.
   3. Notify Architect a minimum of seven days in advance of any proposed utility interruption and obtain approval prior to proceeding. Comply with requirements of the Owner, User, and Utility.
   4. Include all costs, including Owner, municipal or utility costs that will need to be paid to obtain communication services.

B. Coordinate with Authorities Having Jurisdiction including: city, county, state, university, federal and other governmental authorities.
   1. Obtain all permits (including excavation permits) prior to beginning construction.
   2. Pay all fees.
   3. Request inspections required by Authorities Having Jurisdiction in a timely manner and in order to comply with sequencing requirements.

PART 2 - PRODUCTS

2.1 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.

C. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding as required by utility company.

B. Remove rubbish, waste, and excess soils.

3.2 TEMPORARY ELECTRICAL AND COMMUNICATIONS SERVICE

A. Electrical Contractor is to provide and coordinate electrical and communications service at the construction site. Contractor to coordinate temporary power and communications connections with the respective utility.

B. Electrical Contractor is responsible for any fees associated with the temporary power connection.

3.3 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From Contractor.

1.4 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 NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers:
   1. Copper Wire and Cables:
      a. Alcan Aluminum Corporation; Alcan Cable Div.
      b. American Insulated Wire Corp.; a Leviton Company.
      c. General Cable Corporation.
      d. Senator Wire & Cable Company.
      e. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper, minimum size #12 for phase conductors and #14 for control conductors complying with NEMA WC 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THWN-2 complying with NEMA WC 7.

E. Multiconductor Cable: Metal-clad cable (Type MC), with ground wire. MC cable is not permitted.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:
1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Burndy.
4. Hubbell/Anderson.
5. Ilsco.
6. O-Z/Gedney; EGS Electrical Group LLC.
7. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THWN-2, single conductors in raceway**.**

B. Exposed Feeders: Type THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THWN-2, single conductors in raceway**.**

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THWN-2, single conductors in raceway.Exposed Branch Circuits, including in Crawlspaces: Type THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THWN-2, single conductors in raceway. Type MC may not be used except by special permission from owner**.**

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THWN-2, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type THWN-2, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

J. Fire Alarm Circuits:
1. Type THWN-2 in raceway for fire alarm power circuits, for horn circuits, and for strobe circuits.
2. Power-limited, fire-protective, signaling circuit cable in raceway for initiating loop circuits.

K. Emergency circuits: Install in separate raceways from all other wiring, except where they connect to the same equipment for two-source operation.

L. Class 1 Control Circuits: Type THWN-2, in raceway.

M. Class 2 Control Circuits: Type THWN-2, in raceway**.**

N. Fixture Conductors: Install conductors in lighting fixtures with insulation ratings as recommended by the manufacturer’s written instructions or a minimum 90 degrees C., whichever is higher.

O. Communication Conductors: Install communication conductors in raceway or existing cable trays.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Multi-Wire Branch Circuits: Install no more than three circuits in a raceway, unless specifically shown otherwise.

1. For 120V multi-wire branch circuits, provide shared neutral conductor that is one size larger than the phase conductors.

C. Minimum Branch Circuit Conductor Size: Provide the following minimum sizes for distances listed on 20A branch circuits to prevent excessive voltage drop. The circuit length shall be measured along the length of the conductor form the circuit breaker in the panelboard to the last device on the circuit. If required, increase raceway size to comply with conductor fill requirements of NFPA 70.

1. Branch Circuit Voltage of 120V:
   a. Circuit lengths less than 70 feet: Provide minimum #12 AWG conductor size.
   b. Circuit lengths between 70 feet and 110 feet: Provide minimum #10 AWG conductor size.
   c. Circuit lengths between 110 feet and 170 feet: Provide minimum #8 AWG conductor size.
   d. Circuit lengths greater than 170 feet: Perform voltage drop calculations and provide conductor size to keep branch circuit voltage drop less than 3% with a 15 amp load.

2. Branch Circuit Voltage of 277V:
   a. Circuit lengths less than 150 feet: Provide minimum #12 AWG conductor size.
   b. Circuit lengths between 150 feet and 240 feet: Provide minimum #10 AWG conductor size.
   c. Circuit lengths between 240 feet and 380 feet: Provide minimum #8 AWG conductor size.
   d. Circuit lengths greater than 380 feet: Perform voltage drop calculations and provide conductor size to keep branch circuit voltage drop less than 3% with a 15 amp load.

D. GFI circuit breakers or feed-thru outlets to outlets served: provide separate neutrals.

E. Panelboards, switchboards, MCCs, switchgear: Do not route conductors through a section which terminate in another section, except for interconnecting control conductors.

F. Remove existing conductors from raceway before pulling in new wires and cables.

G. Parallel conductors: Where parallel conductors are installed in parallel raceways, install in each raceway conductors of phase, neutral and/or ground as specified. Carefully cut parallel conductors to identical length for each phase leg. Do not parallel conductors less than #1/0.

H. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

I. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

J. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

K. Do not install wiring through any part of a transformer vault or elevator equipment room and shaft that is does not serve equipment in the respective room. Also, coordinate that piping or other items foreign to the transformer vault, elevator equipment room or shaft is not installed in these spaces.

L. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

M. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

N. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.3 CONNECTIONS

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

B. Conductor splices: Minimize conductor splices. Do not install in conduit bodies.

C. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

E. Furniture connections: connect systems furniture to power supply circuits per manufacturer's written instructions.

F. Panelboard connections: do not splice conductors in panelboards.

G. Utility Service Connections: Provide lugs, cable, and all other materials necessary to complete connections to the transformer or service lateral for the building.
   1. Measure voltage at main disconnect and adjust taps if necessary to obtain the proper value.

3.4 FIELD QUALITY CONTROL

A. Proof of Performance: A schedule of field quality control conductor testing shall be provided to the Commissioning Agent prior to performing any testing. Coordinate with Commissioning Agent for observation of testing.

B. Testing: Perform the following field quality-control testing:
   1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
   2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 275123 - INTERCOMMUNICATIONS AND PROGRAM SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 284619 – PLC Electronic Detention Monitoring and Control.

C. Section 280500 - Common Work Results for Electronic Safety and Security.

1.2 SUMMARY

A. Section Includes: Modifications to manually switched (by detection door/intercom control screen) intercommunications and program systems with the following components:
   1. Master stations.
   2. Speaker-microphone stations.
   3. Call-switch unit.
   4. All-call amplifier.
   5. Intercommunication amplifier.
   6. Paging amplifier.
   7. Loudspeakers/speaker microphones.
   8. Conductors and cables.
   9. Raceways.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For intercommunications and program systems. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Include scaled drawings for master station that details built-in equipment.
   3. Wiring Diagrams: For power, signal, and control wiring.
      a. Identify terminals to facilitate installation, operation, and maintenance.
      b. Single-line diagram showing interconnection of components.
      c. Cabling diagram showing cable routing.

C. Qualification Data: For qualified Installer.

D. Field quality-control reports.

E. Operation and Maintenance Data: For intercommunications and program systems to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. A record of Owner's equipment-programming option decisions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. 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.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of ceiling-mounted speaker microphones with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. Bogen Communications, Inc.
2. Dukane Communication Systems; part of GE Infrastructure, Security.
3. Federal Signal Corporation; Electrical Products Division.
4. Jeron Electronic Systems, Inc.
5. Rauland-Borg Corporation.
6. TOA Electronics, Inc.

2.2 FUNCTIONAL DESCRIPTION OF MANUALLY SWITCHED SYSTEMS

A. Master Station:
1. Communicating selectively with other master and speaker-microphone stations by actuating control screen selector icons.
2. Communicating simultaneously with all other stations by actuating a single all-call switch.
3. Communicating with individual stations in privacy.
4. Accessing separate paging speakers or groups of paging speakers by actuating control screen selector switches.

B. Speaker-Microphone Station (EXISINTG):
1. Having privacy from remote monitoring without a warning tone signal at monitored station. Designated speaker-microphone stations have a privacy switch to prevent another station from listening and to permit incoming calls.
2. Communicating hands free.
3. Calling master station by actuating call switch.
4. Being free of noise and distortion during operation and when in standby mode.

C. Speakers: Free of noise and distortion during operation and when in standby mode.

2.3 GENERAL REQUIREMENTS FOR EQUIPMENT AND MATERIALS

A. Coordinate features and select components to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Equipment: Modular type using solid-state components, fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.

C. Weather-Resistant Equipment: Listed and labeled by an NRTL for duty outdoors or in damp locations.

2.4 MASTER STATION FOR MANUALLY SWITCHED SYSTEMS

A. Station-Selector and Talk-Listen Switches: Icons on detection door control screen.

B. Volume Control: Regulates incoming-call volume.

C. LED Annunciation: Icons on detection door control screen. Identifies calling stations and stations in use. Icon remains on until call is answered.

D. Tone Annunciation: Momentary audible tone signal announces incoming calls.

E. Speaker Microphone: Transmits and receives calls.

F. Equipment Cabinet: Provide as required for additional equipment. Comply with TIA/EIA-310-D. Lockable, ventilated metal cabinet houses terminal strips, power supplies, amplifiers, system volume control, and auxiliary equipment.

2.5 SPEAKER-MICROPHONE STATIONS (EXISTING)

2.6 ALL-CALL AMPLIFIER (EXISTING)

2.7 INTERCOMMUNICATION AMPLIFIER (EXISTING)

2.8 PAGING AMPLIFIER

A. Input Voltage: 120-V ac, 60 Hz.

B. Frequency Response: Within plus or minus 3 dB from 60 to 10,000 Hz.

C. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.

D. Total Harmonic Distortion: Less than 3 percent at rated power output from 70 to 12,000 Hz.

E. Output Regulation: Less than 2 dB from full to no load.

F. Controls: On-off, input levels, and low-cut filter.

G. Input Sensitivity: Matched to input circuit and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphones or handset transmitters.

H. Amplifier Protection: Prevents damage from shorted or open output.

I. Output Circuit: 70-V line.

2.9 CONE-TYPE LOUDSPEAKERS/SPEAKER MICROPHONES (EXISTING)

2.10 HORN-TYPE LOUDSPEAKERS/SPEAKER MICROPHONES (EXISTING)

2.11 CONDUCTORS AND CABLES

A. Conductors: As required provide acketed, twisted pair and twisted multipair, untinned solid copper. Sizes as recommended by system manufacturer, but no smaller than No. 22 AWG.

B. Insulation: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.

C. Shielding: For speaker-microphone leads and elsewhere where recommended by manufacturer; No. 34 AWG, tinned, soft-copper strands formed into a braid or equivalent foil.
1. Minimum Shielding Coverage on Conductors: 60 percent.

D. Plenum Cable: Listed and labeled for plenum installation.

2.12 RACEWAYS

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used]. Conceal raceway and cables except in unfinished spaces.
1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for Division 26.

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF RACEWAYS

A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements:
1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.

3. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.

C. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceiling by cable supports not more than [**60 inches (1524 mm)**] apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

3.4 INSTALLATION

A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

C. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

D. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.6 SYSTEM PROGRAMMING

A. Programming: Fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

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

C. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:
1. Schedule tests with at least seven days' advance notice of test performance.
2. After installing intercommunications and program systems and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Test originating station-to-station[**, all-call, and page**] messages at each intercommunication station. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.

E. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

F. Intercommunications and program systems will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Perform startup service[and initial system programming].
1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
2. Complete installation and startup checks according to manufacturer's written instructions.

3.9 ADJUSTING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.10 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain the intercommunications and program systems.
   1. Train Owner's maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining the system and equipment.

END OF SECTION 275123

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Electronic safety and security equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electronic safety and security installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work.
   2. Sealing Elements: Interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
   3. Pressure Plates: Plastic. Include two for each sealing element.
   4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in

such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors [**2 inches (50 mm)**] above finished floor level.

G. Size pipe sleeves to provide [**1/4-inch (6.4-mm)**] annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint..

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 280500

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. UTP cabling.
2. Coaxial cabling.
3. RS-232 cabling.
4. RS-485 cabling.
5. Low-voltage control cabling.
6. Control-circuit conductors.
7. Fire alarm wire and cable.
8. Identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

F. RCDD: Registered Communications Distribution Designer.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Pathways shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
1. For coaxial cable, include the following installation data for each type used:
a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings: Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
   1. Vertical and horizontal offsets and transitions.
   2. Clearances for access above and to side of cable trays.
   3. Vertical elevation of cable trays above the floor or bottom of ceiling structure.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Seismic Qualification Certificates: For pathways, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Source quality-control reports.

F. Field quality-control reports.

G. Operation and Maintenance Data: For wire and cable to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Allowable pulling tension of cable.
   2. Cable connectors and terminations recommended by the manufacturer.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: [**25**] <**Insert value**> or less.
   2. Smoke-Developed Index: [**50**] [**450**] <**Insert value**> or less.

C. 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.
   1. Test optical fiber cable to determine the continuity of the strand end to end. Use [**optical-fiber flashlight**] [**or**] [**optical loss test set**] <**Insert test**>.
   2. Test optical fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
   3. Test each pair of UTP cable for open and short circuits.

1.8 PROJECT CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
   1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of [**Category 5e**] [**Category 6**] cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

B. Cable Trays:
   1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
      a. Allied Tube & Conduit; a business unit of Tyco Electrical & Metal Products.
      b. Cablofil.
      c. Cooper B-Line, Inc.
      d. GS Metals Corp.
      e. Snaketray; Cable Management Solutions, Inc.
      f. <**Insert manufacturer's name**>.
   2. Cable Tray Materials: Metal, suitable for indoors, and protected against corrosion by [**electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inch (0.012 mm) thick**] [**hot-dip galvanizing, complying with ASTM A 123/A 123M Grade 0.55, not less than 0.002165 inch (0.055 mm) thick**].
      a. Basket Cable Trays: [**6 inches (150 mm) wide and 2 inches (50 mm) deep**] <**Insert dimensions**>. Wire mesh spacing shall not exceed 2 by 4 inches (50 by 100 mm).
      b. Trough Cable Trays: [**Nominally 6 inches (150 mm)**] <**Insert dimension**> wide.
      c. Ladder Cable Trays: [**Nominally 18 inches (455 mm)**] <**Insert dimension**> wide, and a rung spacing of [**12 inches (305 mm)**] <**Insert spacing**>.
      d. Channel Cable Trays: One-piece construction, [**nominally 4 inches (100 mm)**] <**Insert dimension**> wide. Slot spacing shall not exceed 4-1/2 inches (115 mm) o.c.
      e. Solid-Bottom Cable Trays: One-piece construction, [**nominally 12 inches (305 mm)**] <**Insert dimension**> wide. Provide [**with**] [**without**] solid covers.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."[**Flexible metal conduit shall not be used.**]

D. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2 BACKBOARDS

A. Backboards: Plywood, [**fire-retardant treated,**]3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry".

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. ADC.
2. AMP Netconnect; a brand of Tyco Electronics Corporation.
3. Belden CDT Networking Division/NORDX.
4. Belden Inc.
5. Berk-Tek; a Nexans company.
6. CommScope, Inc.
7. Draka Cableteq USA.
8. Genesis Cable Products; Honeywell International, Inc.
9. Mohawk; a division of Belden.
10. Superior Essex Inc.
11. SYSTIMAX Solutions; a CommScope, Inc. brand.
12. 3M; Communication Markets Division.
13. <**Insert manufacturer's name**>.

B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, [**Category 5e**] [**Category 6**].
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
   a. Communications, General Purpose: Type CM or CMG[**; or MPP, CMP, MPR, CMR, MP, or MPG**].
   b. Communications, Plenum Rated: Type CMP[**or MPP**], complying with NFPA 262.
   c. Communications, Riser Rated: Type CMR[**; or MPP, CMP, or MPR**], complying with UL 1666.
   d. Communications, Limited Purpose: Type CMX[**; or MPP, CMP, MPR, CMR, MP, MPG, CM, or CMG**].
   e. Multipurpose: Type MP or MPG[**; or MPP or MPR**].
   f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
   g. Multipurpose, Riser Rated: Type MPR[**or MPP**], complying with UL 1666.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. ADC.
2. American Technology Systems Industries, Inc.
3. AMP Netconnect; a brand of Tyco Electronics Corporation.
4. Belden CDT Networking Division/NORDX.
5. Dynacom Corporation.
6. Hubbell Incorporated; Hubbell Premise Wiring.
7. Leviton Voice & Data Division.
8. Molex Premise Networks; a division of Molex, Inc.

9. PANDUIT CORP.
10. Siemon.
11. <**Insert manufacturer's name**>.

B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

C. Connecting Blocks: [**110-style for Category 5e**] [**110-style for Category 6**] [**66-style for Category 5e**]. Provide blocks for the number of cables terminated on the block, plus [**25**] <**Insert percentage**> percent spare. Integral with connector bodies, including plugs and jacks where indicated.

2.5 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. AMP Netconnect; a brand of Tyco Electronics Corporation.
2. Belden CDT Networking Division/NORDX.
3. Berk-Tek; a Nexans company.
4. CommScope, Inc.
5. Corning Incorporated; Corning Cable Systems.
6. CSI Technologies Inc.
7. General Cable Technologies Corporation.
8. Mohawk; a division of Belden.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M; Communication Markets Division.
12. <**Insert manufacturer's name**>.

B. Description: Multimode, [**50/125**] [**62.5/125**]-micrometer, [**24**] <**Insert number**>-fiber, [**nonconductive,**]tight buffer, optical fiber cable.
1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with [**TIA-492AAAB**] [**TIA-492AAAA-A**] for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
   a. General Purpose, Nonconductive: Type OFN or OFNG[**, or OFNR, OFNP**].
   b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
   c. Riser Rated, Nonconductive: Type OFNR[**or OFNP**], complying with UL 1666.
   d. General Purpose, Conductive: Type OFC or OFCG[**; or OFNG, OFN, OFCR, OFNR, OFCP, or OFNP**].
   e. Plenum Rated, Conductive: Type OFCP[**or OFNP**], complying with NFPA 262.
   f. Riser Rated, Conductive: Type OFCR[**; or OFNR, OFCP, or OFNP**], complying with UL 1666.
5. Conductive cable shall be [**steel**] [**aluminum**] armored type.
6. Maximum Attenuation: [**3.50**] <**Insert number**> dB/km at 850 nm; [**1.5**] <**Insert number**> dB/km at 1300 nm.
7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:
1. Jacket Color: [**Aqua for 50/125-micrometer cable**] [**Orange for 62.5/125-micrometer cable**].
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

2.6 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. ADC.
2. American Technology Systems Industries, Inc.
3. Belden CDT Networking Division/NORDX.
4. Berk-Tek; a Nexans company.
5. Corning Incorporated; Corning Cable Systems.
6. CSI Technologies Inc.
7. Dynacom Corporation.
8. Hubbell Incorporated; Hubbell Premise Wiring.
9. Molex Premise Networks; a division of Molex, Inc.
10. Siemon.
11. <**Insert manufacturer's name**>.

B. Cable Connecting Hardware: Meet the Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
1. Quick-connect, simplex and duplex, [**Type SC**] [**Type ST**] [**Type LC**] [**Type MT-RJ**] connectors. Insertion loss not more than 0.75 dB.
2. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. Alpha Wire Company.
2. Belden CDT Networking Division/NORDX.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka Cableteq USA.
6. <**Insert manufacturer's name**>.

B. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.
1. No. [**14**] <**Insert size**> AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG59/U: NFPA 70, Type CATVR.
1. No. [**20**] <**Insert size**> AWG, solid, silver-plated, copper-covered steel conductor.

2. Gas-injected, foam-PE insulation.
3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
4. Color-coded PVC jacket.

E. RG-6/U: NFPA 70, Type CATV or CM.
1. No. [**16**] <**Insert size**> AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

F. RG59/U: NFPA 70, Type CATV.
1. No. [**20**] <**Insert size**> AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.
3. PVC jacket.

G. RG59/U (Plenum Rated): NFPA 70, Type CMP.
1. No. [**20**] <**Insert size**> AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

H. NFPA and UL Compliance: Coaxial cables shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655, and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
1. CATV Cable: Type CATV[**, or CATVP or CATVR**].
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR[**; or CATVP, CATVR, or CATV**], complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.8 COAXIAL CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. Emerson Network Power Connectivity Solutions; AIM Electronics brand.
2. Leviton Voice & Data Division.
3. Siemon.
4. <**Insert manufacturer's name**>.

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.9 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.
1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.

5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.
1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.10 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM[**or CMG**].
1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.
1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.11 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.
1. 1 pair, twisted, [**No. 16 AWG, stranded (19x29)**] [**and**] [**No. 18 AWG, stranded (19x30)**] tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
1. 1 pair, twisted, [**No. 16 AWG, stranded (19x29)**] [**and**] [**No. 18 AWG, stranded (19x30)**] tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.12 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, [Type THHN-THWN, complying with UL 83, in raceway] [Type XHHN, complying with UL 44, in raceway].

B. Class 2 Control Circuits: Stranded copper, [Type THHN-THWN, complying with UL 83, in raceway] [power-limited cable, complying with UL 83, concealed in building finishes] [power-

limited tray cable, complying with UL 83, in cable tray] [Type XHHN, complying with UL 44, in raceway].

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.13 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. Comtran Corporation.
2. Draka Cableteq USA.
3. Genesis Cable Products; Honeywell International, Inc.
4. Rockbestos-Suprenant Cable Corp.
5. West Penn Wire; a brand of Belden Inc.
6. <**Insert manufacturer's name**>.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, [not less than] [No. 18 AWG] [<Insert wire size> AWG] [size as recommended by system manufacturer].
1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor[**with outer jacket**] with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.14 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. Brady Corporation.
2. HellermannTyton.
3. Kroy LLC.
4. PANDUIT CORP.
5. <**Insert manufacturer's name**>.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.15 SOURCE QUALITY CONTROL

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.

E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA-569-B.

B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Pathway Installation in Equipment Rooms:
1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits [**3 inches (75 mm)**] <**Insert dimension**> above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems." for installation of supports for pathways, conductors and cables.

3.3 WIRING METHOD

A. Install wiring in metal raceways and wireways. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be [**3/4 inch (21 mm)**] <**insert size**>. Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Install wiring in raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be [**3/4 inch (21 mm)**] <**Insert size**>. Control and data transmission wiring shall not share conduit with other building wiring systems.

C. Install cable, concealed in accessible ceilings, walls, and floors when possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:
1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

D. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with [**Category 5e**] [**Category 6**] rating of components and that ensure [**Category 5e**] [**Category 6**] performance of completed and linked signal paths, end to end.
1. Comply with TIA/EIA-568-B.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

E. Optical Fiber Cable Installation:
1. Comply with TIA/EIA-568-B.3.
2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

F. Outdoor Coaxial Cable Installation:
1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches (915 mm).

G. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than [**60 inches (1525 mm)**] <**Insert dimension**> apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

H. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable [**72 inches (1830 mm)**] <**Insert size**> long shall be neatly coiled not less than [**12 inches (300 mm)**] <**Insert size**> in diameter below each feed point.

I. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.5 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."
1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:
1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is[**not**] permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables [**may**] [**shall not**] be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.6 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:
1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.7 CONNECTIONS

A. Comply with requirements in Division 28 Section "Perimeter Security Systems" for connecting, terminating, and identifying wires and cables.

B. Comply with requirements in Division 28 Section "Intrusion Detection" for connecting, terminating, and identifying wires and cables.

C. Comply with requirements in Division 28 Section "Access Control" for connecting, terminating, and identifying wires and cables.

D. Comply with requirements in Division 28 Section "Video Surveillance" for connecting, terminating, and identifying wires and cables.

E. Comply with requirements in Division 28 Section "PLC Electronic Detention Monitoring and Control Systems" for connecting, terminating, and identifying wires and cables.

F. Comply with requirements in Division 28 Section "[**Digital Addressable Fire-Alarm System**] [**Zoned (DC Loop) Fire-Alarm System**]" for connecting, terminating, and identifying wires and cables.

G. Comply with requirements in Division 28 Section "Refrigerant Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.8 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA-569-B, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.9 GROUNDING

A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.10 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.11 FIELD QUALITY CONTROL

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
4. Optical Fiber Cable Tests:
    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:
        1) Multimode Link Measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
5. Coaxial Cable Tests: Comply with requirements in Division 27 Section "Master Antenna Television System."

D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 282300 - VIDEO SURVEILLANCE SYSTEMS

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.

1.2 SUMMARY

A. This Section includes new, and additions to existing, video surveillance system consisting of cameras, data transmission wiring, recording equipment, and a control station with its associated equipment.

B. Video surveillance system shall be integrated with monitoring and control system specified in Division 28 Section "Card Access" that specifies systems integration.

1.3 DEFINITIONS

A. AGC: Automatic gain control.

B. B/W: Black and white.

C. CCD: Charge-coupled device.

D. MPEG: Moving picture experts group.

E. NTSC: National Television System Committee.

F. UPS: Uninterruptible power supply.

1.4 SUBMITTALS

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

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
   1. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
   2. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
   3. UPS: Sizing calculations.

C. Wiring Diagrams: Power, signal, and control wiring, and grounding. Include diagrams for each piece of specific equipment and for system with all terminals and interconnections identified

D. 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.

E. Manufacturer Seismic Qualification Certification: Submit certification that cameras, camera-supporting equipment, accessories, and components will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints." Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures and Operation and Maintenance Data," include the following:
   1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

H. Warranty: Special warranty specified in this Section.

1.5 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.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
   1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F (16 to 29 deg C) and a relative humidity of 20 to 80 percent, noncondensing.
   2. 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 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 1 enclosures.

3. 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 (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 3R enclosures.
4. 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 deg F (minus 34 to plus 50 deg C) 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 (137 km/h) and snow cover up to 24 inches (610 mm) thick. NEMA 250, Type 3 enclosures.
5. 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.
6. Corrosive Environment: System components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. NEMA 250, Type 4X enclosures.
7. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.7 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: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SYSTEM REQUIREMENTS

A. Video signal format shall comply with the NTSC standard composite video, interlaced. Composite video signal termination shall be 75 ohms.

B. 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 entry connection to components.
   1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 16 Section "Transient Voltage Suppression."
   2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 16 Section "Transient Voltage Suppression" as recommended by manufacturer for type of line being protected.

C. 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.

2.3 STANDARD CAMERAS

A. Manufacturers:
1. American Dynamics.
2. CNB.

B. Color Camera:
1. Pickup Device: CCD interline transfer, 380,000 pixels.
2. Horizontal Resolution: 500 lines.
3. Signal-to-Noise Ratio: Not less than 50 dB, with the camera AGC off.
4. With AGC, manually selectable on or off.
5. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. The illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with the camera AGC off.
6. Manually selectable modes for backlight compensation or normal lighting.
7. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
8. White Balance: Auto-tracing white balance, with manually settable fixed balance option.

C. Automatic Color Dome Camera: Assembled and tested as a manufactured unit, containing a dome assembly, color camera, motorized pan and tilt, zoom lens, and receiver/driver.
1.
2. Pickup Device: CCD interline transfer, 380,000 pixels.
3. Horizontal Resolution: 480 lines.
4. Signal-to-Noise Ratio: Not less than 50 dB, with the camera AGC off.
5. With AGC, manually selectable on or off.
6. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. The illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with the camera AGC off.
7. Manually selectable modes for backlight compensation or normal lighting.
8. Pan and Tilt: Direct-drive motor, 360-degree rotation angle, and 180-degree tilt angle. Pan-and-tilt speed shall be variable controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.
9. Preset positioning: 8 user-definable scenes, each allowing 16-character titles. Controls shall include the following:
   a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
   b. Motion detection shall be available at each camera position.
   c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.
10. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.
11. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
12. Motion Detector: Built-in digital.
13. Dome shall support multiplexed control communications using coaxial cable, or a separate cable, as recommended by manufacturer.

2.4 LENSES

A. Manufacturers:
1. American Dynamics.
2. CNB.

B. Description: 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. Varifocal Lenses: With focal range as indicated on drawings. Replace lenses that do not view the owner's desired field of view at no cost.
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.

2.5 POWER SUPPLIES

A. Power Supplies: Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, type as recommended by camera and lens manufacturer.
1. Enclosure: NEMA 250, Type 1.

2.6 CAMERA-SUPPORTING EQUIPMENT

A. Manufacturers:
1. American Dynamics.
2. CNB

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

C. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

D. Protective Housings for Fixed and Movable Cameras: Steel or 6061 T6 aluminum enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.
1. Camera Viewing Window: Lexan window, aligned with camera lens.
2. Duplex Receptacle: Internally mounted.
3. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
4. Built-in thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
5. With sun shield that does not interfere with normal airflow around the housing.
6. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.
7. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.
8. Enclosure Rating: NEMA 250, Type 3R.

2.7 MONITORS

A. Manufacturers:
1. American Dynamics, or equivalent.

B. Color:
1. Metal cabinet units designed for continuous operation.
2. Screen Size (Diagonal Dimension): 22” minimum or as noted on drawings.
3. Horizontal Resolution: 300 lines.
4. Minimum Front Panel Devices and Controls: Power switch, power-on indicator, and brightness, contrast, color, and tint controls.
5. Degaussing: Automatic.
6. Mounting: as noted on drawings.
7. Electrical: 120-V ac, 60 Hz.

2.8 DIGITAL VIDEO RECORDERS

A. Manufacturers:
1. Advent (to match existing, verify prior to bid).

B. Digital, time-lapse type, full frame and motion recorder, with removable/upgradable hard drive. Units and unit components shall consist of off-the-shelf parts available and serviceable by DFCM electronics personnel and shall include but not be limited to the following features:
1. Recording Rate: Up to 15 frames/second per camera, selectable per camera.
2. Resolution: 720 by 480, minimum.
3. Programming shall be from trackball and push buttons on face of the recorder, or by other means as recommended by the manufacturer, settings shall be displayed on any video monitor connected to the recorder. Programming shall include the following:
   a. Motion analysis graph.
   b. Password protection.
   c. Alarm and timer controls.
   d. Continuous recording option.
   e. Time-lapse operating modes.
   f. Search video by time, event, or motion.
4. Programming: LAN interface card for software updating, image archiving, and image transfer to a PC.
5. Storage: 1TB, removable IDE hard drive.
6. Compression: MPEG-4.
7. Time and Date Generator: Records time (hr:min:sec) and date legend of each frame.
8. Audio Recording: 70 to 7000 Hz. Input: phono and microphone; output: phono.
9. Mounting: as noted on drawings.

2.9 SIGNAL TRANSMISSION COMPONENTS

A. Cable: Coaxial cable elements have 75-ohms nominal impedance. Cables shall comply with Division 16 Section "Master Antenna Television System."

B. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Of three-piece construction, consisting of a crimp-type center tit, sleeve, and main body.

C. Wire Labeling: Provide labeling system for all wire at their point of origin to indicate what remote location all wires are terminated at. Submit wire labeling system for approval. Provide owner with index to all wire labels.

D. UTP Video Transmission Transceivers: Provide passive UPT video transmission transceivers and wire as indicated with the following features: All equipment rack mounted; channel rack mounted hubs and direct-connect to camera modules; Built in transient protection; Full motion color video; Uses unshielded twisted pair (UTP) #24 AWG or thicker; Provide UTP video transmission transceivers by Network Video Technologies, Inc. or equivalent only.

E. Fiber Optic Video Transmission Transceivers: Provide fiber optic video transmission transceivers and transmission cables as indicated with the following features: All equipment rack mounted; System Bandwidth: 8MHz; Signal-to-Noise Ratio: >54 dB @ maximum optical attenuation; I/O Level: 1 V p-p; I/0 impedance: 75 Ohms; Differential Gain: <3%; Differential Phase: < 3 degrees; Optical.

PART 3 - EXECUTION

3.1 WIRING

A. Wiring Method: Install cables in raceways except in accessible indoor ceiling spaces, in attics, and as otherwise indicated. Conceal raceways and wiring except in unfinished spaces.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

C. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with 84-inch- (2134-mm-) 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.

D. Install power supplies and other auxiliary components at control stations, unless otherwise indicated.

E. Avoid ground loops by making ground connections at only the control station.
   1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

F. Identify system components, wiring, cabling, and terminals according to Division 16 Section " Electrical Identification."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and supervise pretesting, testing, and adjusting of video surveillance equipment.

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

C. 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. Prepare equipment list described in Part 1 "Submittals" Article.
2. Verify operation of auto-iris lenses.
3. 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.
4. 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 (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
5. Set and name all preset positions; consult Owner's personnel.
6. Set sensitivity of motion detection.
7. Connect and verify responses to alarms.
8. Verify operation of control-station equipment.

D. 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.

E. 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.

F. Remove and replace malfunctioning items and retest as specified above.

G. Record test results for each piece of equipment.

H. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.4 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. 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' utilization of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.5 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.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video surveillance equipment.
   1. Train Owner'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. Refer to Division 1 Section "Closeout Procedures" and "Operation and Maintenance Data."
   4. Conduct a minimum of 8 hours' training as specified in instructions to Owner's employees in Division 1 Section "Closeout Procedures" and "Demonstration and Training."

END OF SECTION 282300

SECTION 284619 - PLC ELECTRONIC DETENTION MONITORING AND CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes modifications of existing detention monitoring and control operating system, based on PLC technology with touchscreen video-control panel operator interface.

1.3 DEFINITIONS

A. I/O: Input/output.

B. LAN: Local Area Network.

C. LED: Light-emitting diode.

D. Monitoring: Acquisition, processing, communication, and display of system and equipment status data and event and alarm signals.

E. MOV: Metal-oxide varistor.

F. Nonsecure: Closed and locked and with no unlock or open commands pending. (For doors and gates.)

G. PLC: Programmable logic controller.

H. Secure: Unlocked or open. (For doors and gates.)

I. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.

J. TVSS: Transient voltage surge suppressor.

K. Zone: A space or area defined on Drawings for a specific purpose.

1.4 SUBMITTALS

A. Product Data: For components for detention monitoring and control and systems integration. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
   1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
   2. Control Panel Layout: At full scale, show required artwork and device identification.

3. Wiring Diagrams: Detail specific power, control, signal, communication, and data wiring and cabling. Coordinate nomenclature and presentation with block diagram.
4. Raceway Riser Diagrams: Detail raceway runs required for detention monitoring and control and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.

C. Coordination Drawings:
1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections.
   a. Indicate methods used to achieve systems integration.
   b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
   c. Describe characteristics of network and other data communication lines.
   d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.

D. Samples for Initial Color Selection: For control panel graphics and for equipment with factory-applied color finishes.

E. Samples for Color Verification: For each control panel graphic and for each type of exposed finish required for equipment.

F. Touchscreen Audible Tones and Visual Indications: Include the following material for use at touchscreen video control panels:
1. Audible indication, notification, and alarm tones.
2. Visual materials for touchscreen video control panel display screens, complete with proposed shapes, colors, scale, and textual content, including the following:
   a. Graphics, including maps.
   b. Icons.
   c. Dialog boxes.
   d. Help messages, prompts, and instructions.
3. Submittal Media: CD-ROM with color printout of graphic and textual material.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by detention door control manufacturer and detention monitoring and control equipment manufacturer and with detention facility construction and systems integration experience with the following electronic systems:
1. Perimeter security.
2. Fire alarm.
3. Intercommunications.
4. Paging.
5. Remote lighting and power controls.
6. Video surveillance.

B. Detention Electronic Systems Integrator Qualifications: A qualified detention electronics systems installer who has completed detention electronic systems integration work for installations similar in material, design, and extent to that indicated for Project, and whose work has resulted in construction with a record of successful in-service performance.
1. Experience: Full detention electronic systems integration responsibility for no fewer than 10 detention facility projects (jails or prisons) that have been completed and in operation for a minimum of 5 years.

2. Experience: Detention Electronic Systems Integrator shall employ personnel that have documented experience exercising full responsibility for overall systems integration for the types of detention monitoring and control systems indicated for this Project and for facilities similar in scope to this Project.

C. 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.

1.6 SERVICE CONDITIONS

A. Environmental Service Conditions: Systems, equipment, and components shall be capable of operating continuously in the following conditions without mechanical or electrical damage or degradation of operating capability:
1. Ambient Temperature: 140 deg F (60 deg C).
2. Relative Humidity: 10 to 95 percent, noncondensing.

B. Electrical Service Conditions: Equipment shall operate continuously in the following conditions without damage or degradation of operating capability:
1. Voltage Range for Equipment with a Nominal Rating of 120-V AC: 88 to 132 V.
2. Voltage Range for Equipment with a Nominal Rating of 24-V DC: 22 to 85 V.
3. Frequency Range for Equipment with a Nominal Frequency Rating of 60 Hz: 45 to 63 Hz.

1.7 COORDINATION

A. Coordinate Work of this Section with that of Sections specifying systems and components required to be integrated with detention monitoring and control equipment.

B. Coordinate features of detention monitoring and control components with those of related detention electronic systems.
1. Provide integrated interconnections of compatible components.
2. Match components and interconnections for optimum performance of indicated functions.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide <**Insert number**> months' full maintenance by skilled employees of Detention Electronic Systems Integrator or Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper detention monitoring and control system operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment and components.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuses: A quantity equal to 10 percent of each type and rating indicated, but no fewer than 1 of each.
2. Network Interface Cards: One spare delivered to owner of each type installed.
3. Relay Modules: Two of each type used.
4. Wire and Cable Terminals: Five of each type and size used.
5. PLC CPUs: One of each type and configuration used.
6. PLC EPROMs: One completely programmed module for each program used.
7. I/O Modules: [One] <Insert number> for every 10 of each type installed.

8. Complete Touchscreen Video Control Panel Program: One.

PART 2 - PRODUCTS

2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control Panels for Monitoring and Control Operator Interface:
   1. Touchscreen video control panels.

B. Normal System and Device Programming Equipment:
   1. Touchscreen video control computer.

C. Interconnection of Touchscreen Video Control Panels: Through a dedicated touchscreen file server network.

D. Interconnection of PLCs with Each Other and with Control Panels: Through a PLC network.

E. Interface between PLC System and Controlled and Monitored Devices: Relay assemblies.

F. Systems Integration: Detention monitoring and control system shall be integrated with features and functions of the following systems and equipment:
   1. Intercommunication and paging specified in Division 27 Section "Intercommunications and Program Systems."
   2. Fire alarm system specified in Division 28 Section "Fire Detection and Alarm."
   3. Closed-circuit television specified in Division 28 Section "Video Surveillance."
   4. Existing detention door locking system.

G. Reliability: Components, arrangement, assembly, construction, wiring, connections, integration, adjustments, and system programming shall have a reliability such that no single malfunction or equipment failure can impair the normal operational control function of more than 10 percent of doors and associated components controlled by the overall system.

H. Independent Operation: System equipment, software, operation, controls, and communications shall provide, as an optional emergency control mode, totally independent operation for the primary local control panel for each operational area.

I. System Response Time: For indicated items, shall be within the following limits:
   1. Mechanical Locking and Unlocking of Doors: Within one second of operator action at control panel.
   2. Initiate Mechanical Movement of Electrically Controlled Doors and Gates: Within one second of operator action at control panel.
   3. Initiate Audible and Visual Indications at Control Panels: Within one second of change of state of monitored field devices, or of alarm or intercom call-in events.
   4. Initiate Automatic Switching and Start of Automatic Countdown Cycles: Within one second of occurrence of specified triggering event.

J. Audible Tone: A distinctive, audible, confirmation signal tone shall sound locally for 0.25 second each time an operator performs a switching, selection, acknowledgment, silence, reset, or other similar operation at a control panel.

2.2 COMPONENT PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housings and entering through power, communication, signal, control, and sensing leads. Include surge protection for external wiring of each conductor entry connecting to components.
   1. Minimum Protection for AC Power Circuits 120 V and More: Multistage surge suppressors, listed under UL 1449, using a combination of inductors and silicon avalanche diodes or equivalent, and with 300-V suppression level and 5-nanosecond maximum response time.
      a. Silicon Avalanche Diodes: Bipolar, Grade A, plus or minus 5 percent tolerance.
      b. Discrete TVSS Units External to Protected Equipment: Enclosed modules with indicating lights labeled "power on" and "failure."

B. Interference Protection: Component function shall be unaffected by radiated-radio-frequency interference and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz, or by conducted interference signals up to 0.25-V RMS injected into power supply lines at 10 to 10,000 MHz.

2.3 TOUCHSCREEN VIDEO CONTROL PANELS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Elo Touchsystems (or equivalent).

C. Description: Computer-operated, video control unit complying with 47 CFR 15, Subparts A and B, for Class A and B digital devices and having dynamic presentation of annunciation and controls on a monitor equipped with a touch-sensitive panel overlay on the front of display screen. Include the following minimum features, components, and capabilities:
   1. CPU: IBM-compatible computer housed in an industrial chassis and having the following requirements:
      a. CPU Speed and Capacity: <Insert processor speed and cache capacity.>
      b. RAM: 2GB.
      c. Fixed Disk Drive: RAID mirror 320G.
      d. CD-ROM Drive: 40 X.
      e. Floppy Disk Drive: One, 3-1/2 inches.
      f. Internal Backup Tape Drive:
      g. Sound Card: As required.
      h. One serial and one parallel port in addition to those required for detention monitoring and control.
      i. Network Interface Cards: Dual ports matched to protocol and media used for each network.
      j. Automatic Reboot Capability: When power is restored after an outage.
      k. Operating System: As required.
   2. Monitor and Touchscreen Panel: **21 inches (533 mm).** With high resolution.
      a. On-Screen Colors: **256**.
      b. Video Card Capacity: capacity as required, VRAM with capture.
      c. Interface Overlay: Capacitive touch or surface acoustic wave switching system.
         1) Single, Transparent-Glass, Panel Type: 92 percent light transmission.
         2) Touch Position Accuracy: Maximum error; 0.125 in. (3.18 mm).
         3) Touch Endurance: 2,000,000 finger touches at 12-ounce force (3.34-N) pressure at any selected point, regardless of screen size, without failure or noticeable degradation.

4) Activation Force Required for Switching: **1 to 8 ounces force (0.3 to 2.23 N)**, software adjustable.

3. Peripheral Components:
   a. Keyboard.
   b. Mouse.
   c. Speakers: Two amplified computer speakers.

D. General Functional Performance:
1. Video display shall be connected so an operator can interact with and control the computer, responding to inputs and creating outputs that control external functions.
2. Data from external sensors and signal sources shall be processed by external I/O units, PLCs, and the computer, and initiate displays of system and equipment status, activity, and other information on the monitor and through related signal devices. Where indicated, data from external sensors and signal sources also initiate automatic system responses.
3. Software correlates various points on the touch-sensitive panel with software-generated graphics so operational outputs are created by touching the screen at locations defined by the graphics.
4. Touch-panel outputs shall be processed by computer and by integrated external I/O modules and PLCs to produce control signals and operating voltages for switching devices and relays that control those devices.
5. Computer software shall provide pop-up and tool-bar-type menus and special icons that guide the operator in responding to events and in switching to different screen displays to obtain access to different control panel functions.

E. Detailed Operational Performance: Include the following control, monitoring, and performance functions by touchscreen video control panels and associated equipment and circuits:
1. Global Functions: Touching the icons or toolbar buttons at the bottom of each graphic screen, and elsewhere as indicated, controls the following functions:
   a. Operator Log-On and Log-Off: Dialog box appears for password entry.
      1) Logging Off: Dialog box prompts operator to verify intent to log off, and to either exit the process or complete it.
      2) Completion of log-off process displays log-on screen for the next operator to access touchscreen functions.
   b. Map Finder: Graphic map index appears with provision for the operator to select a map and its associated functions to be displayed.
   c. Clean Screen: All icons and graphics are extinguished for 15 seconds to facilitate physical cleaning of control panel screen surface.
   d. System Utilities: System management screen appears, presenting functional choices appropriate for the logged-on operator's programmed access level; choices inappropriate for the operator appear in dialog box but are grayed out to indicate they are inactive. Choices include the following:
      1) Configure station users.
      2) Change password.
      3) Calibrate touchscreen.
      4) Set date and time.
   e. Scroll to Adjacent Area: Four icons, one on each side of the screen, near the edge. Touching these icons selects the screen for adjacent area on that side of area currently displayed.
2. Audible and Visual Alarm Indications and Controls: Red alarm icon flashes and a distinctive tone pulses continuously at control panel when an alarm condition or uncontrolled change of state occurs in controlled or monitored circuits or equipment.
   a. Tone is silenced by momentary-contact silence control icon, and status icon becomes steady.

b. Depressing the momentary-contact reset control icon extinguishes status icon for alarms that can be reset at control panel.

3. Door Status Visual Indications: Denoted by status icon at door control icon as follows:
   a. Nonsecure: Red icon.
   b. Secure: Green icon.
   c. Alarm (Door Position or Lock Status Inconsistent with Control Position or Status): Flashing red icon.
4. Panel-Controlled, Unlocking and Automatic-Locking, Single Swing Doors: Operation of control icon unlocks door for a period programmable from 1/2 to 10 seconds.
5. Power-Operated Door and Gate with Open and Close Control: Operation of open control icon applies power, initiating opening. Limit switch supplied with door or gate mechanism stops unit at end of its travel. If control icon is operated during opening or closing cycle, mechanism stops for one second before reversing.
6. Individually Controlled Cell Doors: Touching the control icon locks or unlocks door, depending on current status.
7. Doors with Both Individual and Group Control:
   a. Touching the individual door control icon locks or unlocks door, depending on current status.
   b. Doors are individually enabled for group locking and unlocking using separate group assign and unassign control icon.
8. Assign and Unassign Group-Door Function:
   a. Touching the group door assign and unassign control icon lights that icon and a red status icon at each door that is currently assigned for group operation, and permits unassigning any of those doors by touching the associated lock and unlock control icon.
   b. Doors not currently assigned are assigned for group operation by touching the associated lock and unlock control icon while group assign and unassign control icon continues to be lighted.
   c. Touching the group door assign and unassign control icon again returns system to normal operating mode.
9. Group Door Control, Locking and Unlocking: Touching the group lock and unlock control icon locks doors in group if they are currently unlocked. If doors are locked, action presents a dialog box requiring operator confirmation before unlocking doors assigned to group.
   a. Locking or unlocking of doors is performed individually at one-second intervals.
10. Door Interlocking: Interlocks designated groups of doors and gates.
    a. Effect: When one door in a group is unlocked or open, the others in the group are prevented from being unlocked or opened.
    b. Interlocked Door Indications: The following status indications apply to interlocked doors in addition to specified indications for controlled doors:
       1) Door status icons for secure doors light steadily yellow when one door in group is nonsecure; icons flash yellow when group is in override mode.
       2) When two or more doors in group are nonsecure, status icons for doors in group flash red; tone pulses; touching the silence control icon silences tone.
11. Operator-Controlled, Emergency Door Release: Operation of emergency-release control icon presents a dialog box requiring operator confirmation before unlocking designated doors. Doors remain unlocked until relocked individually or in groups.
    a. Next operation of icon locks door.
    b. Locking or unlocking of doors is performed individually at one-second intervals.
    c. Indications: Red status icon at emergency-release control icon is lighted and sounds a distinctive tone.
       1) When emergency-release control icon unlocks doors, status icon flashes continuously five times per second and audible alarm pulses.
       2) Touching the silence control icon silences audible alarm.

3) When doors are relocked or alarm-reset control icon is touched, status icon is extinguished and alarm is silenced.

12. Automatic Fire-Door Release: A signal from fire alarm control panel triggers automatic, sequential, timed release of doors in a specific zone. Fire alarm system determines zone(s) for which doors are to be released.
    a. Doors in egress path are released first, after a timed countdown period.
    b. When doors in egress path are unlocked, a countdown period for release of cell doors begins.
    c. Countdown periods are of programmable duration.
    d. Countdown may be stopped during either period by actuating an abort control icon at control panel.
    e. If there is an additional fire alarm signal from same zone after countdown has been aborted but before smoke detectors have been cleared and fire alarm system reset, system shall restart the countdown; the restarted countdown shall have the same time remaining as remained when cycle was aborted.
    f. If there is an additional fire alarm signal from a different zone before original initiating smoke detectors are cleared and fire alarm system is reset, countdown shall begin in the new zone with the same time remaining as remained for original alarm zone at time of second alarm.
    g. Locking or unlocking of doors is performed individually at one-second intervals.
    h. Indications: A separate countdown status icon and a distinctive audible tone designated for each countdown cycle shall indicate the countdown is in process.
        1) While cycle is in progress, icon for that cycle shall flash five times per second and tone shall pulse once for each second of the countdown.
        2) When doors are released, nonsecure status icons for those doors shall begin flashing continuously.
        3) During each countdown cycle, digital clock in the control panel shall count down the time remaining before release of doors in that cycle.
13. Intercommunication Control:
    a. Incoming Intercom Call: When staff or inmate station initiates a call to control panel station, a distinctive tone sounds and icon at station control icon flashes.
    b. Operator acknowledges call by touching the intercom control icon associated with calling station or the acknowledge control icon. Status icon is lighted steadily and tone ceases.
    c. Acknowledgment of the call opens an audio path to calling station and permits operator to conduct two-way conversation using push-to-talk switch and microphone.
    d. Operating the control icon again, or selecting another station, terminates the connection and the status icon at first station is extinguished.
    e. Listening or Outgoing-Call Function: Operator selects station by operating the station select control icon. Operator may listen or proceed with two-way conversation using push-to-talk switch and microphone. Selecting station again, or selecting another station, terminates the connection.
14. Paging: Operator transmits paging announcements by touching a momentary-contact paging zone control icon, closing a momentary push-to-talk switch, and using microphone. Status icon lights at paging zone control icon until it is operated again to terminate the connection. Multiple zones may be paged simultaneously by operating more than one paging zone control icon before transmitting.
15. Audio-Level Alarm: Touching the audio-level-alarm control icon shall place intercom system in monitoring mode for cell noise level.
    a. Red icon at audio-level-alarm control icon is lighted when system is in alarm mode.
    b. When in alarm mode, system alarms when noise level in any cell exceeds an adjustable preset threshold. Green icon flashes at control panel intercom station control icon for the cell originating the alarm, and audible alarm tone pulses.

c. Touching the silence control icon silences audible alarm and causes green icon to light steadily.
d. When reset control icon is operated, the green status icon is extinguished.

16. Video Switching Control:
    a. Signal from assigned camera is automatically switched to spot monitor at control panel when the following occurs:
        1) Operator selects associated intercommunication station by operating the selector control icon for the station, by acknowledging incoming intercom call, or by touching the camera control icon.
        2) A staff-duress signal is initiated in the vicinity of camera.
    b. Video signal from assigned camera is manually switched to spot monitor at control station when operator touches camera control icon.
    c. Green status icon on the graphic control panel identifies and locates the video camera currently providing the signal for spot monitor at control panel location.
17. Cell Lighting Control: Two control icons for each cell provide on-off and inmate control for lights and receptacles in each cell.
    a. Touching the inmate control icon energizes receptacles and enables or disables local control of lighting within cell, depending on current status.
    b. Touching the on-off control icon turns lights and receptacles on or off, depending on current condition.
    c. Indications: Icon at on-off control icon is lighted when lighting and power are on; otherwise, icon is not lighted. Icon at inmate control icon is lighted when inmate control is enabled.
18. Electrical Circuit On-Off Switching Control: A control icon for each function toggles between on and off to energize and de-energize circuits.
    a. Indications: Icon at control icon indicates when lighting or power is on.
19. Fire Alarm System Status Indications:
    a. Red fire alarm icon flashes when alarm occurs.
    b. Red icon for each zone flashes when alarm occurs for that zone.
    c. Red icon for each detection device and each manual station flashes when that device or station is in an alarm state.
    d. Audible alarm tone pulses when alarm signal occurs.
    e. Depressing the silence control icon silences audible tone and causes status icon to light steadily. After fire alarm system is reset, touching the reset control icon extinguishes status icon.
20. Smoke Control: Touching the smoke control icon initiates a signal to HVAC system controls to start preestablished smoke-control operating mode. Yellow status icon flashes continuously to confirm HVAC system is operating in smoke-control mode.
21. Duress-Status Indications: When staff-duress device for a zone is activated, red staff-duress status icon for that zone flashes and audible alarm tone pulses. Operating the silence control icon silences audible alarm and causes status icon to light steadily. Operating the reset control icon extinguishes status icon.

2.4 TOUCHSCREEN VIDEO CONTROL SOFTWARE

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. Wonderware; Invensys Systems, Inc. (or equivalent).

C. Description: Custom developed from a detention application package, and commercially available through a distributor network.

D. Features and Functional Performance Requirements:
   1. Programmed to provide features and functional performance indicated without use of proprietary software code.
   2. Automatic alignment and adjustment of touchscreen interface with video monitor and its graphics.
   3. Visual and Audible Presentations: Designed for simplicity and rapid operator orientation, and conducive to operator focus on the highest-priority mission functions assigned to operator and station.
   4. Maps: Facility floor and site plans presented in selectable, scaled, on-screen, part-plan increments with the following content:
      a. Basic architectural elements depicted with white lines on a black background.
      b. Floor plan features for which control icons or status indicators are specified, including doors, gates, intercom stations, paging speakers, video cameras, duress stations, fire alarm stations, smoke detectors, and similar items.
      c. Egress paths.
      d. Control icons represent switches for specified control functions, operating through integration with the touchscreen interface.
      e. Indicator icons show status of related feature by changing from nonlighted to lighted, by flashing, and by changing color.
   5. Priority Level Implementation: For processing and registering alarms, device signals, and intercom activity in the following order:
      a. Fire and other life-safety alarms.
      b. Staff-duress alarms.
      c. Inmate sound-level monitoring alarms.
      d. Door-monitoring and perimeter-security alarms and trouble signals.
      e. Intercom calls from other master stations.
      f. Intercom calls from access and inmate-movement control stations.
      g. Intercom calls from cells.
      h. System and equipment derangement and trouble alarms.
   6. Access Protection: Log-on passwords for access to various functional capabilities provided at each touchscreen station. System shall support multiple users.
   7. Audible Tones: Multiple computer-generated tones that can be programmed for frequency, volume, duration, and repetition rate and selected for each audio annunciation application.

E. Telephone Technical Support: Unlimited technical support to respond to user questions about hardware and communication link troubleshooting, reconfiguring, and adjusting.
   1. Telephone Calls: Toll free.
   2. Availability: 24 hours per day, 7 days per week.
   3. Responder Qualifications: Engineer or technician familiar with detention monitoring and control equipment.

2.5 TOUCHSCREEN LAN FILE SERVER

A. Description: IBM-compatible microcomputer configured as a network file server. Minimum features, components, and capabilities shall be same as specified for touchscreen video control panel CPU, with the following exceptions:
   1. Fixed-Disk Drives: 320GB.
   2. Power Supply: 225-W rating.
   3. Expansion Slots: Four.
   4. Internal Backup Tape Drive:
   5. Network Interface Cards: Dual, matched to network protocols, operating systems, and media.
   6. Network Operating System: Proprietary system.
   7. Peripheral Components:

a. Keyboard:
b. Mouse: [Two] [Three]-button model
c. Monitor: 19 (228 mm), Color.

2.6 PLC SYSTEM (EXISTING)

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. GE Fanuc Automation (to match existing).

C. Description: Modular, generic PLCs manufactured for, and in general use in, general-purpose industrial applications; complete with controllers, power supplies, I/O modules, communication links, and housings. Features and functionality include the following:
1. Characteristics: Adequate memory, software, I/O connections, communication capabilities, power capacity, and logic and timing functions to meet indicated requirements.
2. Controller and I/O Uniformity: Manufacturer's different models shall be compatible, sharing common mounting centers, commands, control language, instruction code, and I/O structure.
3. I/O Modules: Same manufacturer as PLCs and applicable within the full range of manufacturer's controller models.
4. Controller Output Capacity: Adequate to drive local I/O within 50 feet (15 m) of controller without interface modules or additional power supplies. Adequate to drive remote I/O within 1640 feet (503 m) of controller using remote I/O interface modules and a high-speed data link.
5. Controller EPROM: Stores system application program, operating software, and fixed database.
6. Controller General-Purpose RAM: Provides operational memory and storage for operating database. RAM is backed up by lithium battery of adequate capacity for a 12-month outage.
7. Controller Communication Capability: Serial RS 232, RS 422, or RS 485, plus standard Ethernet LAN, using nonproprietary protocol and copper or fiber-optic media.
8. Diagnostics and Failure Response: Controllers and associated I/O devices shall be self-monitoring and self-diagnostic. They shall also monitor their communication links. Failure of any type shall be indicated by LED on the unit, and occurrence of failure shall be communicated to applicable control panel, where it shall result in a failure indication. An analysis of failure shall be registered in PLC memory and shall be remotely software accessible.
9. Redundant Controllers: If installed to meet indicated reliability requirements, a failure of controlling PLC shall be sensed by the redundant unit, which shall assume control and transmit a controller malfunction signal within one second.
10. PLC and Local I/O Power Supply: Regulated dc unit located in the same rack enclosure as units it serves; with 24-V output. Include the following features:
    a. Capacity: 150 percent of load.
    b. Voltage Control and Protection: Remote sensing of voltage at load and internal overvoltage protection.
    c. Fault Protection: Fuses and inherent design protect against short circuit and overload, including shorting of either leg of dc output to conductive material energized intentionally or through malfunction at 120 V.
    d. Surge Protection: Protect the power supply and its I/O circuits in all modes of operation.

11. Automatic Battery Backup: Capacity to deliver total power-supply input full-load current within specification tolerances for four hours if normal power source fails. Backup circuit shall be arranged so no alarms, indications, control functions, or data are lost or degraded during transfer of source.
12. PLC and Local I/O Device Mounting: Rack mounting in ventilated enclosures.

2.7 DATA COMMUNICATIONS

A. Touchscreen video control panels and PLCs shall communicate directly with each other via serial communication links.

B. Touchscreen video control panels shall communicate via LANs as follows:
1. Communication between Touchscreen Video Control Panels and PLCs: Via PLC LAN, using PLC network interfaces.
2. Touchscreen Video Control Panel Communication: Via a touchscreen LAN, control panel to control panel.
a. Touchscreen LAN: Interconnect touchscreen video control panels and touchscreen LAN file server, providing indicated reliability level, maximum response times, and the following additional features:
1) Hardware: Network interface components with self-diagnostic capability to identify causes of network malfunctions and describe appropriate remedial action in on-screen displays accessible at touchscreen video control panels.
2) Media: Redundant signal paths with automatic switching from normal to alternate signal paths in the event of normal path failure. Use twisted-pair copper cable.

2.8 RELAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Phoenix (or equivalent).

C. Description: Plug-in, electromagnetic or solid-state electronic units. Arrange in relay assemblies that have the following features:
1. Fuse and TVSS protection.
2. Indicating LED for each relay.

D. Rating: A minimum of 125 percent of the inrush current of controlled device, but not less than 6 A.

2.9 CABLES

A. Low-Voltage Control Cable: Multiple conductor, color-coded, No. 20 AWG copper, minimum.
1. Sheath: PVC, except use sheath listed for plenums in plenum-type spaces.

B. Twisted-Pair Signal and Data Cable:
1. Comply with Division 28 Section "Conductors and Cables for Electronic Safety and Security."

2.10 ACCESSORIES

A. Interfaces with equipment specified in other sections include accessories, adapters, electronic interface units, and connections required for functional performance indicated.

2.11 SECURITY FASTENERS

A. Description: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive system type, head style, material, and protective coating as required for assembly, installation, and strength.
   1. Drive System Types: pinned Torx or pinned hex (Allen).
   2. Socket Flat Countersunk Head Fasteners:
      a. Heat-treated alloy steel, ASTM F 835 (ASTM F 835M).
      b. Stainless steel, ASTM F 879 (ASTM F 879M), Group 1 CW.
   3. Socket Button Head Fasteners:
      a. Heat-treated alloy steel, ASTM F 835 (ASTM F 835M).
      b. Stainless steel, ASTM F 879 (ASTM F 879M), Group 1 CW.
   4. Protective Coatings for Heat-Treated Alloy Steel:
      a. Zinc chromate, ASTM F 1135, Grade 3 or 4; for exterior applications and interior applications where indicated.
      b. Zinc chromate with oil, ASTM F 1137, Grade 1, or black oxide; unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention monitoring and control system.
   1. Examine roughing-in for embedded and built-in anchors to verify actual locations of system connections before detention monitoring and control system installation.
   2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention monitoring and control system.

B. Inspect built-in and cast-in anchor installations, before installing detention monitoring and control system, to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

C. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

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

3.2 SYSTEMS INTEGRATION

A. Integrate installations and connections of equipment and systems to existing detention door harsware and as specified in this Section with those specified in the following Sections:
   1. Division 08 Section "Detention Door Hardware" for detention hardware controlled by detention monitoring and control system.

2. Division 27 Section "Intercommunications and Program Systems" for intercommunication and paging equipment.
3. Division 28 Section "Video Surveillance" for closed-circuit television equipment.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Anchor equipment to building structural elements and support according to requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounted items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

F. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

G. Right of Way: Give to raceways and piping systems installed at a required slope.

H. Security Fasteners: Where accessible to inmates, install detention monitoring and control components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project.

3.4 GROUNDING

A. AC Power and Lighting Circuits: Comply with Division 26 Section "Grounding and Bonding for Electrical Systems" for materials and installation requirements.

B. Class 2 Power - Limited Power, Signal, and Control Circuits: Ground systems and equipment according to manufacturer's written instructions.

3.5 WIRE AND CABLE INSTALLATION

A. Low-Voltage Analog Circuits: Install wiring as specified in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Network and Data-Line Twisted-Pair Circuits: Install wiring as specified in Division 28 Section "Conductors and Cables for Electronic Safety and Security."

C. Fiber-Optic Cable: Install and terminate as specified in Division 28 Section "Conductors and Cables for Electronic Safety and Security.

D. Bundle, train, and support wire and cable in enclosures.

E. Connections: Make connections according to manufacturer's wiring diagrams, unless otherwise indicated.

F. Wiring Method: Install wire and cable in metal raceway except where another wiring method is indicated.

3.6 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

D. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

E. Rectangular Sleeve Minimum Metal Thickness:
1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

F. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

G. Cut sleeves to length for mounting flush with both surfaces of walls.

H. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

I. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

J. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

K. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

L. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

M. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

N. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

O. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.7 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.9 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

B. Label each monitoring and control module and equipment unit with a unique designation that is consistent with wiring diagrams and schedules in operation and maintenance manual. Label conductors and cables at each end and where exposed within troughs and pull-and-junction boxes.

3.10 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. Report results in writing.

B. Perform tests and inspections and prepare test reports.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
1. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.
2. Inspect new and existing detention monitoring and control components for defects and physical damage, labeling of testing laboratory, and nameplate compliance with the Contract Documents.
3. Inspect interiors of enclosures, including the following:
   a. Integrity of mechanical and electrical connections.
   b. Component type and labeling verification.
   c. Ratings of installed components.
4. Electrical Tests: Use caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
   a. Continuity tests of circuits.

b. Operational Tests: Set and operate controls at each control panel and at each monitored and controlled device to demonstrate their functions and capabilities. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Record response to each test command and operation, including logging and printout of events. Record time intervals between initiation of alarm conditions and registration of alarms at control (panel), and between initiation of commands and execution at controlled equipment.
   1) Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled and systems to be integrated with detention monitoring and control work.
   2) Simulate malfunctions to verify protective features and appropriate alarm indications.

5. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.
6. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
7. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, retests, and inspections. Include printout of testing event log, annotated to provide a machine record of testing that corresponds to written test records.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 01 Section "Demonstration and Training."

B. Video Training: Provide two DVD copies of instructional videotape covering features, capabilities, and operation of installed control panels. Illustrate actual equipment and related functions. Show cause-and-effect sequences during operation. Cross-reference instruction manuals throughout. Follow same order of presentation as instruction manual. Include the following:
   1. Control Panel Operation:
      a. Describe and demonstrate indications, controls, and features.
      b. Demonstrate responses to all indications, call-ins, and emergencies.
      c. Demonstrate setup of control panels and related equipment.
      d. Describe and demonstrate safety and security precautions.
      e. Show how to get help.
   2. System and Equipment Maintenance:
      a. Describe and demonstrate safety and security precautions.
      b. Demonstrate basic maintenance; need for qualified technician for internal maintenance; basic maintenance schedule; techniques for keeping terminals properly tightened, filter screens clean, and overheat sensors checked; and techniques for performing other required servicing.
      c. Demonstrate adjustment of controls. Describe warranty and show how to get help.
   3. System Troubleshooting:
      a. Demonstrate troubleshooting procedure for common software, programming, control panel, communications, and field device problems.

3.12 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested by Owner, within one year of date of Substantial Completion, provide a minimum of three project-site visits to adjust and calibrate components,

to make programming adjustments and revisions, and to assist Owner's personnel in making program changes and in adjusting equipment and controls. Provide up to 12 hours of services, exclusive of travel time, for these purposes.

3.13 CONTROL PANEL SCHEDULES

A. Panel Designation: Create and

B. Type of Panel: Touchscreen.

C. Configuration of Switches and Other Components on Panel: Graphic.

D. Controls, Visual Status Indicators, and Other Features: Include the following in addition to indicators specified as associated with controls in Part 2:
   1. Door and Gate Controls and Indications:
      a. Individual Lock and Unlock, Group Assign Controls and Visual Status Indicators for Doors.
      b. Individually Controlled Cell Door Controls.
      c. Controls for Mechanical Operation of Power-Operated Doors and Gates: control for doors and gates.
      d. Status Indications for Each Controlled Door and Gate: Nonsecure and secure.
      e. Controls and Visual Status Indications for Interlocked Door Groups.
      f. Override control for each interlocked door group.
      g. Controls for Doors with Group and Individual Control Option.
      h. Controls for Group Locking and Unlocking of Doors.
      i. Control for Assigning Doors to a Group for Locking and Unlocking.
      j. Abort Control for Automatic Fire-Door Release Function:
         1) Countdown indicator for egress doors.
         2) Countdown indicator for cell doors.
      k. Inmate Access Enable and Disable Controls.
      l. Individual Status Indications for Doors with Status Indications Only at Panel (No Lock and Unlock Control).
   2. Audio Controls and Visual Indications: Include the following:
      a. Intercom Station Controls and Indications.
      b. Paging Zone Controls and Indications:
      c. Audio Threshold Monitoring Controls and Indications.
   3. Video Controls and Indications: Include the following.
      a. Controls for Manual Selection of Individual Cameras for Monitor Viewing.
      b. Visual indications identifying camera switched to spot monitor.
      c. Automatic Camera Selection: Coordinate requirements with owner.
   4. Lighting, Power, Duress, Fire Alarm, Duress and Miscellaneous Controls and Indications: Maintain all existing controls and indications on new control screens.
   5. Acknowledge control for intercom call-in.
   6. Microphone for intercom and paging.
   7. Push-to-talk control for microphone.
   8. Digital clock.

E. Touchscreen Map Requirements: Include the following maps:
   1. Floor Plans of each housing unit: Include locking and unlocking, intercom, and audio and video features.
   2. Floor Plans of each half of the main building as indicated on the site plan.
   3. Floor Plan of Facility: Include elevator, generator set, and UPS features.
   4. Facility Site Plan: Include perimeter detection and related features.

F. Duplicates of Maps Indicated for Other Touchscreen Video Control Panels: Include functions for which this panel may require control or indication.

END OF SECTION 284619