Request for Proposals (RFP)
Surveillance Security System for Horace W. Porter School
Columbia, CT
Solicitation Number 2019-1

TOWN OF COLUMBIA

323 Jonathan Trumbull Highway, Columbia, CT 06237
(860) 228-0110 Fax: (860) 228-1952

The Town of Columbia is accepting sealed bids for the RFP for Surveillance Security System for Horace W. Porter School (HWP) at the Town Administration Office at Town Hall, 323 Route 87, Columbia, Connecticut, until **4:00 p.m. on July 15, 2019**. Thereafter, the names of those submitting qualifications and proposals will be read aloud.

The RFP documents will be available from the Town Administration Office at Town Hall, 323 Route 87, Columbia, Connecticut, telephone number (860) 228-0110 or the Town's website, www.columbiact.org. After bids are received, the Town Administrator may analyze whether vendors have submitted comparable bids and meet the requirements called for. In reviewing the bids, the Town Administrator may consider the past performance, financial responsibility, and sales and service experience of the vendors. The Town reserves the right to reject any or all bids, to waive any defects in same, or to choose to make purchases other than strictly in accordance with price considerations, and/or to choose other than the lowest bidder, if it be deemed in the best interest of the Town of Columbia or as funding allows.

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TABLE OF CONTENTS

INTRODUCTION 3
MANDATORY WALKTHROUGH 3
KEY EVENT DATES 3
OBTAINING RFQ&P DOCUMENTS 4
QUESTIONS ABOUT PROPOSAL REQUIREMENTS 4
RFQ&P RESPONSE SUBMISSION INSTRUCTIONS 4
PRESUMPTION OF FIRM BEING FULLY INFORMED 5
INTERPRETATION OF ACCEPTABLE WORK 5
TAX EXEMPTIONS 5
INSURANCE 5
1) General Conditions: 5
2) Insurance Limits and Coverage: 7
INDEMNIFICATION AND HOLD HARMLESS 8
PERMITS 8
FAIR EMPLOYMENT PRACTICES 8
TERMS AND CONDITIONS OF CONTRACT 8
AWARDING THE CONTRACT 8
GENERAL INSTRUCTIONS 10
INSTRUCTIONS FOR FIRM'S SUBMITTING RESPONSES 10
EVALUATION AND SELECTION CRITERIA 10
SELECTION PROCEDURES 10
RESPONSE FORM # 1 REQUIRED RESPONSE 11
RESPONSE FORM #2 REQUIRED RESPONSE 12
RESPONSE FORM #3 REQUIRED RESPONSE 13
EXHIBIT A – SCOPE OF SERVICES 14
EXHIBIT B – SAMPLE CONTRACT FOR SURVEILLANCE SECURITY SYSTEM FOR HORACE W. PORTER SCHOOL 16

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INTRODUCTION

THE TOWN OF COLUMBIA is requesting responses from all vendors and resellers of Surveillance that meet the Horace W. Porter School requirements as stated below. Qualified firms (including individuals) interested in providing Surveillance Security Systems services (hereinafter "Firm" or "Firm") to the TOWN OF COLUMBIA, Horace W. Porter Surveillance Security System Services .

Prospective vendors must be experienced in evaluating the proposed systems/needs thus providing the best possible solution and installing the best type of security systems for Horace W. Porter School.

An overview of the required Surveillance System services includes:

- The best video coverage with the least amount of cameras.
- Seamless video management through intuitive Client interface.
- Analytics features to include Appearance Search and Unusual Motion Detection.
- Quality video retention and export via HDSM SmartCodec technology support.
- Light and Dark UI Themes.
- ONVIF® Profile S and Profile T compliant VMS.
- Scalable integration with external systems.
- Detailed management, monitoring, and reporting of system status and security.
- Alarm escalation to create complete end-to-end workflows for monitoring, assigning, and acknowledging alarms.
- ACC Mobile software.

Carefully examine the specifications, conditions and limitations. The selection of the successful Contractor will be made based on a thorough evaluation and determination of the relative ability of each Bidder to deliver quality installation and commissioning services in a cost-effective manner.

MANDATORY WALKTHROUGH

The Town will hold a walkthrough of the Horace Porter School on July 8, 2019 at 10:00 am. The Horace Porter School is located at 3 Schoolhouse Rd., Columbia, CT. Proposals submitted by vendors that did not attend the walkthrough shall be rejected.

KEY EVENT DATES

Advertisement of RFQ&P	**June 26, 2019**
Public Opening of Responses	**4:00 pm, July 15, 2019**
Contract Awarded (Not Definite)	**July 17, 2019**

STANDARD INSTRUCTIONS TO PROPOSERS (continued)

OBTAINING RFQ&P DOCUMENTS

Specifications and RFQ&P documents may be obtained from The RFP documents will be available from the Town Administration Office at Town Hall, 323 Route 87, Columbia, Connecticut, telephone number (860) 228-0110 or the Town's website www.columbiact.org under the RFP/RFQ/Bids tab.

QUESTIONS ABOUT PROPOSAL REQUIREMENTS

Respondents with questions regarding the submission requirements may contact the following purchasing agent of the Town of Columbia by email: Mark Walter, townadministrator@columbiact.org.

RFQ&P RESPONSE SUBMISSION INSTRUCTIONS

A. One (1) original and two (2) copies of all responses must be submitted in a sealed envelope clearly marked "Surveillance Security System for Horace W. Porter School". If forwarded by mail or courier, the sealed envelope must be addressed to "Town Administrator Town of Columbia, 323 Route 87, Columbia, Connecticut 06237". Responses must be at the office of the Town Administrator by the time of the Public Opening of Responses date noticed in Section 2 titled Key Event Dates. Postmarks are NOT an acceptable waiver of this policy. Corrections and/or modifications received after the first response is publicly opened will NOT be accepted. Late submittals will be rejected.
B. If you do not intend to submit a proposal, return all documents, materials and attachments to the aforementioned representative/address by July 8, 2019.
C. Ditto marks or words such as "SAME" on the Response Form are NOT considered writing and must not be used.
D. All information must be submitted in ink or typewritten. Mistakes may be crossed out and corrections inserted. Corrections must be initialed by the person signing the response.
E. Responses are considered valid for ninety (90) days after response(s) are opened. Firms submitting responses may not withdraw, cancel or modify their response for a period of ninety (90) days after response(s) are opened.
F. Responses must be signed by an authorized person representing the legal entity of the firm submitting the response.
G. The inability to meet any specified requirements(s) must be stated in writing and attached to the response form or written on the response form.
H. Any and all exceptions of the respondent to the terms and specifications of this RFP shall be made in writing and submitted in full with the proposal.
I. The respondent shall bear all costs associated with submitting its RFP.

J. Any and all written RFP documents submitted to the Town shall be property of the Town and therefore shall be subject to public disclosure under the Freedom of Information Act.

PRESUMPTION OF FIRM BEING FULLY INFORMED

At the time the first response is opened, each Firm is presumed to have read and be thoroughly familiar with all RFP and contract documents herein. Failure or omission of the Firm to receive or examine any information shall in no way relieve any Firm from obligations with respect to their response.

The Town may, before or after proposal opening and in its sole discretion, clarify, modify, amend or terminate this RFP if the Town determines it is in the Town's best interest. Any such action shall be effected by a posting on the Town's website, www.columbiact.org. Each respondent is responsible for checking the Town's website to determine if the Town has issued any addenda and, if so, to complete its proposal in accordance with the RFP as modified by the addenda.

INTERPRETATION OF ACCEPTABLE WORK

The specifications, response and contract documents are to be interpreted as meaning those acceptable to the TOWN of COLUMBIA. Any substantive changes or interpretations will be issued by the Town in writing as an addendum.

TAX EXEMPTIONS

The TOWN of COLUMBIA is exempt from Federal Excise taxes and Connecticut Sales and Use taxes. Firms shall avail themselves of these exemptions.

INSURANCE

The firm awarded this contract must provide a current Certificate of Insurance to the Town Administrator PRIOR to commencement of work, with the following requirements:

1) **General Conditions:** Within ten (10) business days of the award or notice, or prior to the start of work, whichever comes first, the contractor/insured will provide, pay for, and maintain in full force and effect the insurance outlined here for coverage's at not less than the prescribed minimum limits of liability. Such coverage is to remain in force during the life of the contract and for such additional time as may be required, and will cover the contractor/insured's activities, those of any and all subcontractors, or anyone directly or indirectly employed by any of them, or by anyone for whose acts of them may be liable.

STANDARD INSTRUCTIONS TO PROPOSERS (continued)

A. **Certificates of insurance:** The contractor/insured will give the Town of Columbia a certificate of insurance completed by a duly authorized representative of their insurer certifying that at least the minimum coverage's required here are in effect and specifying that the liability coverage's are written on an occurrence form and that the coverage's will not be canceled, non-renewed, or materially changed by endorsement or through issuance of other policy(ices) of insurance without sixty (60) days advance written notice to the Town of Columbia's, Town Administrator.

   Failure of the owner to demand such certificate or other evidence of full compliance with these insurance requirements or failure of the town to identify a deficiency from evidence provided will not be construed as a waiver of the contractor/insured's obligation to maintain such insurance.

B. **Insurer Qualifications:** All Insurance will be provided through companies authorized to do business in the State of Connecticut and considered acceptable by the Town.
C. **Additional Insured:** The policy or policies providing insurance as required, with the exception of professional liability and worker's compensation, Contractor shall add the Town of Columbia on all insurance policies. Contractor shall provide the Town of Columbia with a certificate of insurance. Contractor insurance shall be primary and non-contributory.
D. **Retroactive Date and Extended Reporting Period:** Any coverage written on a claims made basis requires an extended reporting period of at least 36 months upon final payment or date of project completion, whichever occurs later.
E. **Subcontractors' Insurance:** The contractor will require and cause each subcontractor hired and/or employed by the contractor to purchase and maintain insurance of the types specified below. When requested by the town, the contractor will furnish copies of certificates of insurance evidencing coverage for each subcontractor. Any coverage written on a claims made basis requires an extended reporting period of at least 36 months upon final payment or date of project completion, whichever occurs later.
F. **Waiver of Subrogation:** The contractor shall waive subrogation and all rights of recovery against the Town of Columbia. Contractor will require all insurance policies related to the work and secured and maintained by the contractor to include clauses waiving subrogation in the certificate of insurance. The contractor/insured will require of subcontractors, by appropriate written agreements, similar waivers each in favor of all parties enumerated in this section.

G. **Hold Harmless:** To the fullest extent permitted by law, Contractor shall defend, indemnify and hold harmless the Town of Columbia, and their boards, employees and agents from and against all claims, damages, losses, judgments and expenses, including but not limited to attorney fees of counsel selected by the Town, that arise from or may arise from the performance of the work, the supplying of materials and/or the breach of this Agreement provided that such claim, loss, damage, judgment and/or loss expense is attributable to bodily injury, sickness, disease or death, or to injury or destruction of tangible property (other than the work itself) but only to the extent caused by the negligent acts or omissions of the Contractor, subcontractors, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder.

2) Insurance Limits and Coverage:

A. To the extent applicable, the amounts and types of insurance will conform to the minimum terms and conditions and coverages of the national Insurance Services Office (ISO) policies, forms, and endorsements.

B. If the contractor/insured has self-insured retention' s or deductibles under any of the following minimum required coverage's, the contractor/insured must identify on the certificate of insurance the nature and amount of such self-insured retention's or deductibles and provide satisfactory evidence of financial responsibility for such obligations. All self-insured retention's or deductibles will be the contractor/insured's sole responsibility.

C. Commercial General Liability: The contractor/insured will maintain commercial general liability insurance covering all operations by or on behalf of the contractor/insured on an occurrence basis against all claims for personal injury (including bodily injury or death) and property damage (including loss of use).

Such insurance will have these minimum limits:

- $ 1,000,000 each occurrence.
- $ 1,000,000 each occurrence if blasting is required.
- $ 2,000,000 general aggregate with dedicated limits per project site.
- $ 2,000,000 products and completed operations aggregate.
- $ 1,000,000 personal and advertising injury.

D. Automobile Liability: The contractor/insured will maintain business auto liability coverage for liability arising out of any auto, including owned, hired, and non-owned autos.

E. Workers' Compensation: The contractor/insured will maintain workers' compensation and employer's liability insurance in the following minimum limits:
   - Workers' Compensation: statutory limits.
   - Employer's Liability: $1,000,000 bodily injury for each accident.
   - Employer's Liability: $1,000,000 bodily injury by disease each employee.
   - Employer's Liability: $1,000,000 bodily injury disease aggregate.

F. Professional Liability: $1,000,000
G. Governing Law: This agreement shall be governed by the laws of the State of Connecticut.
H. These are, minimum insurance limit requirements only. Additional insurance coverage's and amounts may be required by the Town of Columbia on a per project basis.

INDEMNIFICATION AND HOLD HARMLESS

To the fullest extent permitted by law the Firm shall defend, indemnify and hold harmless the Town, its officers, officials, employees and volunteers from any and all claims, injuries, damages, losses or suits including attorney fees, arising out of or in connection with the performance of services hereunder, except for injuries and damages caused by the sole negligence of the Town.

PERMITS

The Firm is solely responsible for obtaining all required permits, obtaining all necessary inspections and approvals, and satisfying any and all fees. The Town will waive all TOWN of COLUMBIA fees for building permits and inspections.

FAIR EMPLOYMENT PRACTICES

The Firm agrees not to discriminate against any employee or applicant for employment in the performance of this RFP's work with respect to hire, tenure, terms, conditions, or privileges of employment due to race, sex, age, religion, national origin, or other condition proscribed by State or Federal law.

TERMS AND CONDITIONS OF CONTRACT

The terms, conditions, and requirements of the contract for Surveillance Security System for Horace W. Porter School are detailed in the attached specimen contract.

AWARDING THE CONTRACT

The TOWN of COLUMBIA reserves the right to accept or reject, any, all, or any part of responses, to waive formalities or informalities, and to make awards that are deemed to be in the best interests of the Town.

STANDARD INSTRUCTIONS TO PROPOSERS (continued)

It is the Town's policy to not award to those who owe TOWN of COLUMBIA prior year(s) property taxes.

The "Contract Awarded" date in section 2. entitled Key Event Dates is the date the contract is anticipated to be awarded. It is not a date certain.

The lowest priced response is NOT the sole determining factor when making awards.

END OF STANDARD INSTRUCTIONS TO PROPOSERS

GENERAL INSTRUCTIONS

INSTRUCTIONS FOR FIRM'S SUBMITTING RESPONSES

The services to be performed under the Contract are more particularly described in **Exhibit A** attached hereto. Requirements as to how the services are to be performed are set forth in the Sample Contract, **Exhibit B**, attached hereto.

EVALUATION AND SELECTION CRITERIA

THE TOWN OF COLUMBIA will base its evaluation of responses on the following criteria, which are not necessarily in order of importance:

a) The Firm's understanding of the work as evidenced by the quality of the response submitted.
b) The background and experience of the Firm in providing services requested and past successful history of assignments on an as-needed basis.
c) The demonstrated effectiveness of the Firm's proposed service delivery system to ensure quality service and timely completion of services in an efficient manner.
d) The background, education, qualifications and relevant experience of key personnel to be assigned to this contract that would work with the Town on a regular basis. Also, the qualifications of any subconsultants or subcontractors the Firm intends to use in the performance of this contract.
e) The appropriate licenses, if applicable held by Firm's staff and subconsultants and subcontractors.
f) References attesting to the quality of similar services performed.
g) Competitiveness of proposed fees and costs, although the Town is not bound to select the Firm(s) who proposes the lowest fees and costs.
h) The Town reserves the right to negotiate fees with the selected Firm(s).
i) Any other factor or criterion that THE TOWN OF COLUMBIA, in its sole discretion, deems or may deem relevant or pertinent for such evaluation.
j) Firm's willingness to execute the contract as provided.

SELECTION PROCEDURES

a) The Town reserves the right to reject any or all responses, to accept any response, to negotiate changes to response terms, and to waive minor inconsistencies with the RFQ&P, if deemed in the best interest of the Town.
b) Responses submitted in response to this RFQ&P will be reviewed against the Selection Criteria listed above.
c) A Selection Committee may assist the Town in choosing a Firm(s) to provide the requested services.
d) Firms submitting the most comprehensive and qualified responses may be invited to an interview with a Selection Committee.
e) The Town intends to enter into contracts with the Firm(s) whose responses are determined to best meet the needs of the Town.

TOWN OF COLUMBIA, CONNECTICUT

RESPONSE FORM # 1 REQUIRED RESPONSE

SURVEILLANCE SECURITY SYSTEM FOR HORACE W. PORTER SCHOOL

penalty of perjury and other remedies available to the TOWN of COLUMBIA, the undersigned certifies this response is submitted without collusion and all responses are true and accurate. If selected to perform services(s) hereunder, it is agreed this form's a contractual obligation to provide such services at fees specified in Response Form #2, subject to and in accordance with all instructions, responses and contract documents, including any addenda, which are all made part of this response.

_____ _____
Signature of Authorized Person Date

_____
Printed Name of Authorized Person

_____
Company Title of Authorized Person

_____
Name of Company

_____
Address of Company

_____
Address of Company

_____
City, State, and Zip Code

_____ _____
Telephone Number Facsimile Number

_____
e-mail address

END OF RESPONSE FORM #1

TOWN OF COLUMBIA, CONNECTICUT
RESPONSE FORM #2 REQUIRED RESPONSE

SURVEILLANCE SECURITY SYSTEM FOR HORACE W. PORTER SCHOOL

I, WE, the undersigned, hereby agree to furnish and deliver at the net price named herein, the following items, subject to and in accordance with specifications and conditions contained herein, all of which are made a part of this proposal.

BASE BID: _____

ALTERNATIVE 1: _____

ALTERNATIVE 2: _____

Lump Sum Price to furnish Surveillance Security System for Horace W. Porter School as described above: TOTAL _____

BIDDING COMPANY:_____

ADDRESS:_____

_____

COMPANY REP: _____

SIGNATURE:_____ DATE:_____

TELEPHONE:_____ EMAIL:_____

THE TOWN RESERVES THE RIGHT TO ACCEPT OR REJECT PROPOSALS IN WHOLE OR IN PART DUE TO TECHNICAL DEFECTS, BUDGET LIMITATIONS OR ANY LEGAL REASON DEEMED TO BE IN THE IN THE TOWN'S BEST INTEREST.

END OF RESPONSE FORM #2

TOWN OF COLUMBIA, CONNECTICUT
SURVEILLANCE SECURITY SYSTEM FOR HORACE W. PORTER SCHOOL
SAMPLE CONTRACT
RESPONSE FORM #3 REQUIRED RESPONSE

Under penalty of perjury and other remedies available to THE TOWN of COLUMBIA, the undersigned certifies:

☐ Firm agrees to execute the Sample Contract (Exhibit B), or

☐ Firm takes the following exceptions to the Sample Contract (Exhibit B):

Paragraph	Exception

END OF RESPONSE FORM #3

EXHIBIT A – SCOPE OF SERVICES

TOWN OF COLUMBIA, CONNECTICUT
SURVEILLANCE SECURITY SYSTEM FOR HORACE W. PORTER SCHOOL

STATEMENT OF WORK

Base Bid requirements are to add the following equipment per design requirements *:

Part type	Model	Quantity	Required Mounts and Accessories				
NVR	HD-NVR4-PRM-192TB-NA	1					
Camera	3.0C-H4A-D1-IR-B	29					
Camera	15C-H4A-3MH-270	2	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-60W-NA
Camera	20C-H4A-4MH-360	2	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-POLE1	POE-INJ2-60W-NA
Camera	3.0C-H4SL-BO1-IR	2	H4-BO-JBOX1				
Camera	3.0C-H4A-DO1-IR-B	2					
Camera	2.0C-H4IRPTZ-DP30-WP	3	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-95W-NA		

*Require (40) ACC7-ENT ACC 7 Enterprise Edition camera license

Alt 1 requirements are to add the following equipment per design requirements *:

Part type	Model	Quantity	Required Mounts and Accessories				
Camera	3.0C-H4A-D1-IR-B	4					
Camera	15C-H4A-3MH-180	1	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	POE-INJ2-60W-NA	
Camera	15C-H4A-3MH-270	1	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-60W-NA
Camera	3.0C-H4A-DO1-IR-B	1					

*Require (7) ACC7-ENT ACC 7 Enterprise Edition camera license

Alt 2 requirements are to add the following equipment per design requirements *:

Part type	Model	Quantity	Required Mounts and Accessories				
Camera	3.0C-H4A-D1-IR-B	3					
Camera	15C-H4A-3MH-180	3	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	POE-INJ2-60W-NA	
Camera	15C-H4A-3MH-270	2	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-60W-NA

*Require (8) ACC7-ENT ACC 7 Enterprise Edition camera license

Note the following information and scope of work which includes but is not limited to the following:

- The Contractor shall include all licenses associated with the systems bid by said Contractor. In no case shall the Contractor bill the Owner for any additional license fees or costs within 3 year of installation completion.
- All Software licenses except as noted shall be included in the proposal. No recurring licenses or Software Upgrade Plan (SUP) costs will be accepted. No additional licenses for client workstations will be accepted.
- The Contractor shall be responsible for all programming noted here. This includes, but is not limited to:

    a. Programming of all equipment and functionality to provide operational system within the scope of this project and to which adheres to the manufacturer's installation and networking best practices.
    b. Setup camera settings and recording according to system design parameters.
    c. Setup Appearance Search on all analytic cameras and UMD on those cameras that are not required to be included in Appearance Search.
    d. Create analytic alarms on high priority cameras to trigger per designated schedule.
    e. Create rule notifications to send email to pre-determined administrators when a designated server or camera event takes place.
    f. Setup workstations to have access to the VMS via ACC Client.
    g. Set up mobile devices to connect with the WebEndpoint using Mobile3 App.

- All cable and cable installation shall be supplied and performed by the security Contractor.
- All conduit, where required by code, shall be provided by the Contractor and adhere to AHJ fire and building code.
- All 120VAC power shall be provided by others but shall be coordinated by the Contractor.
- All power supplies and ancillary equipment shall be installed in the designated data rooms (also known as MDF/IDF rooms as coordinated with OMG
- All equipment warranties must start upon owner activation of the systems
- All equipment must be of new condition (no refurbished).
- All items be IP (Internet Protocol) based, digital units.
- All video equipment must fit within the **latest ONVIF** standards. (Profile C is for IP-based; Profile G is for edge storage and retrieval; and Profile S is for IP-based video systems.
- All equipment will operate on the current power grid unless otherwise required.
- All equipment must be self-sustaining or at least self-starting in the event of a power failure
- No analog equipment will be considered.
- System will be capable of running on generator power or battery backup system.
- All external equipment will equal or exceed IP-66 weatherproofing standards
- Connections for all exterior equipment will equal or exceed IP-67 waterproofing standards
- Connections for interior equipment with equal or exceed IP-66 standards
- All exposed equipment, conduits and other related mounting components will meet IK-10 vandal resistance standards.
- All hardware providing Power over Ethernet will be at the IEEE 802.3at Power over Ethernet standard for every supplied port.
- The Contractor shall coordinate the installation of additional POE switches located in identified IDF/MDF telephone rooms for all Ethernet devices as needed by others.

Networking Equipment

- Vendor shall provide networking equipment necessary to support the Surveillance System based on their needs of the current IT infrastructure of OMG
- Vendor shall be responsible for configuration of required all networking equipment to include wireless transitions to those camera locations that are not capable of hardwire cable runs.
- When possible, recording and client traffic should be segmented into two physical/virtual networks. NIC 1 on the servers can be assigned to the recording traffic and connect to the recording network. NIC 2 on the servers can be assigned to the client traffic and connect to the client network.
- If physical segmentation is impossible, segmentation of the traffic via Vlan or VRF is critical and mandatory for managing potential ARP broadcast issues.
- Network connections to servers and clients should be 1gbps minimum.
- Externally mounted cameras over copper should be protected with surge suppression.
- Do not load an Ethernet connection greater than 70% of its maximum throughput.

Capacity

- The System must be capable of retaining video for a minimum of 60 days at no less than 13 frames per second for outdoor cameras and 10 frames per second for indoor cameras at 40% activity for analytics cameras set to record 1 frame per second when there is no activity using idle scene mode.

- The camera system will shall require internal storage devices that provide access to consolidated block level data storage and must be accessible to server(s) so that the devices appear like locally attached volumes to the operating system.

Exporting

- It is required for the System to be capable of exporting video in standard video formats capable of being played without additional codecs on a Windows OS, MAC OS or standalone commercial DVD player. (I.E. AVE, AVI, WMF).
- File package should also be downloadable to USB sticks.
- It is required that there be exporting in a proprietary format for authenticity of video to be used in a court of law, the necessary codecs and software to play video on a standard Windows OS computer. Said software and codecs, without additional cost, must be legally capable of being distributed to third parties for review of exported video.
- The exported video will need to be of evidentiary quality. This would include court acceptable digital time-date and forensic level watermarks/stamping to prove video was not altered.

Contractor Assumptions and Requirements

- Install all low voltage cabling and connectivity connections required by Surveillance system to include wireless transmission from cameras to recorder.
- All camera installation, configuration, setup, program and related work shall be performed by authorized integrators/electronic technicians certified by the manufacturer.
- Install all line voltage cabling and connections required for project unless otherwise indicated by owner.
- Provide shop drawings as needed during implementation
- Provide as-built drawings showing logical system design and cable diagrams for future facility reference.
- As required, the Contractor will coordinate efforts with other related trades.
- Any fire rated plywood (if required) on which panel and power supply equipment will be installed will be supplied and installed by Contractor.
- All cabling shall be permanently tagged/labeled with purpose and location on each end of the cables.
- Provide new and working equipment
- No refurbished or reutilized components.
- Provide all labor and parts needed to assemble the specified Surveillance systems. (I.e. racks, cabling, mounting hardware, etc.)
- Complete all work in a timely manner and carried out with professional workmanship.
- Follow all local, regional, and national codes for installation of the Camera System.
- Provide identity and contact information of the Project Manager who will act as a single point of contact for all activities regarding this project.
- Provide training on all equipment and software per performance testing standards outlined in this document.
- Contractor shall be responsible for configuration of required networking equipment with the assistance of Horace W. Porter School IT Department.
- Follow all local, regional, and national codes for installation of the system.
- Leave work site clean after each day of work.
- Complete all work in a timely manner and carried out with professional workmanship.

Requirements

- Provide a security project manager to act as a single point of contact for Contractor during the full implementation of the Security System.
- Provide assistance with defining operational modes of the system and any information needed by Contractor for initial programming of the system.
- Provide timely return of information or sign-offs needed by Contractor during implementation.
- Perform necessary internal network configurations to accommodate the install.
- Provide floor plans of building in the projects
- Provide proposed camera locations
- Provide high voltage electrical information electrical information.
- Provide internal IT worker(s) assistance to vendors for collaboration of the install efforts to enable a smooth transition.
- All remote sites must have an ISP upload and download speed of no less than 20Mb/sec dedicated to the Surveillance system. Contractor is not responsible for WAN performance issues pertaining to the Surveillance system.
- If using existing network for the communication of database, controllers and client workstation transmissions, it is the responsibility of Horace W. Porter School's IT department to open necessary ports between subnets and networks to ensure connectivity.

Contractor Administrative Requirements

- All installation, configuration, setup, program and related work shall be performed by authorized manufacturer integrators/electronic technicians certified by the manufacturer in writing.
- Certification for authorized integrators/electronic technicians shall include at a minimum the installation and service of the Surveillance system equipment provided.
- Submit confirmation that installer has received manufacturer training and is certified by the manufacturer on this equipment and that the training the installer received is current.
- Submit confirmation that contractor is licensed to install surveillance security equipment as required by the authority having jurisdiction.
- Coordinate with owner regarding network configuration and estimated bandwidth utilization prior to connection of cameras to owner's network.
- It is the duty of the contractor to provide a working system. Any omissions or errors or differences between this document and the contractor's submitted proposal shall be clearly outlined in a separate document labeled "Proposal Deltas".
- Submit confirmation and details of Avigilon warranty, extended warranty, and replacement policies.

Contractor Installation Requirements

- All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.
- All firmware found in products shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by manufacturer, the provider of the Surveillance system.

- All equipment requiring users to log on using a password shall be configured with user/site-specific password/passwords. No system/product default passwords shall be allowed.
- Contractor shall review configurable features of the system with the Owner's Representative (Project Manager) and establish a punch list for standards, device specifics, location specific and VMA/NVR specific configuration of device(s). The Contractor shall install, program and configure devices in accordance with this punch list and such that no additional programming is required for operation by Horace W. Porter School after close out activities have ended.
- All LAN/WAN connectivity required to make the system operational must be in place and tested a minimum of 2 weeks prior to any identified or committed completion date.

Closeout Activities

- Demonstrate the administration and operation of the Surveillance system as described within this section.
- Demonstrate how an authorized user can gain access to and make changes to configuration.
- Demonstrate how to operate the functionality configured for this project as defined by the scope of work.
- Perform field software changes after the initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to the Owner's operating requirements.
- Software, hardware, firmware, operational or administrative licenses necessary to operate or administer the devices shall be registered to the Owner.
- Install all software, hardware, firmware, operational or administrative licenses necessary to operate or administer the system.
- Using the manufacturer's backup software tool or the VMA/NVR, perform a full system back-up upon completion of initial programming.
- Deliver the configuration backup files, restoration application and instructions detailing for the restoration of back-up configuration.
- Upon completion of all work, and after receipt of all appropriate marked up As Built Drawings, Operating Manuals, Warranties, Guarantees, and Spare Parts required by the Contract Documents, Horace W. Porter School shall prepare the Certificate of Final Completion.
- The Contractor's signature on this Certificate shall be notarized.
- The Contractor shall provide a final Application for Payment to complement the close-out process.
- If Horace W. Porter School is required to prepare a Certificate for Partial Release of Retainage the Contractor shall complete all remaining Work in accordance with the provisions of the General Conditions.
- The Contractor's signature on this Certificate shall be notarized.
- The Contractor may make a request for additional releases of retainage when portions of the Work listed on the Horace W. Porter School punch list have been satisfactorily completed. Each request shall be accompanied by a new application for payment and a new signed and notarized Certificate for Partial Release of Retainage.

- Prior to requesting Partial Completion, the Contractor shall make a thorough inspection of the Work. During this inspection the Contractor shall prepare a comprehensive list of all items remaining to be completed or corrected. This list shall include all remaining Contractor and Subcontractor items to be provided under the Contract Documents.
- The Contractor shall not be relieved of the responsibility to provide Contract items left off the Horace W. Porter School punch list.
- Upon completion of all remaining items, the Final Release of Retainage shall be processed.

Warranty and Maintenance

- The Contractor shall warranty the entire system for a period of 1 -year following successful completion of a 30-day Trial Period Test. Any deficiencies reported to the Contractor by the Owner during the Trial Period Test shall be corrected within 24 hours of the time it is reported without cost and to the satisfaction of the Owner. In the event this is not accomplished, the Trial Period Test shall be started again.
- The Contractor shall provide local "on-call" hardware and software maintenance for all equipment supplied under this Contract during the warranty period. The maintenance shall consist of all material, labor and travel expenses to:
- Replace all defective components as required.
- Perform annual preventive maintenance as required by this document.
- At the end of the warranty period, the Contractor shall provide detailed documentation of service and maintenance performed on the system from the date of acceptance. Documentation shall include Owner signed service slips with a description of symptoms, diagnoses and subsequent actions taken. Recommended changes in routine preventive maintenance procedures shall also be included.
- All warranty, maintenance, and service periods shall commence on the date that the Trial Period Test is completed and the Owner provides a written final acceptance of the system except that, if it is discovered after said date that certain work or materials were not in fact in conformance with the requirements of the Contract Documents, the applicable period of warranty for defective components or software shall recommence from the completion of all remedial work required.
- The Contractor shall warranty that all workmanship shall be serviceable and shall perform dependably for a period of at least one year. Such warranty is in addition to and independent of any guarantee and warranties of suppliers or manufacturers.

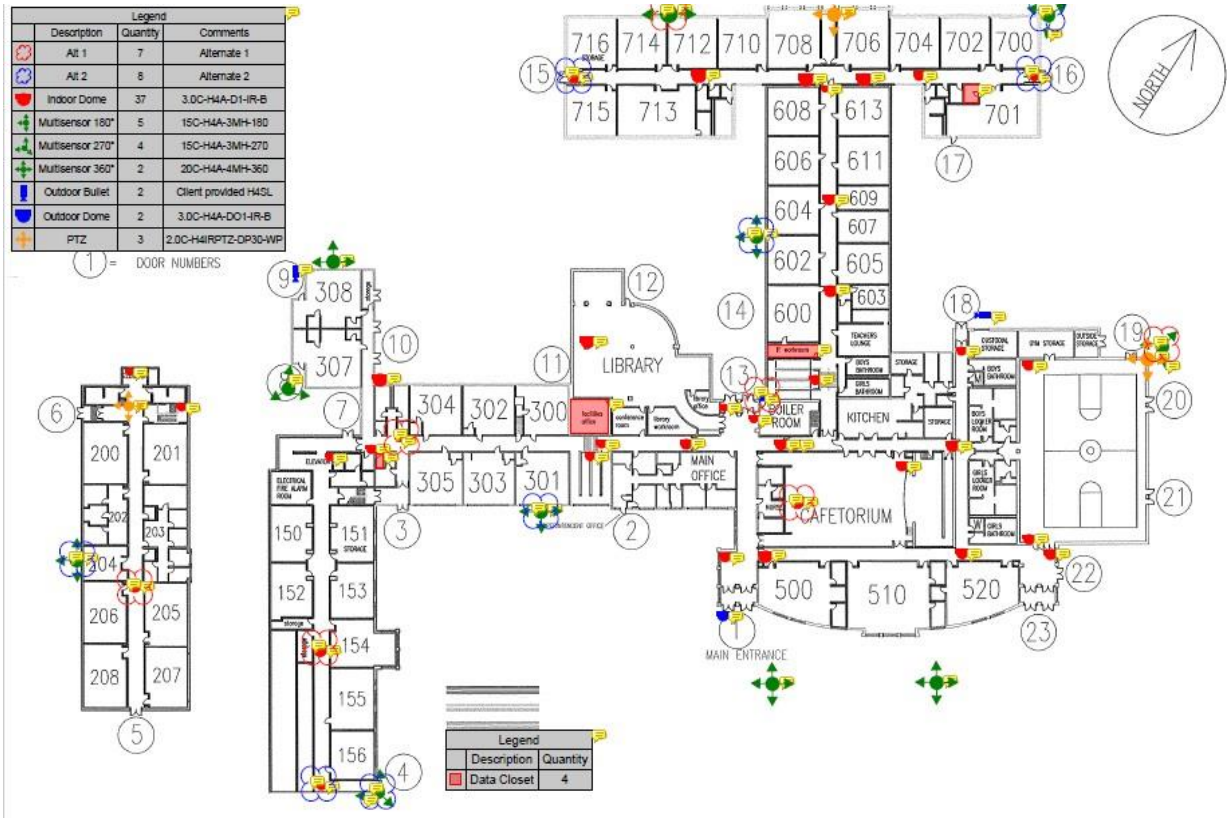
Preventative Maintenance and Service

- The Contractor shall conduct annual preventive maintenance on the entire system in accordance with the manufacturers' recommendations during the warranty period for the first year.
- The software shall be similarly covered with a software maintenance agreement. Under this agreement, the Contractor shall be responsible for updating all software as the manufacturer’s release major revisions and patches, inclusive of the labor required to install these updates. The pricing for this software maintenance agreement shall be included in the cost of the warranty and/ or maintenance agreement.
- The Contractor shall be responsible for maintaining all systems in good, efficient operating condition and shall supply all labor and parts that are necessary to repair the system. Equipment failure shall be reported to the Contractor during the normal workday

by the Owner or its authorized representative. The Contractor shall dispatch one or more qualified technicians to arrive at the equipment location within 48 hours of a call being placed by the Owner or its representatives. The equipment shall be serviced and returned to full operation on the same day of the service call. In the event the equipment cannot be serviced in this time, the Contractor shall notify the Owner. The Contractor shall provide a security system service and maintenance log book on the job. Each service call shall be recorded, and a copy furnished to the Owner filing in the maintenance logbook.

- Following the conclusion of the warranty, the Owner may elect to enter into a maintenance agreement with the Contractor. The Contractor shall provide pricing for repair and maintenance of the system for the four (4) years following expiration of the original warranty. This pricing shall include parts and labor 24 hour per day, holidays included. The maintenance agreement shall provide the same level of coverage as the warranty, including an annual preventative maintenance. All updates, parts and labor shall be covered under this agreement at no additional cost to the owner beyond the annual cost of the maintenance agreement

Drawings and Design: Please refer to attached Drawing documentation and System Design for camera details. Alt 1 and Alt 2 camera settings to be equivalent to Base Bid cameras per System Design documentation.



HD NVRs

NAME	MODEL	EXPANSIONS	STORAGE	TOTAL DATA	STORAGE TIME	STATUS
Storage 1	HD-NVR4-PRM-192TB-NA	n/a	182.4 TB	558.78 Mbps	79 days 9 hours	Valid

HDSM Smart Cameras

NAME	MODEL	STORAGE	QTY	LENS	FL. (MM)	IPS	DUTY CYCLE	COMPRESSION	BITRATE	HDSM SMARTCODEC		
										ENABLED	STRENGTH	MIN IPS
Indoor Dome	3.0C-H4A-D1-IR-B	Storage 1	37	Built-In Lens, 3-9mm, f/1.3, P-Iris, Vari Focal	3.0	10	24	Quality 6	7.18 Mbps	✔	Low	1
Multisensor 180°	15C-H4A-3MH-180	Storage 1	5	Built-In Lens, 4mm, f/1.6					20.29 Mbps			
↳Head 1					4.0	15	24	Quality 6		✔	Low	1
↳Head 2					4.0	15	24	Quality 6		✔	Low	1
↳Head 3					4.0	15	24	Quality 6		✔	Low	1
Multisensor 270°	15C-H4A-3MH-270	Storage 1	4	Built-In Lens, 2.8mm, f/1.2					20.29 Mbps			
↳Head 1					2.8	15	24	Quality 6		✔	Low	1
↳Head 2					2.8	15	24	Quality 6		✔	Low	1
↳Head 3					2.8	15	24	Quality 6		✔	Low	1
H4 MH Camera 3	20C-H4A-4MH-360	Storage 1	2	Built-In Lens, 2.8mm, f/1.2					24.71 Mbps			
↳Head 1					2.8	13	24	Quality 6		✔	Low	1
↳Head 2					2.8	13	24	Quality 6		✔	Low	1
↳Head 3					2.8	13	24	Quality 6		✔	Low	1
↳Head 4					2.8	13	24	Quality 6		✔	Low	1
Outdoor Bullet	3.0C-H4SL-BO1-IR	Storage 1	2	Built-In Lens, 3-9mm, f/1.4, P-Iris, Vari Focal	3.1	10	24	Quality 6	5.96 Mbps	✔	Low	1
Outdoor Dome	3.0C-H4A-DO1-IR-B	Storage 1	2	Built-In Lens, 3-9mm, f/1.3, P-Iris, Vari Focal	< min	10	24	Quality 6	6.69 Mbps	✔	Low	1
PTZ	2.0C-H4IRPTZ-DP30-WP	Storage 1	3	Built-In Lens, 4.3-129 mm, f/1.6-f/4.7	5.7	10	24	Quality 6	12.00 Mbps	✔	Low	1

Scene Details

NAME	MOUNTING HEIGHT (FT)	TARGET HEIGHT (FT)	TARGET DISTANCE (FT)	SCENE WIDTH (FT)	MOUNTING ANGLE	MAXIMUM DISTANCE (FT)	PX/FT
Indoor Dome	9.5	8	30	52	46.7	190	39.4
Multisensor 180°	15						
↳Head 1		6	40	53	50.1	66.7	44.6
↳Head 2		6	40	53	50.1	66.7	44.6
↳Head 3		6	40	53	50.1	66.7	44.6
Multisensor 270°	15						
↳Head 1		6	40	87.4	45.3	66.7	25.8
↳Head 2		6	40	87.4	45.3	66.7	25.8
↳Head 3		6	40	87.4	45.3	66.7	25.8
H4 MH Camera 3	15						
↳Head 1		6	40	87.4	45.3	66.7	25.8
↳Head 2		6	40	87.4	45.3	66.7	25.8
↳Head 3		6	40	87.4	45.3	66.7	25.8
↳Head 4		6	40	87.4	45.3	66.7	25.8
Outdoor Bullet	12	6	40	64	45.1	80	32
Outdoor Dome	8.5	6	40	69.7	45.5	136	29.3
PTZ	15	6	16.5	16.8	46.8	27.5	114

SECTION 28 23 00
VIDEO MANAGEMENT SYSTEM

PART 1 PRODUCTS

1.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon ACC7.

1.2 NETWORK VIDEO MANAGEMENT SOFTWARE (NVMS) SYSTEM DESCRIPTION

A. Description: NVMS provides workstations with a simplified screen layout, intuitive controls, and customizable features that improve multi-person interactions that has the following features:

1. Advanced AI technology that brings a new level of automation to surveillance. Without any predefined rules, Unusual Motion Detection UMD technology continuously learns what typical activity in a scene looks like, and then detects and records motion anomalies.
2. HDSM™ Technology-Efficiently compresses and preserves image quality while intelligently managing HD image transmission throughout system.
3. HDSM SmartCodec technology to automatically optimize compression levels for regions in a scene, to maximize bandwidth while still maintaining image quality.
4. Allows for Focus of Attention interface enables operators to be more effective when monitoring large numbers of cameras. Events that are occurring across cameras from the entire site shall be visualized in an easily consumable format that always makes it clear where the operator should focus his or her attention.
5. ONVIF® Profile S and Profile T Compliant VMS ONVIF Profile S and Profile T compliance ensures interoperability between IP based ONVIF conformant security devices regardless of manufacturer.
6. Alarm Escalation to create complete end-to-end workflows for monitoring, assigning, and acknowledging alarms.
7. Search capabilities with bookmark, event, alarm and thumbnail search options.
8. Easy integration with other leading camera and hardware manufacturers.
9. Allows mobile software push alarm notifications, live and recorded video, audio talkdown, self-learning video analytics overlays, digital output triggers, and PTZ control for Android™ and iOS mobile devices.
10. License Plate Recognition (LPR) analytics.
11. Enables unlocking doors directly from a camera view.
12. Scalable integration with external systems using distributed architecture features .NET-based and REST-based APIs that can easily be integrated with other systems, such as access control and building management.

1.3 NETWORK VIDEO MANAGEMENT SOFTWARE (NVMS) APPLICATION

A. General: Provide an NVMS software application that can be installed on any open platform hardware and does not require hardware multiplexer or time-division technology for video or audio.

1. Recording Storage Capacity: Expandable without additional licenses.
2. The NVMS server and client software applications can be installed and run on same computer or on separate computers.
3. Secure Transmissions: Securely sends video and audio data by transmitting commands and control data via TCP/IP using cryptographic keys based on SSL/TLS to prevent eavesdropping or tampering.
4. Drivers: Supports recording and management of video and audio sources through use of industry standard drivers, including the following drivers:

a. ONVIF Profile S and Profile T Compliant VMS.
b. Publicly Published API.

5. De-wrapping: Supports de-warping of live and recorded video from:
   a. From Avigilon H4 Fisheye cameras.
   b. From supported cameras fitted with an Immervision Panomorph lens.
   c. From cameras with a fixed fisheye lens, including but not limited to:
      1) Oncam Grandeye Evolution line of cameras.

B. Alarms and Events: Provide ability to configure and manage alarms and events.
   1. Defines event triggers that are configured to result in an alarm.
   2. Generates alarms as a result of the following event types:
      a. Detect events that occur within a camera's field of view.
      b. Detect presence of persons within a sensor's range.
      c. Detect if video or audio signal is lost and alert system administrator.
      d. Notify users of system errors.
      e. Receive alarms from third party systems (access control, etc.) and configured to be monitored.
      f. Support receiving digital input triggers and triggering outputs from:
         1) An input/output board.
         2) Supported IP camera, encoder or sensor.
         3) Integrated systems, including POS.
   3. Receives events through ONVIF driver.
   4. Configures resulting video operations.
   5. Supports receiving Simple Network Management Protocol (SNMP) messages from servers and alert users.
   6. Configures email notifications to the following:
      a. Notify system administrators when an event or system error occurs.
      b. Schedule when email notifications are sent.
      c. Include camera images in email notifications.
   7. Configures Central Station Notifications to the following:
      a. Notify a central station monitoring service when an event or system health error occurs.
      b. Include video clips and/or camera images with camera motion, analytic or digital input events.
   8. Provides ability to send central monitoring stations periodic heartbeat messages, or regular notification to confirm system connection and that there are no events of note.
   9. Monitors events and alarms based on a user configurable schedule.

C. Video and Audio Processing and Compression: Supports storage and processing of video and audio as follows:
   1. Natively records audio and video from camera with no transcoding.
   2. Synchronizes audio and video regardless of frame-rate, resolution or bitrate.
   3. Supports industry standard video compression formats, including, but not limited to, the following:
      a. JPEG2000.
      b. MJPEG.
      c. MPEG-4.
      d. H.264.

D. Dynamic Video Stream Management: Performs dynamic video stream management as follows:
      a. Provide Avigilon High Definition Stream Management (HDSM)™.]

2. Reduces system bandwidth and storage usage by only transmitting video to client as required by the Owner.

E. Video Storage Management:
   1. Provides the following multiple levels of video storage management:
      a. Tier 1: Video recorded directly on local server.
      b. Tier 2: Recorded video continuously archived to long term storage.
      c. Ad Hoc: Recorded video on local server can be archived to user-defined storage location on demand.

F. Backup and Archiving:
   1. Schedules archive of recorded video with associated events to a local folder or mapped network drive.
   2. Backs-up settings and configuration for each server, including the following:
      a. Site settings; such as users/groups, maps and web pages.
      b. Server settings, including device connections.
      c. Encrypts backup to maintain security of information.
   3. Restores backed-up settings and configurations to a new or replacement server in a site.

G. Video Analytics:
   1. Provide configurable classified object detection for each device with self-learning video analytics capabilities.
   2. Supports the following video analytic event types when captured by supported cameras:
      a. Objects in area.
      b. Object loitering.
      c. Objects crossing defined line.
      d. Object appears or enters area.
      e. Object not present in area.
      f. Objects enter area.
      g. Objects leave area.
      h. Object stops in area.
      i. Anticipated direction of travel is violated.
      j. Scene dramatically changes in an unexpected fashion.

H. Integration with Other Systems and Products:

   1. Point of Sale (POS) Integration

   2. Third Party Integration Requirements: Support software level integration with third-party applications using NVMS software development kit (SDK).

I. Audio Features:
   1. Provides ability to change input, output, gain and volume for an audio source.
   2. Supports use of uni-directional and bi-directional audio.
   3. Provides ability to link any audio source to any video source.

J. User Interface:
   1. Supports ability to share application window display in a joint session with other users for collaborative investigations.
   2. Provides a system tree of video sources, maps, saved views and web pages in video monitoring tab.
   3. Supports an unlimited number of monitors used for monitoring video and audio streams connected to a single workstation.
      a. Provides tools to build custom video monitoring layouts.
   4. Provides a Virtual Matrix application module:

a. Supporting remote control of multiple monitor displays.
b. Displays simultaneous video streams on connected monitor displays from multiple sites.

5. Supports alarm management operations through video monitoring interface.
6. Supports ability to create a map that represents physical location of cameras and other devices throughout surveillance system.

K. Playback of Recorded Audio and Video and Audio:
1. Supports playback of recorded video and audio.
2. Provides ability to request a second user authentication before recorded video may be displayed.
3. Provides the following methods for navigating recorded video:
a. Selectable calendar.
b. Horizontal, scrollable timeline:
c. Search.
4. Supports recorded video search
5. Supports Avigilon Appearance Search™ technology:

L. Bookmarking:

M. Media Exportation: Support the ability to export media and provide the following options:
1. Exports recorded video in the following formats:
a. Native (AVE).
b. JPEG.
c. PNG.
d. TIFF.
e. AVI.
f. Print.
2. Exports recorded audio
3. Exports a still frame of video as displayed in video preview area:
a. Native (AVE).
b. JPEG.
c. PNG.
d. TIFF.
4. Native (AVE) format exported as follows:
a. Digitally sign recorded video and audio using 256-bit encryption so video can be authenticated for evidentiary purposes.
b. Able to export video from one or multiple camera streams simultaneously.
c. Supports exporting multiple video segments from different spans of time.
d. Supports reviewing of exported or backed-up video and audio in a dedicated player.
e. Supports playback of exported clips in synchronized, sequential time.
f. Supports playback of multiple clips in continuous, sequential order.
g. Supports exporting of video in lower frame-rates than originally recorded.
h. Supports exporting of a designated area from camera's recorded field of view.
i. Supports re-export into Native or other supported formats.
j. Provides a record of video source with the following metadata:
1) Camera model.
2) Firmware version.

3) Location.
4) MAC address.
5) Serial number.
6) Resolution.

PART 2 GENERAL

2.1 SECTION INCLUDES

A. Network Video Recorders for Surveillance Systems.

2.2 RELATED SECTIONS

A. Section 28 21 11 - IP Cameras.
B. Section 28 23 13 - Video Management System Interfaces.

2.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate with Owner or Owner's representative regarding network configuration and estimated throughput utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
2. General Contractor.
3. Project Manager.
4. Manufacturer's Representative.
5. Project Architect.
6. Project Engineer.
7. Security Consultant.

2.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
1. Substrate preparation instructions and recommendations
2. Installation means and methods.
3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:
1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:
1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
a. Training.
b. Installation.
c. Commissioning.
d. Remote diagnostics and integration with 3rd party software and hardware systems.

2.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.
B. Supply network configuration backup files, restoration application and instructions.

2.6 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Minimum of 5 years in business.
2. Installers:
a. Performs Network Video Recorder (NVR) installation, configuration, setup, programming and related work employing authorized integrators/electronic technicians certified by manufacturer.
b. Certification for authorized integrators/electronic technicians shall include, at a minimum, installation and service of equipment provided.

2.7 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 3 PRODUCTS

3.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
2. Phone: (888) 281-5182.
3. Website: www.avigilon.com.
B. Manufacturer List:
1. Manufacturer:
C. Substitution Limitations:
1. Submit substitution requests in accordance with provisions of Section 01 60 00.
2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network video recorders and the following components:
a. IP Video Cameras.
b. Video Management System Interfaces.
c. Video Surveillance Positioning Equipment.
d. Video Surveillance Sensors.

3.2 PERFORMANCE REQUIREMENTS

A. Throughput: NVR system must be capable of managing a combined 1800 Mbps of total throughput with handling for simultaneous recording, playback and live streaming.
B. Search Capacity: System must be capable of supporting up to one hundred (100) cameras.
C. Storage Capacity: System must be capable of storing up to 180TB raw or 157TB when configured as RAID 6.
D. Expansion: System must be configured to be capable of future expansion and scaling.
E. Mounting: Standard server enclosure (rack) mounting, requiring no greater than a 2U configuration.
F. Electrical Power:

1. Input: 100 to 240 V AC, 50/60 Hz, auto-switching.
2. Supply: Appliance must be configurable for multiple power supplies that may be replaced without the need to power down (hot-swappable).
3. Maximum Power Consumption: No greater than 2200W.

G. System Certifications:
1. UL and cUL certification marks for Canada/USA.
2. CE certification mark for European Union.
3. RCM certification mark for Australia.
4. WEEE mark for European Union.
5. Electromagnetic Emissions Certifications:
   a. FCC Part 15 Subpart B Class B.
   b. ICES-003 Class B.
   c. EN 55032 Class B.
   d. EN 61000-6-3.
   e. EN 61000-3-2.
   f. EN 61000-3-3.
6. Electromagnetic Immunity Standards:
   a. EN 55024.
   b. EN 61000-6-1.
   c. EN 50130-4.
7. Safety Standards:
   a. UL/CSA/IEC/EN 60950-1.

3.3 NETWORK VIDEO RECORDERS

A. Basis of Design Product: Avigilon HD NVR4 Premium.

B. System Design:
1. Drive Configuration:
   a. Video Storage: Up to 18 x large form factor near-line SAS hard disk drives, hot-swappable, RAID 6.
   b. Operating System: (2) M.2 SSD drives, RAID 1.
2. Storage Capacity: 192 TB when configured with RAID 6.
3. Operating System: Microsoft Windows Server 2016.
4. Processor: Intel Xeon.
5. RAM: 32GB DDR4.
6. Networking: (2) 10GB Ethernet SFP+ ports and (2) 1GB Ethernet RJ-45 ports (1000Base-T).
7. Power Supply: (2) 80 plus Titanium power supplies configured to allow swapping without the need to power down.
8. Video Output: VGA.
9. Mounting: 2U rack mount chassis.
10. Operational Range:
    a. Temperature: 10 degrees C to 35 degrees C [50F to 95F].
    b. Relative Humidity: 10–80 percent (non-condensing).
    c. Altitude: 3048 meters [10,000 ft].

PART 4 EXECUTION

4.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

4.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

4.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

4.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

C. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

4.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

4.6 CLOSEOUT

A. Demonstration:

1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

PART 3 GENERAL

4.7 SECTION INCLUDES

A. Pan-Tilt-Zoom (PTZ) Infrared Network Type Cameras for video surveillance.

4.8 RELATED SECTIONS

A. Section 28 21 15 - Specialty Cameras.

B. Section 28 21 21 - Illuminators.

C. Section 28 23 11 - Video Management System Analytics.

4.9 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.

1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
2. General Contractor.
3. Project Manager.
4. Manufacturer's Representative.
5. Project Architect.

6. Project Engineer.
7. Security Consultant.

4.10 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:
   1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
      a. Training.
      b. Installation.
      c. Commissioning.
      d. Remote diagnostics and integration with 3rd party software and hardware systems.

4.11 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

4.12 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
   1. One spare for each_____devices.
   2. Provide spare components as noted in the coordinating schedule for work listed in this section.

4.13 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
   1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
   2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
   3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
   1. Do not proceed with remaining Work until workmanship is approved by Architect.
   2. Refinish mock-up area as required to produce acceptable work.

4.14 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
   1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
   2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 4 PRODUCTS

4.15 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

4.16 DESIGN CRITERIA

A. System Design:
   1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
   3. Cameras in this section must be capable of bi-directional communication.
   4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
   1. cULus certification mark for Canada/USA.
   2. CE certification mark for European Union.
   3. ROHS mark for European Union.
   4. RCM certification mark for Australia.
   5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
   6. KC certification mark for Korea.
   7. SASO registration for Saudi Arabia.
   8. Kuwait registration.
   9. WEEE mark for European Union.

C. Safety Standards:
   1. UL/CSA/IEC/EN 62368-1.

D. Electromagnetic Emissions Standards:
   1. FCC Part 15 Subpart B Class B.

2. ICES-003 Class B.
3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

4.17 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support H.264 encoding in a selectable range from 1 up to 60 frames per second based on resolution configured.
4. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
5. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
6. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:
1. Image Compression Method: H.264 (MPEG-4 Part 10/AVC), Motion JPEG, HDSM.

2. Streaming: Multi-stream H.264 and Motion JPEG.
3. Motion Detection: Selectable sensitivity and threshold.
4. Electronic Shutter Control: Automatic, Manual (1/1 to 1/10,000 sec).
5. Iris Control: Automatic, Manual.
6. Day/Night Control: Automatic, Manual.
7. Flicker Control: 50 Hz, 60 Hz.
8. White Balance: Automatic, Manual.
9. Backlight Compensation: Manual.
10. Privacy Zones: Up to 64 zones.

F. Network Requirements: Provide video cameras that have the following network capabilities:
1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:
   a. Fixed (static) IP address.
   b. Subnet mask.
   c. Gateway.
   d. Control port.
3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

G. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

H. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

I. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
   1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
   2. Video masked by privacy zones must be obscured prior to streaming.

J. Security Requirements: Provide video cameras with the following security requirements:
   1. Support the use of the following:
      a. Password protection.
      b. HTTPS Encryption.
      c. Digest authentication.
      d. WS authentication.
      e. User access Log.
      f. SSL encryption.
   2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

K. Electrical Power: Cameras capable of being powered by the following power sources:
      a. 75 W max with 24 VDC aux power, 71W max with 95W PoE, 105 VA with 24 V AC RMS aux power.
      b. 95W PoE: POE-INJ2-95W.
      c. 60W PoE: POE-INJ2-60W.
   2. AC Power: 24 V +/- 10%.
   3. DC Power: 24V +/- 10%.
   4. Battery Backup: 3V manganese lithium.

L. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
   1. Allow firmware updates via network.
   2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
   3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

M. Diagnostics:
   1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
   2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

N. Connectivity:
   1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
   2. Terminal for receiving line level analog audio from an external microphone.
   3. Terminal for providing line level analog audio for connection to an external speaker.

O. Operational Range:
   1. Temperature:
      a. -40 °C to +60 °C (-40 °F to 140 °F) with external power or 95 W PoE.
      b. -10 °C to +50 °C (14 °F to 122 °F) with 60W PoE.
      c. Wiper is functional at 1 °C to +60 °C (34 °F to 140 °F).
   2. Relative Humidity: 0–95 percent (non-condensing).

4.18 PAN-TILT-ZOOM (PTZ) INFRARED NETWORK TYPE CAMERA

A. 1.0 MP 45x IR PTZ Camera with Wiper:
   1. Basis of Design Product: 1.0C-H4IRPTZ-DP45-WP, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 1280x720.
      c. Imaging Area (H x V): 4.8 mm x 2.7mm (0.189 inches x 0.106 inches).
      d. Imaging Rate: Up to 60 fps.
      e. Dynamic Range: 120 dB.
      f. Minimum Illumination:
         1) With IR: 0 lux (F1.6).
         2) Without IR: Color - 0.1 lux (F1.6), Monochrome - 0.03 lux (F1.6).
      g. Resolution Scaling: Down to (16:9) 384x216 or (5:4) 320x256.
      h. Angle of View: 1.5 Degrees – 63.7 Degrees.
      i. Optical Zoom: 45x.
      j. IR Illumination: 250 m (820 ft) maximum distance at 0 lux.

B. 2.0 MP 30x IR PTZ Camera with Wiper:
   1. Basis of Design Product: 2.0C-H4IRPTZ-DP30-WP, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 1920x1080.
      c. Imaging Area (H x V): 4.8 mm x 2.7mm (0.189 inches x 0.106 inches).
      d. Imaging Rate: Up to 60 fps.
      e. Dynamic Range: 120 dB.
      f. Minimum Illumination:
         1) With IR: 0 lux (F1.6).
         2) Without IR: Color - 0.1 lux (F1.6), Monochrome - 0.03 lux (F1.6).
      g. Resolution Scaling: Down to (16:9) 384x216 or (5:4) 320x256.
      h. Angle of View: 2.3 Degrees – 63.7 Degrees.
      i. Optical Zoom: 30x.
      j. IR Illumination: 250 m (820 ft) maximum distance at 0 lux.

4.19 ACCESSORIES

A. Mounts:
   1. IRPTZ-MNT-WALL1: Mount, Pend wall, IR PTZ.
   2. IRPTZ-MNT-NPTA1: Mount, Pend NPT Adapter, IR PTZ.
   3. H4-MT-POLE1: Pole Mounting Bracket.
   4. H4-MT-CRNR1: Corner Mounting Bracket.

B. Electrical Power:
   1. POE-INJ2-95W-NA: Single Port PoE Injector Gigabit, 95W, NA - indoor installation rated.
   2. POE-INJ2-60W: Single Port PoE Injector Gigabit, 60W, NA - indoor installation rated.

PART 5 EXECUTION

5.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

5.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

5.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

5.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).

1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

5.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

5.6 CLOSEOUT

A. Demonstration:

1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:

1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:

1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

PART 6 GENERAL

6.1 SECTION INCLUDES

A. Multiple Sensor, Dome-Type Network cameras for video surveillance.

6.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.

B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

6.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.
B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

6.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.
C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.
D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.
E. System Support Resources:
   1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
      a. Training.
      b. Installation.
      c. Commissioning.
      d. Remote diagnostics and integration with 3rd party software and hardware systems.

6.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.
B. Supply network configuration backup files, restoration application and instructions.

6.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
   1. One spare for each_____devices.

2. Provide spare components as noted in the coordinating schedule for work listed in this section.

6.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
   1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
   2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
   3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
   1. Do not proceed with remaining Work until workmanship is approved by Architect.
   2. Refinish mock-up area as required to produce acceptable work.

6.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
   1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
   2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 7 PRODUCTS

7.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

7.2 DESIGN CRITERIA

A. System Design:
   1. All cameras in this section must be designed in a modular fashion such that mounts, mounting components and hardware are universal and not integrated directly with the camera itself.
   2. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   3. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.

4. Cameras in this section must be capable of bi-directional communication.
5. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
1. ONVIF Profile S and Profile T.
2. cULus certification mark for Canada/USA.
3. CE certification mark for European Union.
4. ROHS mark for European Union.
5. RCM certification mark for Australia.
6. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
7. SASO registration for Saudi Arabia.
8. Kuwait registration.
9. WEEE mark for European Union.

C. Safety Standards:
1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
1. FCC Part 15 Subpart B Class B.
2. ICES-003 Class B.
3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

7.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / H.265 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary and/or tertiary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264, H.265 and Motion JPEG streams (multi-stream).

3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.265 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.265 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264 and H.265, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
8. Support G.711 PCM 8kHz audio compression.

D. Transmission Requirements:
1. Provide cameras that support the following when connecting to a VMS:
   a. Dynamic Bandwidth Management.
   b. High Definition Stream Management.
2. Cameras must Transmit two distinct video streams:
   a. Primary Stream: Supports up to full resolution and prescribed frame rate.
   b. Secondary Stream: Supports fractional resolution and mirrors the frame rate and aspect ratio of the primary stream at a maximum 0.3MP - 640x480 (4:3) / 768x432 (16:9).
3. Cameras must Transmit three distinct video streams:
   a. Primary Stream: Supports up to full resolution and prescribed frame rate.
   b. Second Stream: Supports fractional resolution and mirrors the frame rate and aspect ratio of the primary stream at a maximum 1.3MP – 1280x960 (4:3) / 1536x864 (4:3).
   c. Third Stream: Supports fractional resolution and mirrors the frame rate and aspect ratio of the primary stream at a maximum 0.3MP - 640x480 (4:3) / 768x432 (16:9).

E. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

F. Image Control Requirements:
1. User Configurations Supported:
   a. Automatic and manual white balance control.
   b. Automatic and manually defined exposure zones operating in the range 1 and 1/8000 second.
   c. Flicker control (50 Hz, 60 Hz).
   d. Automatic and manual iris control.
   e. Color saturation and sharpening.
   f. Motion detection sensitivity and threshold.
   g. Digital rotation of the image.
   h. Minimum Dynamic Range:
      1) 100db.

2) Dynamic Range shall not change based on configured encoding resolution.

2. Adaptive Video Analytics Specifications:
   a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
   b. Automatic Analytic set up and tuning of behavior identification:
      1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
      2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.
3. Include detection of the following behaviors:
   a. Object present in ROI.
   b. Object enters ROI.
   c. Object leaves ROI.
   d. Object appeared.
   e. Object disappeared.
   f. Object crosses a line of interest or beam.
   g. Object Movement Direction.
   h. Object loitering.
   i. Multiple objects in ROI over specified dwell time.
   j. Dwell Time.
   k. Number of objects exceeds limit in ROI.
   l. Number of objects below limit in ROI.
   m. Camera tampering.

G. Network Requirements: Provide video cameras that have the following network capabilities:
1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:
   a. Fixed (static) IP address.
   b. Subnet mask.
   c. Gateway.
   d. Control port.
3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

H. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:
1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
3. Threshold: Percentage of pixels that must detect change.

I. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
1. Alarm input terminal.
2. Video motion detection.
3. Camera temperature outside operative range.

J. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:

1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

K. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

L. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

M. Security Requirements: Provide video cameras with the following security requirements:
1. Support the use of the following:
   a. Password protection.
   b. HTTPS Encryption.
   c. Digest authentication.
   d. WS authentication.
   e. User access Log.
   f. SSL encryption.
2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

N. Electrical Power: Cameras capable of being powered by the following power sources:
1. PoE: up to IEEE 802.3af Class 3 PoE Compliant.
2. AC Power: 24 V +/- 10%, 10 VA min (13 VA min with -IR option).
3. DC Power: 12 V +/- 10%, 7 W min (9 W min with -IR option).
4. Battery Backup: 3V manganese lithium.

O. Functionality:

1. Alarm input and output terminals.
2. Line audio input (for external microphone) and audio output (for external speaker) connections.
3. Firmware reset button to reset cameras to factory default settings.
4. Enhanced Framerate Mode: Enhanced framerate mode allowing for higher framerates when analytics are disabled on all camera heads within the system.

P. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

Q. Connectivity:
1. Gigabit Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

R. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

S. Operational Range:
1. Temperature:
   a. Ceiling Mount: -10 degrees C to +50 degrees C [14 F to +122 F].
   b. Pendant and Surface Mount: -40 degrees C to +60 degrees C [-40 F to +140 F].
2. Relative Humidity: 0–95 percent (non-condensing).

7.4 MULTISENSOR IP CAMERAS

A. 9MP HD Multisensor Camera; three 3MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
1. Basis of Design Product: 9C-H4A-3MH-270 – H4 Multisensor, by Avigilon.
2. Performance:
   a. Image Sensors: 1/2.8 inch progressive scan CMOS.
   b. Aspect Ratio: 4:3.
   c. Active Pixels (H x V): 2048 x 1536 per sensor.
   d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
   e. Imaging Rate: 24 fps at 60Hz and 25 fps at 50Hz.
   f. IR Illumination:
      1) Color Mode: 0.025 lux (F1.2).
      2) Mono Mode 0.005 lux (F1.2).
      3) With IR Illuminator Active: 0 lux.
   g. Dynamic Range: 100 dB with WDR active.
   h. Resolution Scaling: Down to 640 x 480.
   i. Angle of View: 103 degrees.
   j. Mounting:
      1) Indoor Ceiling Mount.

2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

B. 9MP HD Multisensor Camera; three 3MP sensors, wide dynamic range (WDR) and a 4mm lens:
1. Basis of Design Product: 9C-H4A-3MH-180 – H4 Multisensor, by Avigilon.
2. Performance:
a. Image Sensors: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536 per sensor.
d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
e. Imaging Rate: 24 fps at 60 Hz and 25 fps at 50Hz.
f. IR Illumination:
1) Color Mode: 0.05 lux (F1.6).
2) Mono Mode 0.01 lux (F1.6).
3) With IR Illuminator Active: 0 lux.
g. Dynamic Range: 100 dB with WDR active.
h. Resolution Scaling: Down to 640 x 480.
i. Angle of View: 72 degrees.
j. Mounting:
1) Indoor Ceiling Mount.
2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

C. 12MP HD Multisensor Camera; four 3MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
a. Basis of Design Product: 12C-H4A-4MH-360 – H4 Multisensor, by Avigilon.
b. Performance:
c. Image Sensors: 1/2.8 inch progressive scan CMOS.
d. Aspect Ratio: 4:3.
e. Active Pixels (H x V): 2048 x 1536 per sensor.
f. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
g. Imaging Rate: 20 fps at 60 Hz and 20 fps at 50Hz.
h. IR Illumination:
1) Color Mode: 0.025 lux (F1.2).
2) Mono Mode 0.005 lux (F1.2).
3) With IR Illuminator Active: 0 lux.
i. Dynamic Range: 100 dB with WDR active.
j. Resolution Scaling: Down to 640 x 480.
k. Angle of View: 103 degrees.
l. Mounting:
1) Indoor Ceiling Mount.
2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

D. 15MP HD Multisensor Camera; three 5MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
1. Basis of Design Product: 15C-H4A-3MH-270 – H4 Multisensor, by Avigilon.
2. Performance:
a. Image Sensors: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2592 x 1944 per sensor.
d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).

e. Imaging Rate: 15 fps at 60 Hz and 17 fps at 50Hz.
f. IR Illumination:
    1) Color Mode: 0.025 lux (F1.2).
    2) Mono Mode 0.005 lux (F1.2).
    3) With IR Illuminator Active: 0 lux.
g. Dynamic Range: 100 dB with WDR active.
h. Resolution Scaling: Down to 640 x 480.
i. Angle of View: 103 degrees.
j. Mounting:
    1) Indoor Ceiling Mount.
    2) Indoor / Outdoor Pendant Mount.
    3) Indoor / Outdoor Surface Mount.

E. 15MP HD Multisensor Camera; three 5MP sensors, wide dynamic range (WDR) and a 4mm lens:
1. Basis of Design Product: 15C-H4A-3MH-180 – H4 Multisensor, by Avigilon.
2. Performance:
    a. Image Sensors: 1/2.8 inch progressive scan CMOS.
    b. Aspect Ratio: 4:3.
    c. Active Pixels (H x V): 2592 x 1944 per sensor.
    d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
    e. Imaging Rate: 15 fps at 60 Hz and 17 fps at 50Hz.
    f. IR Illumination:
        1) Color Mode: 0.05 lux (F1.6).
        2) Mono Mode 0.01 lux (F1.6).
        3) With IR Illuminator Active: 0 lux.
    g. Dynamic Range: 100 dB with WDR active.
    h. Resolution Scaling: Down to 640 x 480.
    i. Angle of View: 72 degrees.
    j. Mounting:
        1) Indoor Ceiling Mount.
        2) Indoor / Outdoor Pendant Mount.
        3) Indoor / Outdoor Surface Mount.

F. 20MP HD Multisensor Camera; four 5MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
1. Basis of Design Product: 20C-H4A-4MH-360 – H4 Mutlisensor, by Avigilon.
2. Performance:
    a. Image Sensors: 1/2.8 inch progressive scan CMOS.
    b. Aspect Ratio: 4:3.
    c. Active Pixels (H x V): 2592 x 1944 per sensor.
    d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
    e. Imaging Rate: 13 fps at 60 Hz and 13 fps at 50Hz.
    f. IR Illumination:
        1) Color Mode: 0.025 lux (F1.2).
        2) Mono Mode 0.005 lux (F1.2).
        3) With IR illuminator Active: 0 lux.
    g. Dynamic Range: 100 dB with WDR active.
    h. Resolution Scaling: Down to 640 x 480.
    i. Angle of View: 103 degrees.
    j. Mounting:
        1) Indoor Ceiling Mount.
        2) Indoor / Outdoor Pendant Mount.

3) Indoor / Outdoor Surface Mount.

G. 24MP HD Multisensor Camera; with three 8MP sensors, wide dynamic range (WDR) and a 4mm lens:
   1. Basis of Design Product: 24C-H4A-3MH-270 – H4 Multisensor, by Avigilon.
   2. Performance:
      a. Image Sensors: 1/2.5 inch progressive scan CMOS.
      b. Aspect Ratio: 16:9.
      c. Active Pixels (H x V): 3840 x 2160 per sensor.
      d. Imaging Area (H x V): 6.22 mm x 3.50mm (0.245 inches x 0.138 inches).
      e. Imaging Rate: 12 fps at 60 Hz and 13 fps at 50Hz.
      f. IR Illumination:
         1) Color Mode: 0.2 lux (F1.6).
         2) Mono Mode 0.04 lux (F1.6).
         3) With IR Illuminator: 0 lux.
      g. Dynamic Range: 100 dB with WDR active.
      h. Resolution Scaling: Down to 768 x 432.
      i. Angle of View: 101 degrees.
      j. Mounting:
         1) Indoor Ceiling Mount.
         2) Indoor / Outdoor Pendant Mount.
         3) Indoor / Outdoor Surface Mount.

H. 24MP HD Multisensor Camera: with three 8MP sensors, wide dynamic range (WDR) and a 5.2mm lens:
   1. Basis of Design Product: 24C-H4A-3MH-180 – H4 Multisensor, by Avigilon.
   2. Performance:
      a. Image Sensors: 1/2.5 inch progressive scan CMOS.
      b. Aspect Ratio: 16:9.
      c. Active Pixels (H x V): 3840 x 2160 per sensor.
      d. Imaging Area (H x V): 6.22 mm x 3.50mm (0.245 inches x 0.138 inches).
      e. Imaging Rate: 12 fps at 60 Hz and 13 fps at 50Hz.
      f. IR Illumination:
         1) Color Mode: 0.2 lux (F1.6).
         2) Mono Mode 0.04 lux (F1.6).
         3) With IR Illuminator: 0 lux.
      g. Dynamic Range: 100 dB with WDR active.
      h. Resolution Scaling: Down to 768 x 432.
      i. Angle of View: 101 degrees.
      j. Mounting:
         1) Indoor Ceiling Mount.
         2) Indoor / Outdoor Pendant Mount.
         3) Indoor / Outdoor Surface Mount.

I. 32MP HD Multisensor Camera; four 8MP sensors, wide dynamic range (WDR) and 4mm lens:
   1. Basis of Design Product: 32C-H4A-4MH-360 – H4 Multisensor, by Avigilon.
   2. Performance:
      a. Image Sensors: 1/2.5 inch progressive scan CMOS.
      b. Aspect Ratio: 16:9.
      c. Active Pixels (H x V): 3840 x 2160 per sensor.
      d. Imaging Area (H x V): 6.22 mm x 3.50mm (0.245 inches x 0.138 inches).
      e. Imaging Rate: 8 fps at 60 Hz and 8 fps at 50Hz.
      f. IR Illumination:

1) Color Mode: 0.2 lux (F1.8).
2) Mono Mode 0.04 lux (F1.8).
3) With IR Illuminator: 0 lux.

g. Dynamic Range: 100 dB with WDR active.
h. Resolution Scaling: Down to 768 x 432.
i. Angle of View: 70 degrees.
j. Mounting:
1) Indoor Ceiling Mount.
2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

PART 8 EXECUTION

8.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

8.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

8.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

8.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).
1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

8.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

8.6 CLOSEOUT

A. Demonstration:
1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.
C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

PART 9 GENERAL

9.1 SECTION INCLUDES

A. Indoor surface mounted, dome-type network cameras for video surveillance.

9.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.
B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

9.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.
B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

9.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.
C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.
D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.
E. System Support Resources:

1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
    a. Training.
    b. Installation.
    c. Commissioning.
    d. Remote diagnostics and integration with 3rd party software and hardware systems.

9.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

9.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with “SPARE: DO NOT REMOVE”, and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
    1. One spare for each_____devices.
    2. Provide spare components as noted in the coordinating schedule for work listed in this section.

9.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
    1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
    2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
    3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer’s workmanship.
    1. Do not proceed with remaining Work until workmanship is approved by Architect.
    2. Refinish mock-up area as required to produce acceptable work.

9.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer’s warranty covering parts and labor costs to repair or replace part that fail to perform.
    1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
    2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 10 PRODUCTS

10.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
    1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
    2. Phone: (888) 281-5182.
    3. Website: www.avigilon.com.

B. Manufacturer List:
    1. Manufacturer:

C. Substitution Limitations:

1. Submit substitution requests in accordance with provisions of Section 01 60 00.
2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
    a. Video Management System Analytics.
    b. Video Management System Interfaces.
    c. Video Surveillance Positioning Equipment.
    d. Video Surveillance Sensors.

10.2 DESIGN CRITERIA

A. System Design:
1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
3. Cameras in this section must be capable of bi-directional communication.
4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
1. cULus certification mark for Canada/USA.
2. CE certification mark for European Union.
3. ROHS mark for European Union.
4. RCM certification mark for Australia.
5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
6. KC certification mark for Korea.
7. BIS certification for India.
8. SASO registration for Saudi Arabia.
9. Kuwait registration.
10. WEEE mark for European Union.

C. Safety Standards:
1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
1. FCC Part 15 Subpart B Class B.
2. ICES-003 Class B.
3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

10.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
    a. IEEE 802.3af (Power over Ethernet).
    b. IEEE 802.1X (Authentication).
    c. IPv4 (RFC 791).

B. Video Requirements:

1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.264 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
8. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:
1. User Configurations Supported:
   a. Automatic and manual white balance control.
   b. Automatic and manually defined exposure zones operating in the range 1 and 1/8000 second.
   c. Flicker control (50 Hz, 60 Hz).
   d. Automatic and manual iris control.
   e. Color saturation and sharpening.
   f. Motion detection sensitivity and threshold.
   g. Digital rotation of the image.
   h. Minimum Dynamic Range:
   i. 70db. Dynamic Range shall not change based on configured encoding resolution.
2. Adaptive Video Analytics Specifications:
   a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
   b. Automatic Analytic set up and tuning of behavior identification:

1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.

3. Include detection of the following behaviors:
   a. Object present in ROI.
   b. Object enters ROI.
   c. Object leaves ROI.
   d. Object appeared.
   e. Object disappeared.
   f. Object crosses a line of interest or beam.
   g. Object Movement Direction.
   h. Object loitering.
   i. Multiple objects in ROI over specified dwell time.
   j. Dwell Time.
   k. Number of objects exceeds limit in ROI.
   l. Number of objects below limit in ROI.
   m. Camera tampering.

F. Network Requirements: Provide video cameras that have the following network capabilities:
   1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
   2. Supports user configuration of network parameters including:
      a. Fixed (static) IP address.
      b. Subnet mask.
      c. Gateway.
      d. Control port.
   3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
   4. Provides support for both IPv4 and IPv6 Networks.

G. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:
   1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
   2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
   3. Threshold: Percentage of pixels that must detect change.

H. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
   1. Alarm input terminal.
   2. Video motion detection.
   3. Camera temperature outside operative range.
   4. Schedule.

I. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
   1. IPv4.
   2. HTTP.
   3. HTTPS.
   4. SOAP.
   5. DNS.

6. NTP.
7. RSTP.
8. RTCP.
9. RTP.
10. TCP.
11. UDP.
12. IGMP.
13. ICMP.
14. DHCP.
15. Zeroconf.
16. ARP.
17. SNMP v2c.
18. SNMP v3.

J. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
   1. RTP/UDP.
   2. RTP/UDP multicast.
   3. RTP/RTSP/TCP.
   4. RTP/RTSP/HTTP/TCP.
   5. RTP/RTSP/HTTPS/TCP.
   6. HTTP.

K. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
   1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
   2. Video masked by privacy zones must be obscured prior to streaming.

L. Security Requirements: Provide video cameras with the following security requirements:
   1. Support the use of the following:
      a. Password protection.
      b. HTTPS Encryption.
      c. Digest authentication.
      d. WS authentication.
      e. User access Log.
      f. SSL encryption.
   2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

M. Electrical Power: Cameras capable of being powered by the following power sources:
   1. PoE: up to IEEE 802.3af Class 3 PoE Compliant.
   2. AC Power: 24 V +/- 10%, 10 VA min (13 VA min with -IR option).
   3. DC Power: 12 V +/- 10%, 7 W min (9 W min with -IR option).
   4. Battery Backup: 3V manganese lithium.

N. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
   1. Allow firmware updates via network.
   2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.

3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

O. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

P. Connectivity:
1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

Q. Operational Range:
1. Temperature: -10 degrees C to +50 degrees C [14 F to +122 F].
2. Relative Humidity: 0–95 percent (non-condensing).

10.4 1 MEGAPIXEL IP CAMERAS

A. Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 1.0C-H4A-D1: 1.0 MP H4 HD, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.

B. 1.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 1.0C-H4A-D1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.

C. 1.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 1.0C-H4A-D2-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.

b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 14 degrees to 29 degrees.

10.5 2 MEGAPIXEL IP CAMERAS

A. 2.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 2.0C-H4A-D1-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 30 degrees to 91 degrees.

B. 2.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 2.0C-H4A-D1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.

C. 2.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 2.0CH4A-D2-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).

h. Field of View: 14 degrees to 29 degrees.

10.6 3 MEGAPIXEL IP CAMERAS

A. 3.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
   1. Basis of Design Product: 3.0C-H4A-D1-B, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2048 x 1536.
      c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
      d. Imaging Rate: 30 fps (20 fps with WDR enabled).
      e. Dynamic Range: 67 dB.
      f. Resolution Scaling: Down to 768 x 432.
      g. Minimum Illumination:
         1) Color: 0.04 lux (F1.3).
         2) Monochrome: 0.008 lux (F1.3).
      h. Field of View: 32 degrees to 98 degrees.

B. 3.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
   1. Basis of Design Product: 3.0C-H4A-D 1-IR-B, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2048 x 1536.
      c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
      d. Imaging Rate: 30 fps (20 fps with WDR enabled).
      e. Dynamic Range: 67 dB.
      f. Resolution Scaling: Down to 768 x 432.
      g. Minimum Illumination:
         1) Color: 0.04 lux (F1.3).
         2) Monochrome: 0.008 lux (F1.3).
      h. Field of View: 32 degrees to 98 degrees.

C. 3.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
   1. Basis of Design Product: 3.0C-H4A-D2-B, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2048 x 1536.
      c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
      d. Imaging Rate: 30 fps (20 fps with WDR enabled).
      e. Dynamic Range: 67 dB.
      f. Resolution Scaling: Down to 768 x 432.
      g. Minimum Illumination:
         1) Color: 0.08 lux (F1.6).
         2) Monochrome: 0.016 lux (F1.6).
      h. Field of View: 15 degrees to 31 degrees.

10.7 5 MEGAPIXEL IP CAMERAS

A. 5.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
   1. Basis of Design Product: 5.0L-H4A-D1-B, by Avigilon.

2. Performance:
    a. Image Sensor: 1/1.8 inch progressive scan CMOS.
    b. Active Pixels (H x V): 2592 x 1944.
    c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
    d. Imaging Rate: 30 fps.
    e. Dynamic Range: 83 dB.
    f. Resolution Scaling: Down to 1792 x 1344.
    g. Minimum Illumination:
        1) Color: 0.033 lux (F1.8).
        2) Monochrome: 0.0066 lux (F1.8).
    h. Field of View: 46 degrees to 86 degrees.

B. 5.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.
1. Basis of Design Product: 5.0L-H4A-D1-IR-B, by Avigilon.
2. Performance:
    a. Image Sensor: 1/1.8 inch progressive scan CMOS.
    b. Active Pixels (H x V): 2592 x 1944.
    c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
    d. Imaging Rate: 30 fps.
    e. Dynamic Range: 83 dB.
    f. Resolution Scaling: Down to 1792 x 1344.
    g. Minimum Illumination:
        1) Color: 0.033 lux (F1.8).
        2) Monochrome: 0.0066 lux (F1.8).
    h. Field of View: 46 degrees to 86 degrees.

C. 5.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 5.0L-H4A-D2-B, by Avigilon.
2. Performance:
    a. Image Sensor: 1/1.8 inch progressive scan CMOS.
    b. Active Pixels (H x V): 2592 x 1944.
    c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
    d. Imaging Rate: 30 fps.
    e. Dynamic Range: 83 dB.
    f. Resolution Scaling: Down to 1792 x 1344.
    g. Minimum Illumination:
        1) Color: 0.026 lux (F1.6).
        2) Monochrome: 0.005 lux (F1.6).
    h. Field of View: 18 degrees to 41 degrees.

10.8 8 MEGAPIXEL IP CAMERAS

A. 8.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
1. Basis of Design Product: 8.0-H4A-D1-B, by Avigilon.
2. Performance:
    a. Image Sensor: 1/2.3 inch progressive scan CMOS.
    b. Active Pixels (H x V): 3840 x 2160.
    c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].

d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
e. Dynamic Range: 91 dB.
f. Resolution Scaling: Down to 3072 x 1728.
g. Minimum Illumination:
1) Color: 0.29 lux (F1.8).
2) Monochrome: 0.058 lux (F1.8).
h. Field of View: 44 degrees to 81 degrees.

B. 8.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.
1. Basis of Design Product: 8.0-H4A-D1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.3 inch progressive scan CMOS.
b. Active Pixels (H x V): 3840 x 2160.
c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
e. Dynamic Range: 91 dB.
f. Resolution Scaling: Down to 3072 x 1728.
g. Minimum Illumination:
1) Color: 0.29 lux (F1.8).
2) Monochrome: 0.058 lux (F1.8).
h. Field of View: 44 degrees to 81 degrees.
i. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.

PART 11 EXECUTION

11.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

11.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

11.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

11.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).
1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

11.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

11.6 CLOSEOUT

A. Demonstration:
   1. Demonstrate administration and operation of devices described by this section.
   2. Demonstrate how to authorize users and applications to operate and configure installed devices.
   3. Demonstrate how an authorized user can gain access to and make changes to configuration.
   4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

[SUBJECT]

PART 12 GENERAL

12.1 SECTION INCLUDES

A. Outdoor, dome-type network cameras for video surveillance.

12.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.
B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

12.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

12.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:
   1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
      a. Training.
      b. Installation.
      c. Commissioning.
      d. Remote diagnostics and integration with 3rd party software and hardware systems.

12.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

12.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
   1. One spare for each_____devices.
   2. Provide spare components as noted in the coordinating schedule for work listed in this section.

12.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
   1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
   2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
   3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
   1. Do not proceed with remaining Work until workmanship is approved by Architect.
   2. Refinish mock-up area as required to produce acceptable work.

12.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
   1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
   2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 13 PRODUCTS

13.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

13.2 DESIGN CRITERIA

A. System Design:
   1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
   3. Cameras in this section must be capable of bi-directional communication.
   4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
   1. cULus certification mark for Canada/USA.
   2. CE certification mark for European Union.
   3. ROHS mark for European Union.
   4. RCM certification mark for Australia.
   5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
   6. KC certification mark for Korea.
   7. BIS certification for India.
   8. SASO registration for Saudi Arabia.
   9. Kuwait registration.
   10. WEEE mark for European Union.

C. Safety Standards:
   1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
   1. FCC Part 15 Subpart B Class B.
   2. ICES-003 Class B.

3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

13.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.264 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
8. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:
   1. User Configurations Supported:
      a. Automatic and manual white balance control.
      b. Automatic and manually defined exposure zones operating in the range 1 and 1/8000 second.
      c. Flicker control (50 Hz, 60 Hz).
      d. Automatic and manual iris control.
      e. Color saturation and sharpening.
      f. Motion detection sensitivity and threshold.
      g. Digital rotation of the image.
      h. Minimum Dynamic Range:
      i. 70db. Dynamic Range shall not change based on configured encoding resolution.
   2. Adaptive Video Analytics Specifications:
      a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
      b. Automatic Analytic set up and tuning of behavior identification:
         1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
         2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.
   3. Include detection of the following behaviors:
      a. Object present in ROI.
      b. Object enters ROI.
      c. Object leaves ROI.
      d. Object appeared.
      e. Object disappeared.
      f. Object crosses a line of interest or beam.
      g. Object Movement Direction.
      h. Object loitering.
      i. Multiple objects in ROI over specified dwell time.
      j. Dwell Time.
      k. Number of objects exceeds limit in ROI.
      l. Number of objects below limit in ROI.
      m. Camera tampering.

F. Network Requirements: Provide video cameras that have the following network capabilities:
   1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
   2. Supports user configuration of network parameters including:
      a. Fixed (static) IP address.
      b. Subnet mask.
      c. Gateway.
      d. Control port.
   3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
   4. Provides support for both IPv4 and IPv6 Networks.

G. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:

1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
3. Threshold: Percentage of pixels that must detect change.

H. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
1. Alarm input terminal.
2. Video motion detection.
3. Camera temperature outside operative range.

I. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

J. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

K. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

L. Security Requirements: Provide video cameras with the following security requirements:
1. Support the use of the following:
    a. Password protection.
    b. HTTPS Encryption.
    c. Digest authentication.

d. WS authentication.
e. User access Log.
f. SSL encryption.

2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

M. Electrical Power: Cameras capable of being powered by the following power sources:
1. PoE: up to IEEE 802.3af Class 3 PoE Compliant.
2. AC Power: 24 V +/- 10%, 10 VA min (13 VA min with -IR option).
3. DC Power: 12 V +/- 10%, 7 W min (9 W min with -IR option).
4. Battery Backup: 3V manganese lithium.

N. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

O. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

P. Connectivity:
1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

13.4 1 MEGAPIXEL IP CAMERAS

A. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 1.0C-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 1.0C-H4A-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.

b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9 mm lens, IR illuminators and 128 GB SSD.
1. Basis of Design Product: 1.0C-H4A-12G-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Solid State Memory: Pre-installed 128GB solid state drive for onboard video recording.
j. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

D. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 1.0C-H4A-DO2, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 14 degrees to 29 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.5 2 MEGAPIXEL IP CAMERAS

A. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 2.0C-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.

c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 2.0C-H4A-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9 mm lens, IR illuminators and 256 G SSD
1. Basis of Design Product: 2.0C-H4A-25G-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Solid State Memory: Pre-installed 256GB solid state drive for onboard video recording.
j. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables Wide Dynamic Range (WDR).
k. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

D. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 2.0C-H4A-DO2, by Avigilon.
2. Performance:

a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm; [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 14 degrees to 29 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.6 3 MEGAPIXEL IP CAMERAS

A. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 3.0C-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.
c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 32 degrees to 98 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 3.0C-H4A-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.
c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 32 degrees to 98 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9 mm lens, IR illuminators and 256 G SSD.
1. Basis of Design Product: 3.0C-H4A-25G-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.

c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 32 degrees to 98 degrees.
i. Solid State Memory: Pre-installed 256GB solid state drive for onboard video recording.
j. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables Wide Dynamic Range (WDR).
k. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

D. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 3.0C-H4A-DO2, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.
c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 15 degrees to 31 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.7 5 MEGAPIXEL IP CAMERAS

A. 5.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
1. Basis of Design Product: 5.0L-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/1.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2592 x 1944.
c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 83 dB.
f. Resolution Scaling: Down to 1792 x 1344.
g. Minimum Illumination:
1) Color: 0.033 lux (F1.8).
2) Monochrome: 0.0066 lux (F1.8).
h. Field of View: 46 degrees to 86 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 5.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.
   1. Basis of Design Product: 5.0L-H4A-DO1-IR, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/1.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2592 x 1944.
      c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
      d. Imaging Rate: 30 fps.
      e. Dynamic Range: 83 dB.
      f. Resolution Scaling: Down to 1792 x 1344.
      g. Minimum Illumination:
         1) Color: 0.033 lux (F1.8).
         2) Monochrome: 0.0066 lux (F1.8).
         3) With IR Illuminator: 0 lux.
      h. Field of View: 46 degrees to 86 degrees.
      i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 5.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
   1. Basis of Design Product: 5.0L-H4A-DO2, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/1.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2592 x 1944.
      c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
      d. Imaging Rate: 30 fps.
      e. Dynamic Range: 83 dB.
      f. Resolution Scaling: Down to 1792 x 1344.
      g. Minimum Illumination:
         1) Color: 0.026 lux (F1.6).
         2) Monochrome: 0.005 lux (F1.6).
      h. Field of View: 18 degrees to 41 degrees.
      i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.8 8 MEGAPIXEL IP CAMERAS

A. 8.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
   1. Basis of Design Product: 8.0-H4A-DO1, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.3 inch progressive scan CMOS.
      b. Active Pixels (H x V): 3840 x 2160.
      c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
      d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
      e. Dynamic Range: 91 dB.
      f. Resolution Scaling: Down to 3072 x 1728.
      g. Minimum Illumination:
         1) Color: 0.29 lux (F1.8).
         2) Monochrome: 0.058 lux (F1.8).
      h. Field of View: 44 degrees to 81 degrees.
      i. Operating Modes:
         1) Full Feature Mode: Full camera functionality.

2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.

j. Operational Range: -40 degrees C to +50 degrees C [-40 F to +122 F].

B. 8.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.

1. Basis of Design Product: 8.0-H4A-DO1-IR, by Avigilon.
2. Performance:
   a. Image Sensor: 1/2.3 inch progressive scan CMOS.
   b. Active Pixels (H x V): 3840 x 2160.
   c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
   d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
   e. Dynamic Range: 91 dB.
   f. Resolution Scaling: Down to 3072 x 1728.
   g. Minimum Illumination:
      1) Color: 0.29 lux (F1.8).
      2) Monochrome: 0.058 lux (F1.8).
      3) With IR Illuminator: 0 lux.
   h. Field of View: 44 degrees to 81 degrees.
   i. Operating Modes:
      1) Full Feature Mode: Full camera functionality.
      2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.
   j. Operational Range: -40 degrees C to +50 degrees C [-40 F to +122 F].

PART 14 EXECUTION

14.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

14.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

14.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

14.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).

1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

14.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

14.6 CLOSEOUT

A. Demonstration:
   1. Demonstrate administration and operation of devices described by this section.
   2. Demonstrate how to authorize users and applications to operate and configure installed devices.
   3. Demonstrate how an authorized user can gain access to and make changes to configuration.
   4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

[SUBJECT]

PART 15 GENERAL

15.1 SECTION INCLUDES

A. Indoor surface mounted, bullet-type network cameras for video surveillance.

15.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.
B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

15.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

15.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
    1. Substrate preparation instructions and recommendations
    2. Installation means and methods.
    3. Recommendations and requirements for proper storage and handling.
C. Shop Drawings:
    1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
    2. Coordinate with locations listed on Contract Drawings.
D. Warranty Information:
    1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.
E. System Support Resources:
    1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
        a. Training.
        b. Installation.
        c. Commissioning.
        d. Remote diagnostics and integration with 3rd party software and hardware systems.

15.5 CLOSEOUT SUBMITTALS
A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.
B. Supply network configuration backup files, restoration application and instructions.

15.6 MAINTENANCE SUBMITTALS
A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
    1. One spare for each_____devices.
    2. Provide spare components as noted in the coordinating schedule for work listed in this section.

15.7 QUALITY ASSURANCE
A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.
B. Qualifications - Installers:
    1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
    2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
    3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.
C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
    1. Do not proceed with remaining Work until workmanship is approved by Architect.
    2. Refinish mock-up area as required to produce acceptable work.

15.8 WARRANTY
A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.

1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 16 PRODUCTS

16.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

16.2 DESIGN CRITERIA

A. System Design:
   1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
   3. Cameras in this section must be capable of bi-directional communication.
   4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
   1. cULus certification mark for Canada/USA.
   2. CE certification mark for European Union.
   3. ROHS mark for European Union.
   4. RCM certification mark for Australia.
   5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
   6. KC certification mark for Korea.
   7. BIS certification for India.
   8. SASO registration for Saudi Arabia.
   9. Kuwait registration.
   10. WEEE mark for European Union.

C. Safety Standards:
   1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
   1. FCC Part 15 Subpart B Class B.
   2. ICES-003 Class B.
   3. EN 55032 Class B.
   4. EN 61000-6-3.

5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

16.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.264 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 12mbps at 30 FPS for 1-3MP and 20mbps at 30 FPS for 5-8MP .
8. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:

1. User Configurations Supported:
    a. Automatic and manual white balance control.
    b. Automatic and manually defined exposure zones operating in the range 1/6 and 1/8000 second.
    c. Flicker control (50 Hz, 60 Hz).
    d. Automatic and manual iris control.
    e. Color saturation and sharpening.
    f. Motion detection sensitivity and threshold.
    g. Digital rotation of the image when used with control center software.
    h. Minimum Dynamic Range:
    i. 67db for 1-3MP, 83dB for 5MP and 91dB for 8MP. Dynamic Range shall not change based on configured encoding resolution.
2. Adaptive Video Analytics Specifications:
    a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
    b. Automatic Analytic set up and tuning of behavior identification:
        1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
        2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.
3. Include detection of the following behaviors:
    a. Object present in ROI.
    b. Object enters ROI.
    c. Object leaves ROI.
    d. Object appeared.
    e. Object disappeared.
    f. Object crosses a line of interest or beam.
    g. Object Movement Direction.
    h. Object loitering.
    i. Multiple objects in ROI over specified dwell time.
    j. Dwell Time.
    k. Number of objects exceeds limit in ROI.
    l. Number of objects below limit in ROI.
    m. Camera tampering.

F. Network Requirements: Provide video cameras that have the following network capabilities:
1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:
    a. Fixed (static) IP address.
    b. Subnet mask.
    c. Gateway.
    d. Control port.
3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

G. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:
1. Motion Detection Mask: Defined areas within the camera’s field of view for the camera to detect motion.

2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
3. Threshold: Percentage of pixels that must detect change.

H. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
1. Alarm input terminal.
2. Video motion detection.
3. Camera temperature outside operative range.
4. Schedule.

I. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

J. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

K. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

L. Security Requirements: Provide video cameras with the following security requirements:
1. Support the use of the following:
    a. Password protection.
    b. HTTPS Encryption.
    c. Digest authentication.
    d. WS authentication.

e. User access Log.
f. SSL encryption.
2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

M. Electrical Power: Cameras capable of being powered by the following power sources:
1. PoE: IEEE 802.3af Class 3 PoE Compliant.
2. AC Power: 24 V +/- 10%, 19 VA min.
3. DC Power: 12 V +/- 10%, 13 W min.
4. Battery Backup: 3V manganese lithium.

N. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

O. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

P. Connectivity:
1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

Q. Operational Range:
1. Temperature (1.0 – 5.0MP): -40 degrees C to +55 degrees C [-40 F to +131 F].
2. Temperature (8.0 MP): -35 degrees C to +50 degrees C [-31 F to +122 F].
3. Relative Humidity: 0–95 percent (non-condensing).

16.4 1 MEGAPIXEL IP CAMERAS

A. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 3-9mm lens:
1. Basis of Design Product: 1.0C-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).

2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.

B. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 3-9mm lens:
1. Basis of Design Product: 1.0C-H4A-12G-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.
k. Solid State Drive: 128 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

C. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 1.0C-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 14 degrees to 29 degrees.

D. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 9-22mm lens:
1. Basis of Design Product: 1.0C-H4A-12G-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].

e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 14 degrees to 29 degrees.
k. Solid State Drive: 128 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

16.5 2 MEGAPIXEL IP CAMERAS

A. 2.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 3-9mm lens:
1. Basis of Design Product: 2.0C-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.

B. 2.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 3-9mm lens:
1. Basis of Design Product: 2.0C-H4A-25G-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.
k. Solid State Drive: 256 GB.

l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

C. 2.0 MP H4 Camera, Wide Dynamic Range, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 2.0C-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 14 degrees to 29 degrees.

D. 2.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 9-22mm lens:
1. Basis of Design Product: 2.0C-H4A-25G-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 14 degrees to 29 degrees.
k. Solid State Drive: 256 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

16.6 3 MEGAPIXEL IP CAMERAS

A. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 3-9mm lens:
1. Basis of Design Product: 3.0C-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.

d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 30 fps (20 fps with WDR enabled).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 32 degrees to 98 degrees.

B. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 3-9mm lens:
1. Basis of Design Product: 3.0C-H4A-25G-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.
d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 32 degrees to 98 degrees.
k. Solid State Drive: 256 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

C. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 3.0C-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.
d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 30 fps (20 fps with WDR enabled).
f. Dynamic Range: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).

2) Monochrome: 0 lux (F1.6) with IR
j. Field of View: 15 degrees to 31 degrees.

D. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 9-22mm lens:
1. Basis of Design Product: 3.0C-H4A-25G-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.
d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 15 degrees to 31 degrees.
k. Solid State Drive: 256 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

16.7 5 MEGAPIXEL IP CAMERAS

A. 5.0 MP H4 HD Camera, Self-Learning Video Analytics and 4.3-8mm lens:
1. Basis of Design Product: 5.0L-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/1.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2592 x 1944.
d. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range: 83 dB Linear.
g. Resolution Scaling: Down to 1792 x 1344.
h. Minimum Illumination:
1) Color: 0.033 lux (F1.8).
2) Monochrome: 0 lux (F1.8) in IR.
i. Field of View: 46 degrees to 86 degrees.

B. 5.0 MP H4 HD Camera, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 5.0L-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/1.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2592 x 1944.
d. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range: 83 dB Linear.
g. Resolution Scaling: Down to 1792 x 1344.

h. Minimum Illumination:
1) Color: 0.026 lux (F1.6).
2) Monochrome: 0 lux (F1.6) in IR.
i. Field of View: 18 degrees to 41 degrees.

16.8 8 MEGAPIXEL IP CAMERAS

A. 8.0 MP HD Camera, Self-Learning Video Analytics and 4.3-8mm lens:
1. Basis of Design Product: 8.0-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.3 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 3840 x 2160.
d. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
e. Imaging Rate: 20 fps (30 fps in High Framerate mode).
f. Dynamic Range: 91 dB Linear.
g. Resolution Scaling: Down to 3072 x 1728.
h. Minimum Illumination:
1) Color: 0.29 lux (F1.8).
2) Monochrome: 0 lux (F1.8) with IR
i. Field of View: 44 degrees to 81 degrees.
j. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.

PART 17 EXECUTION

17.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.
B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

17.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

17.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

17.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.
B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).
1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.
C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.
D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

17.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

17.6 CLOSEOUT

A. Demonstration:
   1. Demonstrate administration and operation of devices described by this section.
   2. Demonstrate how to authorize users and applications to operate and configure installed devices.
   3. Demonstrate how an authorized user can gain access to and make changes to configuration.
   4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

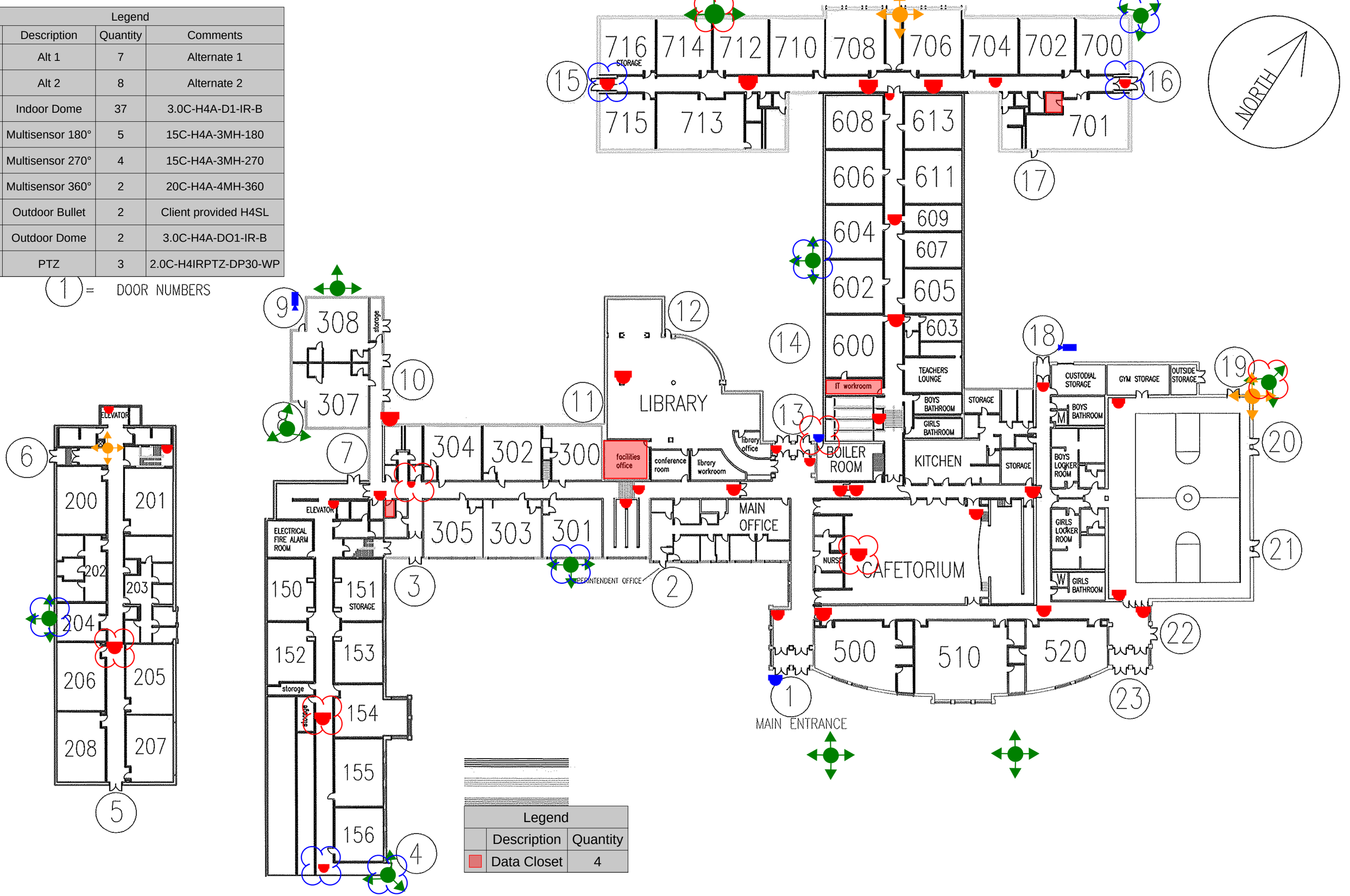
B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

END OF SECTION

Legend			
	Description	Quantity	Comments
	Alt 1	7	Alternate 1
	Alt 2	8	Alternate 2
	Indoor Dome	37	3.0C-H4A-D1-IR-B
	Multisensor 180°	5	15C-H4A-3MH-180
	Multisensor 270°	4	15C-H4A-3MH-270
	Multisensor 360°	2	20C-H4A-4MH-360
	Outdoor Bullet	2	Client provided H4SL
	Outdoor Dome	2	3.0C-H4A-DO1-IR-B
	PTZ	3	2.0C-H4IRPTZ-DP30-WP

1 = DOOR NUMBERS



Legend		
	Description	Quantity
	Data Closet	4

SAMPLE

EXHIBIT B – SAMPLE CONTRACT FOR SURVEILLANCE SECURITY SYSTEM FOR HORACE W. PORTER SCHOOL

Contract for
SURVEILLANCE SECURITY SYSTEM FOR HORACE W. PORTER SCHOOL
by and between
THE TOWN OF COLUMBIA
and

_____

This Contract is by and between THE TOWN OF COLUMBIA, a municipal corporation having its territorial limits within the County of Hartford, and State of Connecticut, hereinafter referred to as the **Town**, and _____, whose address is_____, hereinafter referred to as the **Firm.**

WHEREAS, the Town is seeking qualified firms (including individuals) interested in providing Surveillance Security Systems services.

WHEREAS, the Firm is qualified, ready, willing, and able to perform such services for an agreed upon compensation,

NOW, THEREFORE,

The Town and Firm do mutually covenant and agree as follows:

1. Scope of Services

1.1 General

The Firm agrees to provide, THE TOWN OF COLUMBIA Surveillance Systems services that meet the Horace W. Porter School requirements as stated below. Prospective vendors must be experienced in evaluating the proposed systems/needs thus providing the best possible solution and installing the best type of security systems for Horace W. Porter School.

STATEMENT OF WORK

Base Bid requirements are to add the following equipment per design requirements *:

Part type	Model	Quantity	Required Mounts and Accessories				
NVR	HD-NVR4-PRM-192TB-NA	1					
Camera	3.0C-H4A-D1-IR-B	29					
Camera	15C-H4A-3MH-270	2	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-60W-NA
Camera	20C-H4A-4MH-360	2	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-POLE1	POE-INJ2-60W-NA
Camera	3.0C-H4SL-BO1-IR	2	H4-BO-JBOX1				
Camera	3.0C-H4A-DO1-IR-B	2					
Camera	2.0C-H4IRPTZ-DP30-WP	3	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-95W-NA		

*Require (40) ACC7-ENT ACC 7 Enterprise Edition camera license

Alt 1 requirements are to add the following equipment per design requirements *:

Part type	Model	Quantity	Required Mounts and Accessories				
Camera	3.0C-H4A-D1-IR-B	4					
Camera	15C-H4A-3MH-180	1	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	POE-INJ2-60W-NA	
Camera	15C-H4A-3MH-270	1	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-60W-NA
Camera	3.0C-H4A-DO1-IR-B	1					

*Require (7) ACC7-ENT ACC 7 Enterprise Edition camera license

Alt 2 requirements are to add the following equipment per design requirements *:

Part type	Model	Quantity	Required Mounts and Accessories				
Camera	3.0C-H4A-D1-IR-B	3					
Camera	15C-H4A-3MH-180	3	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	POE-INJ2-60W-NA	
Camera	15C-H4A-3MH-270	2	H4AMH-AD-PEND1	H4AMH-DO-COVR1	IRPTZ-MNT-WALL1	H4-MT-CRNR1	POE-INJ2-60W-NA

*Require (8) ACC7-ENT ACC 7 Enterprise Edition camera license

Note the following information and scope of work which includes but is not limited to the following:

- The Contractor shall include all licenses associated with the systems bid by said Contractor. In no case shall the Contractor bill the Owner for any additional license fees or costs within 3 year of installation completion.
- All Software licenses except as noted shall be included in the proposal. No recurring licenses or Software Upgrade Plan (SUP) costs will be accepted. No additional licenses for client workstations will be accepted.
- The Contractor shall be responsible for all programming noted here. This includes, but is not limited to:

    a. Programming of all equipment and functionality to provide operational system within the scope of this project and to which adheres to the manufacturer's installation and networking best practices.
    b. Setup camera settings and recording according to system design parameters.
    c. Setup Appearance Search on all analytic cameras and UMD on those cameras that are not required to be included in Appearance Search.
    d. Create analytic alarms on high priority cameras to trigger per designated schedule.
    e. Create rule notifications to send email to pre-determined administrators when a designated server or camera event takes place.
    f. Setup workstations to have access to the VMS via ACC Client.
    g. Set up mobile devices to connect with the WebEndpoint using Mobile3 App.

- All cable and cable installation shall be supplied and performed by the security Contractor.
- All conduit, where required by code, shall be provided by the Contractor and adhere to AHJ fire and building code.
- All 120VAC power shall be provided by others but shall be coordinated by the Contractor.
- All power supplies and ancillary equipment shall be installed in the designated data rooms (also known as MDF/IDF rooms as coordinated with OMG
- All equipment warranties must start upon owner activation of the systems
- All equipment must be of new condition (no refurbished).
- All items be IP (Internet Protocol) based, digital units.
- All video equipment must fit within the **latest ONVIF** standards. (Profile C is for IP-based; Profile G is for edge storage and retrieval; and Profile S is for IP-based video systems.
- All equipment will operate on the current power grid unless otherwise required.
- All equipment must be self-sustaining or at least self-starting in the event of a power failure
- No analog equipment will be considered.
- System will be capable of running on generator power or battery backup system.
- All external equipment will equal or exceed IP-66 weatherproofing standards
- Connections for all exterior equipment will equal or exceed IP-67 waterproofing standards
- Connections for interior equipment with equal or exceed IP-66 standards
- All exposed equipment, conduits and other related mounting components will meet IK-10 vandal resistance standards.
- All hardware providing Power over Ethernet will be at the IEEE 802.3at Power over Ethernet standard for every supplied port.
- The Contractor shall coordinate the installation of additional POE switches located in identified IDF/MDF telephone rooms for all Ethernet devices as needed by others.

Networking Equipment

- Vendor shall provide networking equipment necessary to support the Surveillance System based on their needs of the current IT infrastructure of OMG
- Vendor shall be responsible for configuration of required all networking equipment to include wireless transitions to those camera locations that are not capable of hardwire cable runs.
- When possible, recording and client traffic should be segmented into two physical/virtual networks. NIC 1 on the servers can be assigned to the recording traffic and connect to the recording network. NIC 2 on the servers can be assigned to the client traffic and connect to the client network.
- If physical segmentation is impossible, segmentation of the traffic via Vlan or VRF is critical and mandatory for managing potential ARP broadcast issues.
- Network connections to servers and clients should be 1gbps minimum.
- Externally mounted cameras over copper should be protected with surge suppression.
- Do not load an Ethernet connection greater than 70% of its maximum throughput.

Capacity

- The System must be capable of retaining video for a minimum of 60 days at no less than 13 frames per second for outdoor cameras and 10 frames per second for indoor cameras at 40% activity for analytics cameras set to record 1 frame per second when there is no activity using idle scene mode.

- The camera system will shall require internal storage devices that provide access to consolidated block level data storage and must be accessible to server(s) so that the devices appear like locally attached volumes to the operating system.

Exporting

- It is required for the System to be capable of exporting video in standard video formats capable of being played without additional codecs on a Windows OS, MAC OS or standalone commercial DVD player. (I.E. AVE, AVI, WMF).
- File package should also be downloadable to USB sticks.
- It is required that there be exporting in a proprietary format for authenticity of video to be used in a court of law, the necessary codecs and software to play video on a standard Windows OS computer. Said software and codecs, without additional cost, must be legally capable of being distributed to third parties for review of exported video.
- The exported video will need to be of evidentiary quality. This would include court acceptable digital time-date and forensic level watermarks/stamping to prove video was not altered.

Contractor Assumptions and Requirements

- Install all low voltage cabling and connectivity connections required by Surveillance system to include wireless transmission from cameras to recorder.
- All camera installation, configuration, setup, program and related work shall be performed by authorized integrators/electronic technicians certified by the manufacturer.
- Install all line voltage cabling and connections required for project unless otherwise indicated by owner.
- Provide shop drawings as needed during implementation
- Provide as-built drawings showing logical system design and cable diagrams for future facility reference.
- As required, the Contractor will coordinate efforts with other related trades.
- Any fire rated plywood (if required) on which panel and power supply equipment will be installed will be supplied and installed by Contractor.
- All cabling shall be permanently tagged/labeled with purpose and location on each end of the cables.
- Provide new and working equipment
- No refurbished or reutilized components.
- Provide all labor and parts needed to assemble the specified Surveillance systems. (I.e. racks, cabling, mounting hardware, etc.)
- Complete all work in a timely manner and carried out with professional workmanship.
- Follow all local, regional, and national codes for installation of the Camera System.
- Provide identity and contact information of the Project Manager who will act as a single point of contact for all activities regarding this project.
- Provide training on all equipment and software per performance testing standards outlined in this document.
- Contractor shall be responsible for configuration of required networking equipment with the assistance of Horace W. Porter School IT Department.
- Follow all local, regional, and national codes for installation of the system.
- Leave work site clean after each day of work.
- Complete all work in a timely manner and carried out with professional workmanship.

Requirements

- Provide a security project manager to act as a single point of contact for Contractor during the full implementation of the Security System.
- Provide assistance with defining operational modes of the system and any information needed by Contractor for initial programming of the system.
- Provide timely return of information or sign-offs needed by Contractor during implementation.
- Perform necessary internal network configurations to accommodate the install.
- Provide floor plans of building in the projects
- Provide proposed camera locations
- Provide high voltage electrical information electrical information.
- Provide internal IT worker(s) assistance to vendors for collaboration of the install efforts to enable a smooth transition.
- All remote sites must have an ISP upload and download speed of no less than 20Mb/sec dedicated to the Surveillance system. Contractor is not responsible for WAN performance issues pertaining to the Surveillance system.
- If using existing network for the communication of database, controllers and client workstation transmissions, it is the responsibility of Horace W. Porter School's IT department to open necessary ports between subnets and networks to ensure connectivity.

Contractor Administrative Requirements

- All installation, configuration, setup, program and related work shall be performed by authorized manufacturer integrators/electronic technicians certified by the manufacturer in writing.
- Certification for authorized integrators/electronic technicians shall include at a minimum the installation and service of the Surveillance system equipment provided.
- Submit confirmation that installer has received manufacturer training and is certified by the manufacturer on this equipment and that the training the installer received is current.
- Submit confirmation that contractor is licensed to install surveillance security equipment as required by the authority having jurisdiction.
- Coordinate with owner regarding network configuration and estimated bandwidth utilization prior to connection of cameras to owner's network.
- It is the duty of the contractor to provide a working system. Any omissions or errors or differences between this document and the contractor's submitted proposal shall be clearly outlined in a separate document labeled "Proposal Deltas".
- Submit confirmation and details of Avigilon warranty, extended warranty, and replacement policies.

Contractor Installation Requirements

- All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.
- All firmware found in products shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by manufacturer, the provider of the Surveillance system.

- All equipment requiring users to log on using a password shall be configured with user/site-specific password/passwords. No system/product default passwords shall be allowed.
- Contractor shall review configurable features of the system with the Owner's Representative (Project Manager) and establish a punch list for standards, device specifics, location specific and VMA/NVR specific configuration of device(s). The Contractor shall install, program and configure devices in accordance with this punch list and such that no additional programming is required for operation by Horace W. Porter School after close out activities have ended.
- All LAN/WAN connectivity required to make the system operational must be in place and tested a minimum of 2 weeks prior to any identified or committed completion date.

Closeout Activities

- Demonstrate the administration and operation of the Surveillance system as described within this section.
- Demonstrate how an authorized user can gain access to and make changes to configuration.
- Demonstrate how to operate the functionality configured for this project as defined by the scope of work.
- Perform field software changes after the initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to the Owner's operating requirements.
- Software, hardware, firmware, operational or administrative licenses necessary to operate or administer the devices shall be registered to the Owner.
- Install all software, hardware, firmware, operational or administrative licenses necessary to operate or administer the system.
- Using the manufacturer's backup software tool or the VMA/NVR, perform a full system back-up upon completion of initial programming.
- Deliver the configuration backup files, restoration application and instructions detailing for the restoration of back-up configuration.
- Upon completion of all work, and after receipt of all appropriate marked up As Built Drawings, Operating Manuals, Warranties, Guarantees, and Spare Parts required by the Contract Documents, Horace W. Porter School shall prepare the Certificate of Final Completion.
- The Contractor's signature on this Certificate shall be notarized.
- The Contractor shall provide a final Application for Payment to complement the close-out process.
- If Horace W. Porter School is required to prepare a Certificate for Partial Release of Retainage the Contractor shall complete all remaining Work in accordance with the provisions of the General Conditions.
- The Contractor's signature on this Certificate shall be notarized.
- The Contractor may make a request for additional releases of retainage when portions of the Work listed on the Horace W. Porter School punch list have been satisfactorily completed. Each request shall be accompanied by a new application for payment and a new signed and notarized Certificate for Partial Release of Retainage.

- Prior to requesting Partial Completion, the Contractor shall make a thorough inspection of the Work. During this inspection the Contractor shall prepare a comprehensive list of all items remaining to be completed or corrected. This list shall include all remaining Contractor and Subcontractor items to be provided under the Contract Documents.
- The Contractor shall not be relieved of the responsibility to provide Contract items left off the Horace W. Porter School punch list.
- Upon completion of all remaining items, the Final Release of Retainage shall be processed.

Warranty and Maintenance

- The Contractor shall warranty the entire system for a period of 1 -year following successful completion of a 30-day Trial Period Test. Any deficiencies reported to the Contractor by the Owner during the Trial Period Test shall be corrected within 24 hours of the time it is reported without cost and to the satisfaction of the Owner. In the event this is not accomplished, the Trial Period Test shall be started again.
- The Contractor shall provide local "on-call" hardware and software maintenance for all equipment supplied under this Contract during the warranty period. The maintenance shall consist of all material, labor and travel expenses to:
- Replace all defective components as required.
- Perform annual preventive maintenance as required by this document.
- At the end of the warranty period, the Contractor shall provide detailed documentation of service and maintenance performed on the system from the date of acceptance. Documentation shall include Owner signed service slips with a description of symptoms, diagnoses and subsequent actions taken. Recommended changes in routine preventive maintenance procedures shall also be included.
- All warranty, maintenance, and service periods shall commence on the date that the Trial Period Test is completed and the Owner provides a written final acceptance of the system except that, if it is discovered after said date that certain work or materials were not in fact in conformance with the requirements of the Contract Documents, the applicable period of warranty for defective components or software shall recommence from the completion of all remedial work required.
- The Contractor shall warranty that all workmanship shall be serviceable and shall perform dependably for a period of at least one year. Such warranty is in addition to and independent of any guarantee and warranties of suppliers or manufacturers.

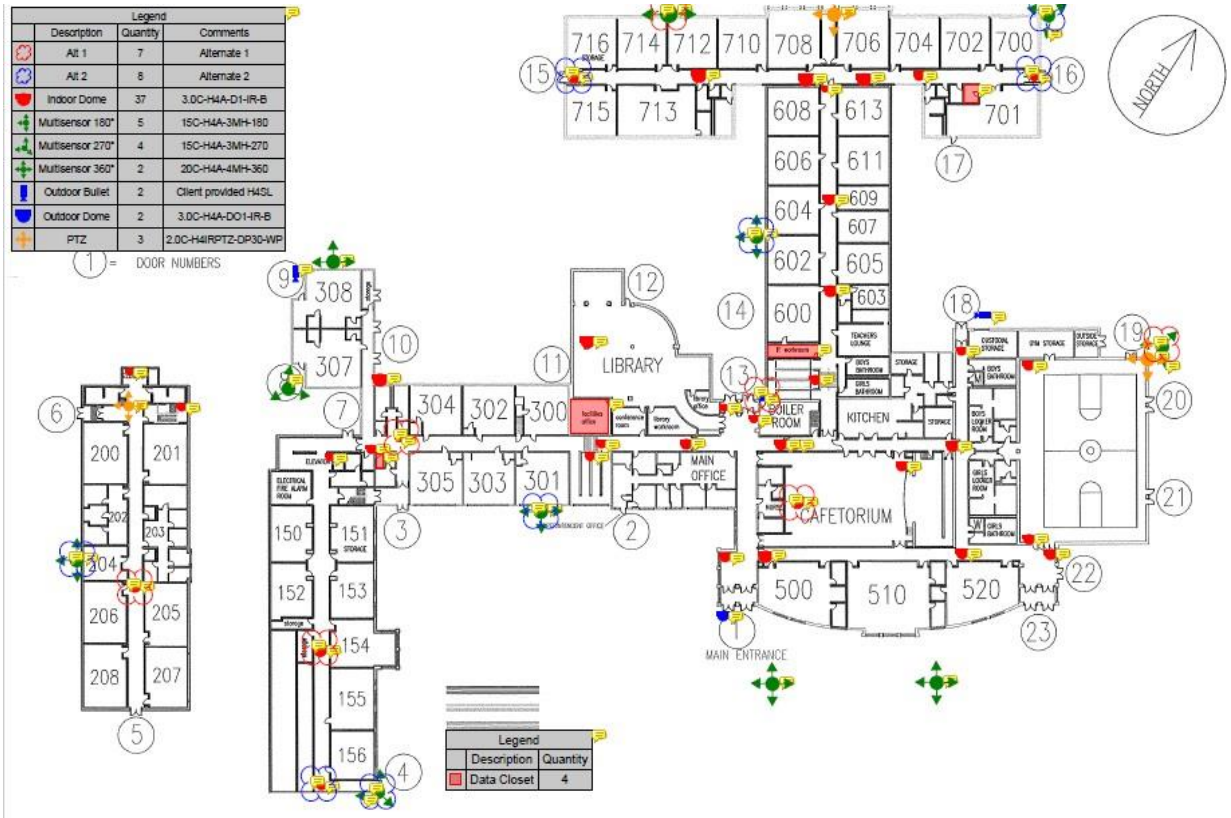
Preventative Maintenance and Service

- The Contractor shall conduct annual preventive maintenance on the entire system in accordance with the manufacturers' recommendations during the warranty period for the first year.
- The software shall be similarly covered with a software maintenance agreement. Under this agreement, the Contractor shall be responsible for updating all software as the manufacturer’s release major revisions and patches, inclusive of the labor required to install these updates. The pricing for this software maintenance agreement shall be included in the cost of the warranty and/ or maintenance agreement.
- The Contractor shall be responsible for maintaining all systems in good, efficient operating condition and shall supply all labor and parts that are necessary to repair the system. Equipment failure shall be reported to the Contractor during the normal workday

by the Owner or its authorized representative. The Contractor shall dispatch one or more qualified technicians to arrive at the equipment location within 48 hours of a call being placed by the Owner or its representatives. The equipment shall be serviced and returned to full operation on the same day of the service call. In the event the equipment cannot be serviced in this time, the Contractor shall notify the Owner. The Contractor shall provide a security system service and maintenance log book on the job. Each service call shall be recorded, and a copy furnished to the Owner filing in the maintenance logbook.

- Following the conclusion of the warranty, the Owner may elect to enter into a maintenance agreement with the Contractor. The Contractor shall provide pricing for repair and maintenance of the system for the four (4) years following expiration of the original warranty. This pricing shall include parts and labor 24 hour per day, holidays included. The maintenance agreement shall provide the same level of coverage as the warranty, including an annual preventative maintenance. All updates, parts and labor shall be covered under this agreement at no additional cost to the owner beyond the annual cost of the maintenance agreement

Drawings and Design: Please refer to attached Drawing documentation and System Design for camera details. Alt 1 and Alt 2 camera settings to be equivalent to Base Bid cameras per System Design documentation.



HD NVRs

NAME	MODEL	EXPANSIONS	STORAGE	TOTAL DATA	STORAGE TIME	STATUS
Storage 1	HD-NVR4-PRM-192TB-NA	n/a	182.4 TB	558.78 Mbps	79 days 9 hours	Valid

HDSM Smart Cameras

NAME	MODEL	STORAGE	QTY	LENS	FL. (MM)	IPS	DUTY CYCLE	COMPRESSION	BITRATE	HDSM SMARTCODEC		
										ENABLED	STRENGTH	MIN IPS
Indoor Dome	3.0C-H4A-D1-IR-B	Storage 1	37	Built-In Lens, 3-9mm, f/1.3, P-Iris, Vari Focal	3.0	10	24	Quality 6	7.18 Mbps	✔	Low	1
Multisensor 180°	15C-H4A-3MH-180	Storage 1	5	Built-In Lens, 4mm, f/1.6					20.29 Mbps			
↳Head 1					4.0	15	24	Quality 6		✔	Low	1
↳Head 2					4.0	15	24	Quality 6		✔	Low	1
↳Head 3					4.0	15	24	Quality 6		✔	Low	1
Multisensor 270°	15C-H4A-3MH-270	Storage 1	4	Built-In Lens, 2.8mm, f/1.2					20.29 Mbps			
↳Head 1					2.8	15	24	Quality 6		✔	Low	1
↳Head 2					2.8	15	24	Quality 6		✔	Low	1
↳Head 3					2.8	15	24	Quality 6		✔	Low	1
H4 MH Camera 3	20C-H4A-4MH-360	Storage 1	2	Built-In Lens, 2.8mm, f/1.2					24.71 Mbps			
↳Head 1					2.8	13	24	Quality 6		✔	Low	1
↳Head 2					2.8	13	24	Quality 6		✔	Low	1
↳Head 3					2.8	13	24	Quality 6		✔	Low	1
↳Head 4					2.8	13	24	Quality 6		✔	Low	1
Outdoor Bullet	3.0C-H4SL-BO1-IR	Storage 1	2	Built-In Lens, 3-9mm, f/1.4, P-Iris, Vari Focal	3.1	10	24	Quality 6	5.96 Mbps	✔	Low	1
Outdoor Dome	3.0C-H4A-DO1-IR-B	Storage 1	2	Built-In Lens, 3-9mm, f/1.3, P-Iris, Vari Focal	< min	10	24	Quality 6	6.69 Mbps	✔	Low	1
PTZ	2.0C-H4IRPTZ-DP30-WP	Storage 1	3	Built-In Lens, 4.3-129 mm, f/1.6-f/4.7	5.7	10	24	Quality 6	12.00 Mbps	✔	Low	1

Scene Details

NAME	MOUNTING HEIGHT (FT)	TARGET HEIGHT (FT)	TARGET DISTANCE (FT)	SCENE WIDTH (FT)	MOUNTING ANGLE	MAXIMUM DISTANCE (FT)	PX/FT
Indoor Dome	9.5	8	30	52	46.7	190	39.4
Multisensor 180°	15						
↳Head 1		6	40	53	50.1	66.7	44.6
↳Head 2		6	40	53	50.1	66.7	44.6
↳Head 3		6	40	53	50.1	66.7	44.6
Multisensor 270°	15						
↳Head 1		6	40	87.4	45.3	66.7	25.8
↳Head 2		6	40	87.4	45.3	66.7	25.8
↳Head 3		6	40	87.4	45.3	66.7	25.8
H4 MH Camera 3	15						
↳Head 1		6	40	87.4	45.3	66.7	25.8
↳Head 2		6	40	87.4	45.3	66.7	25.8
↳Head 3		6	40	87.4	45.3	66.7	25.8
↳Head 4		6	40	87.4	45.3	66.7	25.8
Outdoor Bullet	12	6	40	64	45.1	80	32
Outdoor Dome	8.5	6	40	69.7	45.5	136	29.3
PTZ	15	6	16.5	16.8	46.8	27.5	114

SECTION 28 23 00
VIDEO MANAGEMENT SYSTEM

PART 1 PRODUCTS

1.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon ACC7.

1.2 NETWORK VIDEO MANAGEMENT SOFTWARE (NVMS) SYSTEM DESCRIPTION

A. Description: NVMS provides workstations with a simplified screen layout, intuitive controls, and customizable features that improve multi-person interactions that has the following features:

1. Advanced AI technology that brings a new level of automation to surveillance. Without any predefined rules, Unusual Motion Detection UMD technology continuously learns what typical activity in a scene looks like, and then detects and records motion anomalies.
2. HDSM™ Technology-Efficiently compresses and preserves image quality while intelligently managing HD image transmission throughout system.
3. HDSM SmartCodec technology to automatically optimize compression levels for regions in a scene, to maximize bandwidth while still maintaining image quality.
4. Allows for Focus of Attention interface enables operators to be more effective when monitoring large numbers of cameras. Events that are occurring across cameras from the entire site shall be visualized in an easily consumable format that always makes it clear where the operator should focus his or her attention.
5. ONVIF® Profile S and Profile T Compliant VMS ONVIF Profile S and Profile T compliance ensures interoperability between IP based ONVIF conformant security devices regardless of manufacturer.
6. Alarm Escalation to create complete end-to-end workflows for monitoring, assigning, and acknowledging alarms.
7. Search capabilities with bookmark, event, alarm and thumbnail search options.
8. Easy integration with other leading camera and hardware manufacturers.
9. Allows mobile software push alarm notifications, live and recorded video, audio talkdown, self-learning video analytics overlays, digital output triggers, and PTZ control for Android™ and iOS mobile devices.
10. License Plate Recognition (LPR) analytics.
11. Enables unlocking doors directly from a camera view.
12. Scalable integration with external systems using distributed architecture features .NET-based and REST-based APIs that can easily be integrated with other systems, such as access control and building management.

1.3 NETWORK VIDEO MANAGEMENT SOFTWARE (NVMS) APPLICATION

A. General: Provide an NVMS software application that can be installed on any open platform hardware and does not require hardware multiplexer or time-division technology for video or audio.

1. Recording Storage Capacity: Expandable without additional licenses.
2. The NVMS server and client software applications can be installed and run on same computer or on separate computers.
3. Secure Transmissions: Securely sends video and audio data by transmitting commands and control data via TCP/IP using cryptographic keys based on SSL/TLS to prevent eavesdropping or tampering.
4. Drivers: Supports recording and management of video and audio sources through use of industry standard drivers, including the following drivers:

a. ONVIF Profile S and Profile T Compliant VMS.
b. Publicly Published API.

5. De-wrapping: Supports de-warping of live and recorded video from:
   a. From Avigilon H4 Fisheye cameras.
   b. From supported cameras fitted with an Immervision Panomorph lens.
   c. From cameras with a fixed fisheye lens, including but not limited to:
      1) Oncam Grandeye Evolution line of cameras.

B. Alarms and Events: Provide ability to configure and manage alarms and events.
   1. Defines event triggers that are configured to result in an alarm.
   2. Generates alarms as a result of the following event types:
      a. Detect events that occur within a camera's field of view.
      b. Detect presence of persons within a sensor's range.
      c. Detect if video or audio signal is lost and alert system administrator.
      d. Notify users of system errors.
      e. Receive alarms from third party systems (access control, etc.) and configured to be monitored.
      f. Support receiving digital input triggers and triggering outputs from:
         1) An input/output board.
         2) Supported IP camera, encoder or sensor.
         3) Integrated systems, including POS.
   3. Receives events through ONVIF driver.
   4. Configures resulting video operations.
   5. Supports receiving Simple Network Management Protocol (SNMP) messages from servers and alert users.
   6. Configures email notifications to the following:
      a. Notify system administrators when an event or system error occurs.
      b. Schedule when email notifications are sent.
      c. Include camera images in email notifications.
   7. Configures Central Station Notifications to the following:
      a. Notify a central station monitoring service when an event or system health error occurs.
      b. Include video clips and/or camera images with camera motion, analytic or digital input events.
   8. Provides ability to send central monitoring stations periodic heartbeat messages, or regular notification to confirm system connection and that there are no events of note.
   9. Monitors events and alarms based on a user configurable schedule.

C. Video and Audio Processing and Compression: Supports storage and processing of video and audio as follows:
   1. Natively records audio and video from camera with no transcoding.
   2. Synchronizes audio and video regardless of frame-rate, resolution or bitrate.
   3. Supports industry standard video compression formats, including, but not limited to, the following:
      a. JPEG2000.
      b. MJPEG.
      c. MPEG-4.
      d. H.264.

D. Dynamic Video Stream Management: Performs dynamic video stream management as follows:
      a. Provide Avigilon High Definition Stream Management (HDSM)™.]

2. Reduces system bandwidth and storage usage by only transmitting video to client as required by the Owner.

E. Video Storage Management:
   1. Provides the following multiple levels of video storage management:
      a. Tier 1: Video recorded directly on local server.
      b. Tier 2: Recorded video continuously archived to long term storage.
      c. Ad Hoc: Recorded video on local server can be archived to user-defined storage location on demand.

F. Backup and Archiving:
   1. Schedules archive of recorded video with associated events to a local folder or mapped network drive.
   2. Backs-up settings and configuration for each server, including the following:
      a. Site settings; such as users/groups, maps and web pages.
      b. Server settings, including device connections.
      c. Encrypts backup to maintain security of information.
   3. Restores backed-up settings and configurations to a new or replacement server in a site.

G. Video Analytics:
   1. Provide configurable classified object detection for each device with self-learning video analytics capabilities.
   2. Supports the following video analytic event types when captured by supported cameras:
      a. Objects in area.
      b. Object loitering.
      c. Objects crossing defined line.
      d. Object appears or enters area.
      e. Object not present in area.
      f. Objects enter area.
      g. Objects leave area.
      h. Object stops in area.
      i. Anticipated direction of travel is violated.
      j. Scene dramatically changes in an unexpected fashion.

H. Integration with Other Systems and Products:

   1. Point of Sale (POS) Integration

   2. Third Party Integration Requirements: Support software level integration with third-party applications using NVMS software development kit (SDK).

I. Audio Features:
   1. Provides ability to change input, output, gain and volume for an audio source.
   2. Supports use of uni-directional and bi-directional audio.
   3. Provides ability to link any audio source to any video source.

J. User Interface:
   1. Supports ability to share application window display in a joint session with other users for collaborative investigations.
   2. Provides a system tree of video sources, maps, saved views and web pages in video monitoring tab.
   3. Supports an unlimited number of monitors used for monitoring video and audio streams connected to a single workstation.
      a. Provides tools to build custom video monitoring layouts.
   4. Provides a Virtual Matrix application module:

a. Supporting remote control of multiple monitor displays.
b. Displays simultaneous video streams on connected monitor displays from multiple sites.

5. Supports alarm management operations through video monitoring interface.
6. Supports ability to create a map that represents physical location of cameras and other devices throughout surveillance system.

K. Playback of Recorded Audio and Video and Audio:
1. Supports playback of recorded video and audio.
2. Provides ability to request a second user authentication before recorded video may be displayed.
3. Provides the following methods for navigating recorded video:
a. Selectable calendar.
b. Horizontal, scrollable timeline:
c. Search.
4. Supports recorded video search
5. Supports Avigilon Appearance Search™ technology:

L. Bookmarking:

M. Media Exportation: Support the ability to export media and provide the following options:
1. Exports recorded video in the following formats:
a. Native (AVE).
b. JPEG.
c. PNG.
d. TIFF.
e. AVI.
f. Print.
2. Exports recorded audio
3. Exports a still frame of video as displayed in video preview area:
a. Native (AVE).
b. JPEG.
c. PNG.
d. TIFF.
4. Native (AVE) format exported as follows:
a. Digitally sign recorded video and audio using 256-bit encryption so video can be authenticated for evidentiary purposes.
b. Able to export video from one or multiple camera streams simultaneously.
c. Supports exporting multiple video segments from different spans of time.
d. Supports reviewing of exported or backed-up video and audio in a dedicated player.
e. Supports playback of exported clips in synchronized, sequential time.
f. Supports playback of multiple clips in continuous, sequential order.
g. Supports exporting of video in lower frame-rates than originally recorded.
h. Supports exporting of a designated area from camera's recorded field of view.
i. Supports re-export into Native or other supported formats.
j. Provides a record of video source with the following metadata:
1) Camera model.
2) Firmware version.

3) Location.
4) MAC address.
5) Serial number.
6) Resolution.

PART 2 GENERAL

2.1 SECTION INCLUDES

A. Network Video Recorders for Surveillance Systems.

2.2 RELATED SECTIONS

A. Section 28 21 11 - IP Cameras.
B. Section 28 23 13 - Video Management System Interfaces.

2.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate with Owner or Owner's representative regarding network configuration and estimated throughput utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
2. General Contractor.
3. Project Manager.
4. Manufacturer's Representative.
5. Project Architect.
6. Project Engineer.
7. Security Consultant.

2.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
1. Substrate preparation instructions and recommendations
2. Installation means and methods.
3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:
1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:
1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
a. Training.
b. Installation.
c. Commissioning.
d. Remote diagnostics and integration with 3rd party software and hardware systems.

2.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.
B. Supply network configuration backup files, restoration application and instructions.

2.6 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Minimum of 5 years in business.
2. Installers:
a. Performs Network Video Recorder (NVR) installation, configuration, setup, programming and related work employing authorized integrators/electronic technicians certified by manufacturer.
b. Certification for authorized integrators/electronic technicians shall include, at a minimum, installation and service of equipment provided.

2.7 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 3 PRODUCTS

3.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
2. Phone: (888) 281-5182.
3. Website: www.avigilon.com.
B. Manufacturer List:
1. Manufacturer:
C. Substitution Limitations:
1. Submit substitution requests in accordance with provisions of Section 01 60 00.
2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network video recorders and the following components:
a. IP Video Cameras.
b. Video Management System Interfaces.
c. Video Surveillance Positioning Equipment.
d. Video Surveillance Sensors.

3.2 PERFORMANCE REQUIREMENTS

A. Throughput: NVR system must be capable of managing a combined 1800 Mbps of total throughput with handling for simultaneous recording, playback and live streaming.
B. Search Capacity: System must be capable of supporting up to one hundred (100) cameras.
C. Storage Capacity: System must be capable of storing up to 180TB raw or 157TB when configured as RAID 6.
D. Expansion: System must be configured to be capable of future expansion and scaling.
E. Mounting: Standard server enclosure (rack) mounting, requiring no greater than a 2U configuration.
F. Electrical Power:

1. Input: 100 to 240 V AC, 50/60 Hz, auto-switching.
2. Supply: Appliance must be configurable for multiple power supplies that may be replaced without the need to power down (hot-swappable).
3. Maximum Power Consumption: No greater than 2200W.

G. System Certifications:
1. UL and cUL certification marks for Canada/USA.
2. CE certification mark for European Union.
3. RCM certification mark for Australia.
4. WEEE mark for European Union.
5. Electromagnetic Emissions Certifications:
   a. FCC Part 15 Subpart B Class B.
   b. ICES-003 Class B.
   c. EN 55032 Class B.
   d. EN 61000-6-3.
   e. EN 61000-3-2.
   f. EN 61000-3-3.
6. Electromagnetic Immunity Standards:
   a. EN 55024.
   b. EN 61000-6-1.
   c. EN 50130-4.
7. Safety Standards:
   a. UL/CSA/IEC/EN 60950-1.

3.3 NETWORK VIDEO RECORDERS

A. Basis of Design Product: Avigilon HD NVR4 Premium.

B. System Design:
1. Drive Configuration:
   a. Video Storage: Up to 18 x large form factor near-line SAS hard disk drives, hot-swappable, RAID 6.
   b. Operating System: (2) M.2 SSD drives, RAID 1.
2. Storage Capacity: 192 TB when configured with RAID 6.
3. Operating System: Microsoft Windows Server 2016.
4. Processor: Intel Xeon.
5. RAM: 32GB DDR4.
6. Networking: (2) 10GB Ethernet SFP+ ports and (2) 1GB Ethernet RJ-45 ports (1000Base-T).
7. Power Supply: (2) 80 plus Titanium power supplies configured to allow swapping without the need to power down.
8. Video Output: VGA.
9. Mounting: 2U rack mount chassis.
10. Operational Range:
    a. Temperature: 10 degrees C to 35 degrees C [50F to 95F].
    b. Relative Humidity: 10–80 percent (non-condensing).
    c. Altitude: 3048 meters [10,000 ft].

PART 4 EXECUTION

4.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

4.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

4.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

4.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

C. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

4.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

4.6 CLOSEOUT

A. Demonstration:

1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

PART 3 GENERAL

4.7 SECTION INCLUDES

A. Pan-Tilt-Zoom (PTZ) Infrared Network Type Cameras for video surveillance.

4.8 RELATED SECTIONS

A. Section 28 21 15 - Specialty Cameras.

B. Section 28 21 21 - Illuminators.

C. Section 28 23 11 - Video Management System Analytics.

4.9 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.

1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
2. General Contractor.
3. Project Manager.
4. Manufacturer's Representative.
5. Project Architect.

6. Project Engineer.
7. Security Consultant.

4.10 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:
   1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
      a. Training.
      b. Installation.
      c. Commissioning.
      d. Remote diagnostics and integration with 3rd party software and hardware systems.

4.11 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

4.12 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
   1. One spare for each_____devices.
   2. Provide spare components as noted in the coordinating schedule for work listed in this section.

4.13 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
   1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
   2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
   3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
   1. Do not proceed with remaining Work until workmanship is approved by Architect.
   2. Refinish mock-up area as required to produce acceptable work.

4.14 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
   1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
   2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 4 PRODUCTS

4.15 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

4.16 DESIGN CRITERIA

A. System Design:
   1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
   3. Cameras in this section must be capable of bi-directional communication.
   4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
   1. cULus certification mark for Canada/USA.
   2. CE certification mark for European Union.
   3. ROHS mark for European Union.
   4. RCM certification mark for Australia.
   5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
   6. KC certification mark for Korea.
   7. SASO registration for Saudi Arabia.
   8. Kuwait registration.
   9. WEEE mark for European Union.

C. Safety Standards:
   1. UL/CSA/IEC/EN 62368-1.

D. Electromagnetic Emissions Standards:
   1. FCC Part 15 Subpart B Class B.

2. ICES-003 Class B.
3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

4.17 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support H.264 encoding in a selectable range from 1 up to 60 frames per second based on resolution configured.
4. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
5. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
6. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:
1. Image Compression Method: H.264 (MPEG-4 Part 10/AVC), Motion JPEG, HDSM.

2. Streaming: Multi-stream H.264 and Motion JPEG.
3. Motion Detection: Selectable sensitivity and threshold.
4. Electronic Shutter Control: Automatic, Manual (1/1 to 1/10,000 sec).
5. Iris Control: Automatic, Manual.
6. Day/Night Control: Automatic, Manual.
7. Flicker Control: 50 Hz, 60 Hz.
8. White Balance: Automatic, Manual.
9. Backlight Compensation: Manual.
10. Privacy Zones: Up to 64 zones.

F. Network Requirements: Provide video cameras that have the following network capabilities:
1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:
   a. Fixed (static) IP address.
   b. Subnet mask.
   c. Gateway.
   d. Control port.
3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

G. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

H. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

I. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
   1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
   2. Video masked by privacy zones must be obscured prior to streaming.

J. Security Requirements: Provide video cameras with the following security requirements:
   1. Support the use of the following:
      a. Password protection.
      b. HTTPS Encryption.
      c. Digest authentication.
      d. WS authentication.
      e. User access Log.
      f. SSL encryption.
   2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

K. Electrical Power: Cameras capable of being powered by the following power sources:
      a. 75 W max with 24 VDC aux power, 71W max with 95W PoE, 105 VA with 24 V AC RMS aux power.
      b. 95W PoE: POE-INJ2-95W.
      c. 60W PoE: POE-INJ2-60W.
   2. AC Power: 24 V +/- 10%.
   3. DC Power: 24V +/- 10%.
   4. Battery Backup: 3V manganese lithium.

L. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
   1. Allow firmware updates via network.
   2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
   3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

M. Diagnostics:
   1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
   2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

N. Connectivity:
   1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
   2. Terminal for receiving line level analog audio from an external microphone.
   3. Terminal for providing line level analog audio for connection to an external speaker.

O. Operational Range:
   1. Temperature:
      a. -40 °C to +60 °C (-40 °F to 140 °F) with external power or 95 W PoE.
      b. -10 °C to +50 °C (14 °F to 122 °F) with 60W PoE.
      c. Wiper is functional at 1 °C to +60 °C (34 °F to 140 °F).
   2. Relative Humidity: 0–95 percent (non-condensing).

4.18 PAN-TILT-ZOOM (PTZ) INFRARED NETWORK TYPE CAMERA

A. 1.0 MP 45x IR PTZ Camera with Wiper:
   1. Basis of Design Product: 1.0C-H4IRPTZ-DP45-WP, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 1280x720.
      c. Imaging Area (H x V): 4.8 mm x 2.7mm (0.189 inches x 0.106 inches).
      d. Imaging Rate: Up to 60 fps.
      e. Dynamic Range: 120 dB.
      f. Minimum Illumination:
         1) With IR: 0 lux (F1.6).
         2) Without IR: Color - 0.1 lux (F1.6), Monochrome - 0.03 lux (F1.6).
      g. Resolution Scaling: Down to (16:9) 384x216 or (5:4) 320x256.
      h. Angle of View: 1.5 Degrees – 63.7 Degrees.
      i. Optical Zoom: 45x.
      j. IR Illumination: 250 m (820 ft) maximum distance at 0 lux.

B. 2.0 MP 30x IR PTZ Camera with Wiper:
   1. Basis of Design Product: 2.0C-H4IRPTZ-DP30-WP, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 1920x1080.
      c. Imaging Area (H x V): 4.8 mm x 2.7mm (0.189 inches x 0.106 inches).
      d. Imaging Rate: Up to 60 fps.
      e. Dynamic Range: 120 dB.
      f. Minimum Illumination:
         1) With IR: 0 lux (F1.6).
         2) Without IR: Color - 0.1 lux (F1.6), Monochrome - 0.03 lux (F1.6).
      g. Resolution Scaling: Down to (16:9) 384x216 or (5:4) 320x256.
      h. Angle of View: 2.3 Degrees – 63.7 Degrees.
      i. Optical Zoom: 30x.
      j. IR Illumination: 250 m (820 ft) maximum distance at 0 lux.

4.19 ACCESSORIES

A. Mounts:
   1. IRPTZ-MNT-WALL1: Mount, Pend wall, IR PTZ.
   2. IRPTZ-MNT-NPTA1: Mount, Pend NPT Adapter, IR PTZ.
   3. H4-MT-POLE1: Pole Mounting Bracket.
   4. H4-MT-CRNR1: Corner Mounting Bracket.

B. Electrical Power:
   1. POE-INJ2-95W-NA: Single Port PoE Injector Gigabit, 95W, NA - indoor installation rated.
   2. POE-INJ2-60W: Single Port PoE Injector Gigabit, 60W, NA - indoor installation rated.

PART 5 EXECUTION

5.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

5.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

5.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

5.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).

1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

5.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

5.6 CLOSEOUT

A. Demonstration:

1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:

1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:

1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

PART 6 GENERAL

6.1 SECTION INCLUDES

A. Multiple Sensor, Dome-Type Network cameras for video surveillance.

6.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.

B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

6.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.
B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

6.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.
C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.
D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.
E. System Support Resources:
   1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
      a. Training.
      b. Installation.
      c. Commissioning.
      d. Remote diagnostics and integration with 3rd party software and hardware systems.

6.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.
B. Supply network configuration backup files, restoration application and instructions.

6.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
   1. One spare for each_____devices.

2. Provide spare components as noted in the coordinating schedule for work listed in this section.

6.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
   1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
   2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
   3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
   1. Do not proceed with remaining Work until workmanship is approved by Architect.
   2. Refinish mock-up area as required to produce acceptable work.

6.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
   1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
   2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 7 PRODUCTS

7.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

7.2 DESIGN CRITERIA

A. System Design:
   1. All cameras in this section must be designed in a modular fashion such that mounts, mounting components and hardware are universal and not integrated directly with the camera itself.
   2. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   3. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.

4. Cameras in this section must be capable of bi-directional communication.
5. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
1. ONVIF Profile S and Profile T.
2. cULus certification mark for Canada/USA.
3. CE certification mark for European Union.
4. ROHS mark for European Union.
5. RCM certification mark for Australia.
6. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
7. SASO registration for Saudi Arabia.
8. Kuwait registration.
9. WEEE mark for European Union.

C. Safety Standards:
1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
1. FCC Part 15 Subpart B Class B.
2. ICES-003 Class B.
3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

7.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / H.265 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary and/or tertiary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264, H.265 and Motion JPEG streams (multi-stream).

3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.265 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.265 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264 and H.265, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
8. Support G.711 PCM 8kHz audio compression.

D. Transmission Requirements:
1. Provide cameras that support the following when connecting to a VMS:
   a. Dynamic Bandwidth Management.
   b. High Definition Stream Management.
2. Cameras must Transmit two distinct video streams:
   a. Primary Stream: Supports up to full resolution and prescribed frame rate.
   b. Secondary Stream: Supports fractional resolution and mirrors the frame rate and aspect ratio of the primary stream at a maximum 0.3MP - 640x480 (4:3) / 768x432 (16:9).
3. Cameras must Transmit three distinct video streams:
   a. Primary Stream: Supports up to full resolution and prescribed frame rate.
   b. Second Stream: Supports fractional resolution and mirrors the frame rate and aspect ratio of the primary stream at a maximum 1.3MP – 1280x960 (4:3) / 1536x864 (4:3).
   c. Third Stream: Supports fractional resolution and mirrors the frame rate and aspect ratio of the primary stream at a maximum 0.3MP - 640x480 (4:3) / 768x432 (16:9).

E. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

F. Image Control Requirements:
1. User Configurations Supported:
   a. Automatic and manual white balance control.
   b. Automatic and manually defined exposure zones operating in the range 1 and 1/8000 second.
   c. Flicker control (50 Hz, 60 Hz).
   d. Automatic and manual iris control.
   e. Color saturation and sharpening.
   f. Motion detection sensitivity and threshold.
   g. Digital rotation of the image.
   h. Minimum Dynamic Range:
      1) 100db.

2) Dynamic Range shall not change based on configured encoding resolution.

2. Adaptive Video Analytics Specifications:
   a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
   b. Automatic Analytic set up and tuning of behavior identification:
      1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
      2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.
3. Include detection of the following behaviors:
   a. Object present in ROI.
   b. Object enters ROI.
   c. Object leaves ROI.
   d. Object appeared.
   e. Object disappeared.
   f. Object crosses a line of interest or beam.
   g. Object Movement Direction.
   h. Object loitering.
   i. Multiple objects in ROI over specified dwell time.
   j. Dwell Time.
   k. Number of objects exceeds limit in ROI.
   l. Number of objects below limit in ROI.
   m. Camera tampering.

G. Network Requirements: Provide video cameras that have the following network capabilities:
1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:
   a. Fixed (static) IP address.
   b. Subnet mask.
   c. Gateway.
   d. Control port.
3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

H. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:
1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
3. Threshold: Percentage of pixels that must detect change.

I. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
1. Alarm input terminal.
2. Video motion detection.
3. Camera temperature outside operative range.

J. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:

1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

K. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

L. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

M. Security Requirements: Provide video cameras with the following security requirements:
1. Support the use of the following:
   a. Password protection.
   b. HTTPS Encryption.
   c. Digest authentication.
   d. WS authentication.
   e. User access Log.
   f. SSL encryption.
2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

N. Electrical Power: Cameras capable of being powered by the following power sources:
1. PoE: up to IEEE 802.3af Class 3 PoE Compliant.
2. AC Power: 24 V +/- 10%, 10 VA min (13 VA min with -IR option).
3. DC Power: 12 V +/- 10%, 7 W min (9 W min with -IR option).
4. Battery Backup: 3V manganese lithium.

O. Functionality:

1. Alarm input and output terminals.
2. Line audio input (for external microphone) and audio output (for external speaker) connections.
3. Firmware reset button to reset cameras to factory default settings.
4. Enhanced Framerate Mode: Enhanced framerate mode allowing for higher framerates when analytics are disabled on all camera heads within the system.

P. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

Q. Connectivity:
1. Gigabit Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

R. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

S. Operational Range:
1. Temperature:
   a. Ceiling Mount: -10 degrees C to +50 degrees C [14 F to +122 F].
   b. Pendant and Surface Mount: -40 degrees C to +60 degrees C [-40 F to +140 F].
2. Relative Humidity: 0–95 percent (non-condensing).

7.4 MULTISENSOR IP CAMERAS

A. 9MP HD Multisensor Camera; three 3MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
1. Basis of Design Product: 9C-H4A-3MH-270 – H4 Multisensor, by Avigilon.
2. Performance:
   a. Image Sensors: 1/2.8 inch progressive scan CMOS.
   b. Aspect Ratio: 4:3.
   c. Active Pixels (H x V): 2048 x 1536 per sensor.
   d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
   e. Imaging Rate: 24 fps at 60Hz and 25 fps at 50Hz.
   f. IR Illumination:
      1) Color Mode: 0.025 lux (F1.2).
      2) Mono Mode 0.005 lux (F1.2).
      3) With IR Illuminator Active: 0 lux.
   g. Dynamic Range: 100 dB with WDR active.
   h. Resolution Scaling: Down to 640 x 480.
   i. Angle of View: 103 degrees.
   j. Mounting:
      1) Indoor Ceiling Mount.

2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

B. 9MP HD Multisensor Camera; three 3MP sensors, wide dynamic range (WDR) and a 4mm lens:
1. Basis of Design Product: 9C-H4A-3MH-180 – H4 Multisensor, by Avigilon.
2. Performance:
a. Image Sensors: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536 per sensor.
d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
e. Imaging Rate: 24 fps at 60 Hz and 25 fps at 50Hz.
f. IR Illumination:
1) Color Mode: 0.05 lux (F1.6).
2) Mono Mode 0.01 lux (F1.6).
3) With IR Illuminator Active: 0 lux.
g. Dynamic Range: 100 dB with WDR active.
h. Resolution Scaling: Down to 640 x 480.
i. Angle of View: 72 degrees.
j. Mounting:
1) Indoor Ceiling Mount.
2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

C. 12MP HD Multisensor Camera; four 3MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
a. Basis of Design Product: 12C-H4A-4MH-360 – H4 Multisensor, by Avigilon.
b. Performance:
c. Image Sensors: 1/2.8 inch progressive scan CMOS.
d. Aspect Ratio: 4:3.
e. Active Pixels (H x V): 2048 x 1536 per sensor.
f. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
g. Imaging Rate: 20 fps at 60 Hz and 20 fps at 50Hz.
h. IR Illumination:
1) Color Mode: 0.025 lux (F1.2).
2) Mono Mode 0.005 lux (F1.2).
3) With IR Illuminator Active: 0 lux.
i. Dynamic Range: 100 dB with WDR active.
j. Resolution Scaling: Down to 640 x 480.
k. Angle of View: 103 degrees.
l. Mounting:
1) Indoor Ceiling Mount.
2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

D. 15MP HD Multisensor Camera; three 5MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
1. Basis of Design Product: 15C-H4A-3MH-270 – H4 Multisensor, by Avigilon.
2. Performance:
a. Image Sensors: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2592 x 1944 per sensor.
d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).

e. Imaging Rate: 15 fps at 60 Hz and 17 fps at 50Hz.
f. IR Illumination:
    1) Color Mode: 0.025 lux (F1.2).
    2) Mono Mode 0.005 lux (F1.2).
    3) With IR Illuminator Active: 0 lux.
g. Dynamic Range: 100 dB with WDR active.
h. Resolution Scaling: Down to 640 x 480.
i. Angle of View: 103 degrees.
j. Mounting:
    1) Indoor Ceiling Mount.
    2) Indoor / Outdoor Pendant Mount.
    3) Indoor / Outdoor Surface Mount.

E. 15MP HD Multisensor Camera; three 5MP sensors, wide dynamic range (WDR) and a 4mm lens:
1. Basis of Design Product: 15C-H4A-3MH-180 – H4 Multisensor, by Avigilon.
2. Performance:
    a. Image Sensors: 1/2.8 inch progressive scan CMOS.
    b. Aspect Ratio: 4:3.
    c. Active Pixels (H x V): 2592 x 1944 per sensor.
    d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
    e. Imaging Rate: 15 fps at 60 Hz and 17 fps at 50Hz.
    f. IR Illumination:
        1) Color Mode: 0.05 lux (F1.6).
        2) Mono Mode 0.01 lux (F1.6).
        3) With IR Illuminator Active: 0 lux.
    g. Dynamic Range: 100 dB with WDR active.
    h. Resolution Scaling: Down to 640 x 480.
    i. Angle of View: 72 degrees.
    j. Mounting:
        1) Indoor Ceiling Mount.
        2) Indoor / Outdoor Pendant Mount.
        3) Indoor / Outdoor Surface Mount.

F. 20MP HD Multisensor Camera; four 5MP sensors, wide dynamic range (WDR) and a 2.8mm lens:
1. Basis of Design Product: 20C-H4A-4MH-360 – H4 Mutlisensor, by Avigilon.
2. Performance:
    a. Image Sensors: 1/2.8 inch progressive scan CMOS.
    b. Aspect Ratio: 4:3.
    c. Active Pixels (H x V): 2592 x 1944 per sensor.
    d. Imaging Area (H x V): 5.18 mm x 3.89mm (0.204 inches x 0.153 inches).
    e. Imaging Rate: 13 fps at 60 Hz and 13 fps at 50Hz.
    f. IR Illumination:
        1) Color Mode: 0.025 lux (F1.2).
        2) Mono Mode 0.005 lux (F1.2).
        3) With IR illuminator Active: 0 lux.
    g. Dynamic Range: 100 dB with WDR active.
    h. Resolution Scaling: Down to 640 x 480.
    i. Angle of View: 103 degrees.
    j. Mounting:
        1) Indoor Ceiling Mount.
        2) Indoor / Outdoor Pendant Mount.

3) Indoor / Outdoor Surface Mount.

G. 24MP HD Multisensor Camera; with three 8MP sensors, wide dynamic range (WDR) and a 4mm lens:
   1. Basis of Design Product: 24C-H4A-3MH-270 – H4 Multisensor, by Avigilon.
   2. Performance:
      a. Image Sensors: 1/2.5 inch progressive scan CMOS.
      b. Aspect Ratio: 16:9.
      c. Active Pixels (H x V): 3840 x 2160 per sensor.
      d. Imaging Area (H x V): 6.22 mm x 3.50mm (0.245 inches x 0.138 inches).
      e. Imaging Rate: 12 fps at 60 Hz and 13 fps at 50Hz.
      f. IR Illumination:
         1) Color Mode: 0.2 lux (F1.6).
         2) Mono Mode 0.04 lux (F1.6).
         3) With IR Illuminator: 0 lux.
      g. Dynamic Range: 100 dB with WDR active.
      h. Resolution Scaling: Down to 768 x 432.
      i. Angle of View: 101 degrees.
      j. Mounting:
         1) Indoor Ceiling Mount.
         2) Indoor / Outdoor Pendant Mount.
         3) Indoor / Outdoor Surface Mount.

H. 24MP HD Multisensor Camera: with three 8MP sensors, wide dynamic range (WDR) and a 5.2mm lens:
   1. Basis of Design Product: 24C-H4A-3MH-180 – H4 Multisensor, by Avigilon.
   2. Performance:
      a. Image Sensors: 1/2.5 inch progressive scan CMOS.
      b. Aspect Ratio: 16:9.
      c. Active Pixels (H x V): 3840 x 2160 per sensor.
      d. Imaging Area (H x V): 6.22 mm x 3.50mm (0.245 inches x 0.138 inches).
      e. Imaging Rate: 12 fps at 60 Hz and 13 fps at 50Hz.
      f. IR Illumination:
         1) Color Mode: 0.2 lux (F1.6).
         2) Mono Mode 0.04 lux (F1.6).
         3) With IR Illuminator: 0 lux.
      g. Dynamic Range: 100 dB with WDR active.
      h. Resolution Scaling: Down to 768 x 432.
      i. Angle of View: 101 degrees.
      j. Mounting:
         1) Indoor Ceiling Mount.
         2) Indoor / Outdoor Pendant Mount.
         3) Indoor / Outdoor Surface Mount.

I. 32MP HD Multisensor Camera; four 8MP sensors, wide dynamic range (WDR) and 4mm lens:
   1. Basis of Design Product: 32C-H4A-4MH-360 – H4 Multisensor, by Avigilon.
   2. Performance:
      a. Image Sensors: 1/2.5 inch progressive scan CMOS.
      b. Aspect Ratio: 16:9.
      c. Active Pixels (H x V): 3840 x 2160 per sensor.
      d. Imaging Area (H x V): 6.22 mm x 3.50mm (0.245 inches x 0.138 inches).
      e. Imaging Rate: 8 fps at 60 Hz and 8 fps at 50Hz.
      f. IR Illumination:

1) Color Mode: 0.2 lux (F1.8).
2) Mono Mode 0.04 lux (F1.8).
3) With IR Illuminator: 0 lux.

g. Dynamic Range: 100 dB with WDR active.
h. Resolution Scaling: Down to 768 x 432.
i. Angle of View: 70 degrees.
j. Mounting:
1) Indoor Ceiling Mount.
2) Indoor / Outdoor Pendant Mount.
3) Indoor / Outdoor Surface Mount.

PART 8 EXECUTION

8.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

8.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

8.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

8.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).
1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

8.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

8.6 CLOSEOUT

A. Demonstration:
1. Demonstrate administration and operation of devices described by this section.
2. Demonstrate how to authorize users and applications to operate and configure installed devices.
3. Demonstrate how an authorized user can gain access to and make changes to configuration.
4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.
C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

PART 9 GENERAL

9.1 SECTION INCLUDES

A. Indoor surface mounted, dome-type network cameras for video surveillance.

9.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.
B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

9.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.
B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

9.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.
C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.
D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.
E. System Support Resources:

1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
    a. Training.
    b. Installation.
    c. Commissioning.
    d. Remote diagnostics and integration with 3rd party software and hardware systems.

9.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

9.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with “SPARE: DO NOT REMOVE”, and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
    1. One spare for each_____devices.
    2. Provide spare components as noted in the coordinating schedule for work listed in this section.

9.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
    1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
    2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
    3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer’s workmanship.
    1. Do not proceed with remaining Work until workmanship is approved by Architect.
    2. Refinish mock-up area as required to produce acceptable work.

9.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer’s warranty covering parts and labor costs to repair or replace part that fail to perform.
    1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
    2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 10 PRODUCTS

10.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
    1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
    2. Phone: (888) 281-5182.
    3. Website: www.avigilon.com.

B. Manufacturer List:
    1. Manufacturer:

C. Substitution Limitations:

1. Submit substitution requests in accordance with provisions of Section 01 60 00.
2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
    a. Video Management System Analytics.
    b. Video Management System Interfaces.
    c. Video Surveillance Positioning Equipment.
    d. Video Surveillance Sensors.

10.2 DESIGN CRITERIA

A. System Design:
1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
3. Cameras in this section must be capable of bi-directional communication.
4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
1. cULus certification mark for Canada/USA.
2. CE certification mark for European Union.
3. ROHS mark for European Union.
4. RCM certification mark for Australia.
5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
6. KC certification mark for Korea.
7. BIS certification for India.
8. SASO registration for Saudi Arabia.
9. Kuwait registration.
10. WEEE mark for European Union.

C. Safety Standards:
1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
1. FCC Part 15 Subpart B Class B.
2. ICES-003 Class B.
3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

10.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
    a. IEEE 802.3af (Power over Ethernet).
    b. IEEE 802.1X (Authentication).
    c. IPv4 (RFC 791).

B. Video Requirements:

1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.264 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
8. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:
1. User Configurations Supported:
   a. Automatic and manual white balance control.
   b. Automatic and manually defined exposure zones operating in the range 1 and 1/8000 second.
   c. Flicker control (50 Hz, 60 Hz).
   d. Automatic and manual iris control.
   e. Color saturation and sharpening.
   f. Motion detection sensitivity and threshold.
   g. Digital rotation of the image.
   h. Minimum Dynamic Range:
   i. 70db. Dynamic Range shall not change based on configured encoding resolution.
2. Adaptive Video Analytics Specifications:
   a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
   b. Automatic Analytic set up and tuning of behavior identification:

1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.

3. Include detection of the following behaviors:
   a. Object present in ROI.
   b. Object enters ROI.
   c. Object leaves ROI.
   d. Object appeared.
   e. Object disappeared.
   f. Object crosses a line of interest or beam.
   g. Object Movement Direction.
   h. Object loitering.
   i. Multiple objects in ROI over specified dwell time.
   j. Dwell Time.
   k. Number of objects exceeds limit in ROI.
   l. Number of objects below limit in ROI.
   m. Camera tampering.

F. Network Requirements: Provide video cameras that have the following network capabilities:
   1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
   2. Supports user configuration of network parameters including:
      a. Fixed (static) IP address.
      b. Subnet mask.
      c. Gateway.
      d. Control port.
   3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
   4. Provides support for both IPv4 and IPv6 Networks.

G. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:
   1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
   2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
   3. Threshold: Percentage of pixels that must detect change.

H. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
   1. Alarm input terminal.
   2. Video motion detection.
   3. Camera temperature outside operative range.
   4. Schedule.

I. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
   1. IPv4.
   2. HTTP.
   3. HTTPS.
   4. SOAP.
   5. DNS.

6. NTP.
7. RSTP.
8. RTCP.
9. RTP.
10. TCP.
11. UDP.
12. IGMP.
13. ICMP.
14. DHCP.
15. Zeroconf.
16. ARP.
17. SNMP v2c.
18. SNMP v3.

J. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
   1. RTP/UDP.
   2. RTP/UDP multicast.
   3. RTP/RTSP/TCP.
   4. RTP/RTSP/HTTP/TCP.
   5. RTP/RTSP/HTTPS/TCP.
   6. HTTP.

K. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
   1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
   2. Video masked by privacy zones must be obscured prior to streaming.

L. Security Requirements: Provide video cameras with the following security requirements:
   1. Support the use of the following:
      a. Password protection.
      b. HTTPS Encryption.
      c. Digest authentication.
      d. WS authentication.
      e. User access Log.
      f. SSL encryption.
   2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

M. Electrical Power: Cameras capable of being powered by the following power sources:
   1. PoE: up to IEEE 802.3af Class 3 PoE Compliant.
   2. AC Power: 24 V +/- 10%, 10 VA min (13 VA min with -IR option).
   3. DC Power: 12 V +/- 10%, 7 W min (9 W min with -IR option).
   4. Battery Backup: 3V manganese lithium.

N. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
   1. Allow firmware updates via network.
   2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.

3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

O. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

P. Connectivity:
1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

Q. Operational Range:
1. Temperature: -10 degrees C to +50 degrees C [14 F to +122 F].
2. Relative Humidity: 0–95 percent (non-condensing).

10.4 1 MEGAPIXEL IP CAMERAS

A. Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 1.0C-H4A-D1: 1.0 MP H4 HD, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.

B. 1.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 1.0C-H4A-D1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.

C. 1.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 1.0C-H4A-D2-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.

b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 14 degrees to 29 degrees.

10.5 2 MEGAPIXEL IP CAMERAS

A. 2.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 2.0C-H4A-D1-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 30 degrees to 91 degrees.

B. 2.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 2.0C-H4A-D1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.

C. 2.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 2.0CH4A-D2-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).

h. Field of View: 14 degrees to 29 degrees.

10.6 3 MEGAPIXEL IP CAMERAS

A. 3.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
   1. Basis of Design Product: 3.0C-H4A-D1-B, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2048 x 1536.
      c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
      d. Imaging Rate: 30 fps (20 fps with WDR enabled).
      e. Dynamic Range: 67 dB.
      f. Resolution Scaling: Down to 768 x 432.
      g. Minimum Illumination:
         1) Color: 0.04 lux (F1.3).
         2) Monochrome: 0.008 lux (F1.3).
      h. Field of View: 32 degrees to 98 degrees.

B. 3.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
   1. Basis of Design Product: 3.0C-H4A-D 1-IR-B, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2048 x 1536.
      c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
      d. Imaging Rate: 30 fps (20 fps with WDR enabled).
      e. Dynamic Range: 67 dB.
      f. Resolution Scaling: Down to 768 x 432.
      g. Minimum Illumination:
         1) Color: 0.04 lux (F1.3).
         2) Monochrome: 0.008 lux (F1.3).
      h. Field of View: 32 degrees to 98 degrees.

C. 3.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
   1. Basis of Design Product: 3.0C-H4A-D2-B, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2048 x 1536.
      c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
      d. Imaging Rate: 30 fps (20 fps with WDR enabled).
      e. Dynamic Range: 67 dB.
      f. Resolution Scaling: Down to 768 x 432.
      g. Minimum Illumination:
         1) Color: 0.08 lux (F1.6).
         2) Monochrome: 0.016 lux (F1.6).
      h. Field of View: 15 degrees to 31 degrees.

10.7 5 MEGAPIXEL IP CAMERAS

A. 5.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
   1. Basis of Design Product: 5.0L-H4A-D1-B, by Avigilon.

2. Performance:
    a. Image Sensor: 1/1.8 inch progressive scan CMOS.
    b. Active Pixels (H x V): 2592 x 1944.
    c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
    d. Imaging Rate: 30 fps.
    e. Dynamic Range: 83 dB.
    f. Resolution Scaling: Down to 1792 x 1344.
    g. Minimum Illumination:
        1) Color: 0.033 lux (F1.8).
        2) Monochrome: 0.0066 lux (F1.8).
    h. Field of View: 46 degrees to 86 degrees.

B. 5.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.
1. Basis of Design Product: 5.0L-H4A-D1-IR-B, by Avigilon.
2. Performance:
    a. Image Sensor: 1/1.8 inch progressive scan CMOS.
    b. Active Pixels (H x V): 2592 x 1944.
    c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
    d. Imaging Rate: 30 fps.
    e. Dynamic Range: 83 dB.
    f. Resolution Scaling: Down to 1792 x 1344.
    g. Minimum Illumination:
        1) Color: 0.033 lux (F1.8).
        2) Monochrome: 0.0066 lux (F1.8).
    h. Field of View: 46 degrees to 86 degrees.

C. 5.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 5.0L-H4A-D2-B, by Avigilon.
2. Performance:
    a. Image Sensor: 1/1.8 inch progressive scan CMOS.
    b. Active Pixels (H x V): 2592 x 1944.
    c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
    d. Imaging Rate: 30 fps.
    e. Dynamic Range: 83 dB.
    f. Resolution Scaling: Down to 1792 x 1344.
    g. Minimum Illumination:
        1) Color: 0.026 lux (F1.6).
        2) Monochrome: 0.005 lux (F1.6).
    h. Field of View: 18 degrees to 41 degrees.

10.8 8 MEGAPIXEL IP CAMERAS

A. 8.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
1. Basis of Design Product: 8.0-H4A-D1-B, by Avigilon.
2. Performance:
    a. Image Sensor: 1/2.3 inch progressive scan CMOS.
    b. Active Pixels (H x V): 3840 x 2160.
    c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].

d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
e. Dynamic Range: 91 dB.
f. Resolution Scaling: Down to 3072 x 1728.
g. Minimum Illumination:
1) Color: 0.29 lux (F1.8).
2) Monochrome: 0.058 lux (F1.8).
h. Field of View: 44 degrees to 81 degrees.

B. 8.0 MP H4 HD Indoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.
1. Basis of Design Product: 8.0-H4A-D1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.3 inch progressive scan CMOS.
b. Active Pixels (H x V): 3840 x 2160.
c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
e. Dynamic Range: 91 dB.
f. Resolution Scaling: Down to 3072 x 1728.
g. Minimum Illumination:
1) Color: 0.29 lux (F1.8).
2) Monochrome: 0.058 lux (F1.8).
h. Field of View: 44 degrees to 81 degrees.
i. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.

PART 11 EXECUTION

11.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

11.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

11.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

11.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).
1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

11.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

11.6 CLOSEOUT

A. Demonstration:
   1. Demonstrate administration and operation of devices described by this section.
   2. Demonstrate how to authorize users and applications to operate and configure installed devices.
   3. Demonstrate how an authorized user can gain access to and make changes to configuration.
   4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

[SUBJECT]

PART 12 GENERAL

12.1 SECTION INCLUDES

A. Outdoor, dome-type network cameras for video surveillance.

12.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.
B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

12.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

12.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
   1. Substrate preparation instructions and recommendations
   2. Installation means and methods.
   3. Recommendations and requirements for proper storage and handling.

C. Shop Drawings:
   1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
   2. Coordinate with locations listed on Contract Drawings.

D. Warranty Information:
   1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.

E. System Support Resources:
   1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
      a. Training.
      b. Installation.
      c. Commissioning.
      d. Remote diagnostics and integration with 3rd party software and hardware systems.

12.5 CLOSEOUT SUBMITTALS

A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.

B. Supply network configuration backup files, restoration application and instructions.

12.6 MAINTENANCE SUBMITTALS

A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
   1. One spare for each_____devices.
   2. Provide spare components as noted in the coordinating schedule for work listed in this section.

12.7 QUALITY ASSURANCE

A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.

B. Qualifications - Installers:
   1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
   2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
   3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.

C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
   1. Do not proceed with remaining Work until workmanship is approved by Architect.
   2. Refinish mock-up area as required to produce acceptable work.

12.8 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.
   1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
   2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 13 PRODUCTS

13.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

13.2 DESIGN CRITERIA

A. System Design:
   1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
   3. Cameras in this section must be capable of bi-directional communication.
   4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
   1. cULus certification mark for Canada/USA.
   2. CE certification mark for European Union.
   3. ROHS mark for European Union.
   4. RCM certification mark for Australia.
   5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
   6. KC certification mark for Korea.
   7. BIS certification for India.
   8. SASO registration for Saudi Arabia.
   9. Kuwait registration.
   10. WEEE mark for European Union.

C. Safety Standards:
   1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
   1. FCC Part 15 Subpart B Class B.
   2. ICES-003 Class B.

3. EN 55032 Class B.
4. EN 61000-6-3.
5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

13.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.264 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 17.5mbps at 12 FPS.
8. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:
   1. User Configurations Supported:
      a. Automatic and manual white balance control.
      b. Automatic and manually defined exposure zones operating in the range 1 and 1/8000 second.
      c. Flicker control (50 Hz, 60 Hz).
      d. Automatic and manual iris control.
      e. Color saturation and sharpening.
      f. Motion detection sensitivity and threshold.
      g. Digital rotation of the image.
      h. Minimum Dynamic Range:
      i. 70db. Dynamic Range shall not change based on configured encoding resolution.
   2. Adaptive Video Analytics Specifications:
      a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
      b. Automatic Analytic set up and tuning of behavior identification:
         1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
         2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.
   3. Include detection of the following behaviors:
      a. Object present in ROI.
      b. Object enters ROI.
      c. Object leaves ROI.
      d. Object appeared.
      e. Object disappeared.
      f. Object crosses a line of interest or beam.
      g. Object Movement Direction.
      h. Object loitering.
      i. Multiple objects in ROI over specified dwell time.
      j. Dwell Time.
      k. Number of objects exceeds limit in ROI.
      l. Number of objects below limit in ROI.
      m. Camera tampering.

F. Network Requirements: Provide video cameras that have the following network capabilities:
   1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
   2. Supports user configuration of network parameters including:
      a. Fixed (static) IP address.
      b. Subnet mask.
      c. Gateway.
      d. Control port.
   3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
   4. Provides support for both IPv4 and IPv6 Networks.

G. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:

1. Motion Detection Mask: Defined areas within the camera's field of view for the camera to detect motion.
2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
3. Threshold: Percentage of pixels that must detect change.

H. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
1. Alarm input terminal.
2. Video motion detection.
3. Camera temperature outside operative range.

I. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

J. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

K. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

L. Security Requirements: Provide video cameras with the following security requirements:
1. Support the use of the following:
    a. Password protection.
    b. HTTPS Encryption.
    c. Digest authentication.

d. WS authentication.
e. User access Log.
f. SSL encryption.

2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

M. Electrical Power: Cameras capable of being powered by the following power sources:
1. PoE: up to IEEE 802.3af Class 3 PoE Compliant.
2. AC Power: 24 V +/- 10%, 10 VA min (13 VA min with -IR option).
3. DC Power: 12 V +/- 10%, 7 W min (9 W min with -IR option).
4. Battery Backup: 3V manganese lithium.

N. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

O. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

P. Connectivity:
1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

13.4 1 MEGAPIXEL IP CAMERAS

A. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 1.0C-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 1.0C-H4A-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.

b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9 mm lens, IR illuminators and 128 GB SSD.
1. Basis of Design Product: 1.0C-H4A-12G-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Solid State Memory: Pre-installed 128GB solid state drive for onboard video recording.
j. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

D. 1.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 1.0C-H4A-DO2, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1280 x 720.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 14 degrees to 29 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.5 2 MEGAPIXEL IP CAMERAS

A. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 2.0C-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.

c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 2.0C-H4A-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9 mm lens, IR illuminators and 256 G SSD
1. Basis of Design Product: 2.0C-H4A-25G-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 30 degrees to 91 degrees.
i. Solid State Memory: Pre-installed 256GB solid state drive for onboard video recording.
j. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables Wide Dynamic Range (WDR).
k. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

D. 2.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 2.0C-H4A-DO2, by Avigilon.
2. Performance:

a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 1920 x 1080.
c. Imaging Area (H x V): 4.8 mm x 2.7mm; [0.189 inches x 0.106 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 14 degrees to 29 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.6 3 MEGAPIXEL IP CAMERAS

A. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 3-9 mm lens.
1. Basis of Design Product: 3.0C-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.
c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
h. Field of View: 32 degrees to 98 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9mm lens and IR illuminators.
1. Basis of Design Product: 3.0C-H4A-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.
c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 32 degrees to 98 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 3-9 mm lens, IR illuminators and 256 G SSD.
1. Basis of Design Product: 3.0C-H4A-25G-DO1-IR, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.

c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0.008 lux (F1.3).
3) With IR Illuminator: 0 lux.
h. Field of View: 32 degrees to 98 degrees.
i. Solid State Memory: Pre-installed 256GB solid state drive for onboard video recording.
j. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables Wide Dynamic Range (WDR).
k. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

D. 3.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
1. Basis of Design Product: 3.0C-H4A-DO2, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2048 x 1536.
c. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
d. Imaging Rate: 30 fps (20 fps with WDR enabled).
e. Dynamic Range: 67 dB.
f. Resolution Scaling: Down to 768 x 432.
g. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0.016 lux (F1.6).
h. Field of View: 15 degrees to 31 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.7 5 MEGAPIXEL IP CAMERAS

A. 5.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
1. Basis of Design Product: 5.0L-H4A-DO1, by Avigilon.
2. Performance:
a. Image Sensor: 1/1.8 inch progressive scan CMOS.
b. Active Pixels (H x V): 2592 x 1944.
c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
d. Imaging Rate: 30 fps.
e. Dynamic Range: 83 dB.
f. Resolution Scaling: Down to 1792 x 1344.
g. Minimum Illumination:
1) Color: 0.033 lux (F1.8).
2) Monochrome: 0.0066 lux (F1.8).
h. Field of View: 46 degrees to 86 degrees.
i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

B. 5.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.
   1. Basis of Design Product: 5.0L-H4A-DO1-IR, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/1.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2592 x 1944.
      c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
      d. Imaging Rate: 30 fps.
      e. Dynamic Range: 83 dB.
      f. Resolution Scaling: Down to 1792 x 1344.
      g. Minimum Illumination:
         1) Color: 0.033 lux (F1.8).
         2) Monochrome: 0.0066 lux (F1.8).
         3) With IR Illuminator: 0 lux.
      h. Field of View: 46 degrees to 86 degrees.
      i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

C. 5.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 9-22 mm lens.
   1. Basis of Design Product: 5.0L-H4A-DO2, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/1.8 inch progressive scan CMOS.
      b. Active Pixels (H x V): 2592 x 1944.
      c. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
      d. Imaging Rate: 30 fps.
      e. Dynamic Range: 83 dB.
      f. Resolution Scaling: Down to 1792 x 1344.
      g. Minimum Illumination:
         1) Color: 0.026 lux (F1.6).
         2) Monochrome: 0.005 lux (F1.6).
      h. Field of View: 18 degrees to 41 degrees.
      i. Operational Range: -40 degrees C to +60 degrees C [-40 F to +140 F].

13.8 8 MEGAPIXEL IP CAMERAS

A. 8.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics and 4.3-8mm lens.
   1. Basis of Design Product: 8.0-H4A-DO1, by Avigilon.
   2. Performance:
      a. Image Sensor: 1/2.3 inch progressive scan CMOS.
      b. Active Pixels (H x V): 3840 x 2160.
      c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
      d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
      e. Dynamic Range: 91 dB.
      f. Resolution Scaling: Down to 3072 x 1728.
      g. Minimum Illumination:
         1) Color: 0.29 lux (F1.8).
         2) Monochrome: 0.058 lux (F1.8).
      h. Field of View: 44 degrees to 81 degrees.
      i. Operating Modes:
         1) Full Feature Mode: Full camera functionality.

2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.

j. Operational Range: -40 degrees C to +50 degrees C [-40 F to +122 F].

B. 8.0 MP H4 HD Outdoor Surface Mount Dome Camera with Self-Learning Video Analytics, 4.3-8mm lens and IR illuminators.

1. Basis of Design Product: 8.0-H4A-DO1-IR, by Avigilon.
2. Performance:
   a. Image Sensor: 1/2.3 inch progressive scan CMOS.
   b. Active Pixels (H x V): 3840 x 2160.
   c. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
   d. Imaging Rate: 20 fps (30 fps in High Framerate mode).
   e. Dynamic Range: 91 dB.
   f. Resolution Scaling: Down to 3072 x 1728.
   g. Minimum Illumination:
      1) Color: 0.29 lux (F1.8).
      2) Monochrome: 0.058 lux (F1.8).
      3) With IR Illuminator: 0 lux.
   h. Field of View: 44 degrees to 81 degrees.
   i. Operating Modes:
      1) Full Feature Mode: Full camera functionality.
      2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.
   j. Operational Range: -40 degrees C to +50 degrees C [-40 F to +122 F].

PART 14 EXECUTION

14.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.

B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

14.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

14.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

14.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.

B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).

1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.

C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.

D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

14.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

14.6 CLOSEOUT

A. Demonstration:
   1. Demonstrate administration and operation of devices described by this section.
   2. Demonstrate how to authorize users and applications to operate and configure installed devices.
   3. Demonstrate how an authorized user can gain access to and make changes to configuration.
   4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

[SUBJECT]

PART 15 GENERAL

15.1 SECTION INCLUDES

A. Indoor surface mounted, bullet-type network cameras for video surveillance.

15.2 RELATED SECTIONS

A. Section 28 23 11 - Video Management System Analytics.
B. Section 28 23 13 - Video Management System Interfaces.
C. Section 28 25 00 - Video Surveillance Positioning Equipment.

15.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate with Owner or Owner's representative regarding camera network configuration and estimated bandwidth utilization prior to performing network connections.

B. Sequencing / Scheduling: Provide to Owner or Owner's representative a schedule and list of participants required to attend coordination and progress update meetings.
   1. Owner representative(s) for Facilities Management, Information Technology (IT) Services, and Security Management.
   2. General Contractor.
   3. Project Manager.
   4. Manufacturer's Representative.
   5. Project Architect.
   6. Project Engineer.
   7. Security Consultant.

15.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
    1. Substrate preparation instructions and recommendations
    2. Installation means and methods.
    3. Recommendations and requirements for proper storage and handling.
C. Shop Drawings:
    1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.
    2. Coordinate with locations listed on Contract Drawings.
D. Warranty Information:
    1. Submit confirmation and details of manufacturer's warranty, extended warranty, and replacement policies.
E. System Support Resources:
    1. Submit a list of available manufacturers providing fee based professional services available to the Contractor or Owner, including but not limited to the following:
        a. Training.
        b. Installation.
        c. Commissioning.
        d. Remote diagnostics and integration with 3rd party software and hardware systems.

15.5 CLOSEOUT SUBMITTALS
A. Supply licensing and registration information for all software, hardware, firmware, operational, and administrative licenses.
B. Supply network configuration backup files, restoration application and instructions.

15.6 MAINTENANCE SUBMITTALS
A. Spare Parts: All Spare Parts must be delivered to the owner in their original sealed packaging. Clearly label with "SPARE: DO NOT REMOVE", and include manufacturer part numbers, and date of delivery to Owner. Store all spare parts in an environment and condition recommended by the manufacturer.
    1. One spare for each_____devices.
    2. Provide spare components as noted in the coordinating schedule for work listed in this section.

15.7 QUALITY ASSURANCE
A. Qualifications - Manufacturers: Manufacturer(s) suppling products noted in this section must have a minimum of 5 years in business.
B. Qualifications - Installers:
    1. Installer must be licensed to install video surveillance and security equipment as required by authority having jurisdiction.
    2. Installer must be capable of providing references that will attest to successful completion of projects of similar scope as the work noted in this section.
    3. Installer must be certified by the manufacturer and be up to date with all training required to maintain good standing.
C. Mock-Ups: Provide a mock-up for evaluation of installer's workmanship.
    1. Do not proceed with remaining Work until workmanship is approved by Architect.
    2. Refinish mock-up area as required to produce acceptable work.

15.8 WARRANTY
A. Manufacturer Warranty: Provide manufacturer's warranty covering parts and labor costs to repair or replace part that fail to perform.

1. Warranty Period: Parts and labor warranty for 36 months from date of Substantial Completion or date of purchase, whichever comes first.
2. Service During Warranty: Provide direct support to Owner via phone and email, including access to training and education in the form of documents, videos and other materials via the internet.

PART 16 PRODUCTS

16.1 MANUFACTURERS

A. Basis of Design Manufacturer: Avigilon.
   1. Address: 555 Robson St., Vancouver, BC, V6B 1A6, Canada.
   2. Phone: (888) 281-5182.
   3. Website: www.avigilon.com.

B. Manufacturer List:
   1. Manufacturer:

C. Substitution Limitations:
   1. Submit substitution requests in accordance with provisions of Section 01 60 00.
   2. Single manufacturer will provide, from a single source, a fully integrated surveillance system consisting of network cameras and the following components:
      a. Video Management System Analytics.
      b. Video Management System Interfaces.
      c. Video Surveillance Positioning Equipment.
      d. Video Surveillance Sensors.

16.2 DESIGN CRITERIA

A. System Design:
   1. Video monitoring system must be tightly integrated using application programming interfaces and software development kits.
   2. All systems must be capable of functioning autonomously during a failure of one or more of the related sections.
   3. Cameras in this section must be capable of bi-directional communication.
   4. Video monitoring system to be interfaced through digital communication protocols including but not limited to ASCII or Hexadecimal Data Transmissions.

B. System Certifications:
   1. cULus certification mark for Canada/USA.
   2. CE certification mark for European Union.
   3. ROHS mark for European Union.
   4. RCM certification mark for Australia.
   5. EAC certification mark for Customs Union (Russia, Belarus, Kazakhstan).
   6. KC certification mark for Korea.
   7. BIS certification for India.
   8. SASO registration for Saudi Arabia.
   9. Kuwait registration.
   10. WEEE mark for European Union.

C. Safety Standards:
   1. UL/CSA/IEC/EN 60950-1.

D. Electromagnetic Emissions Standards:
   1. FCC Part 15 Subpart B Class B.
   2. ICES-003 Class B.
   3. EN 55032 Class B.
   4. EN 61000-6-3.

5. EN 61000-3-2.
6. EN 61000-3-3.

E. Electromagnetic Emissions Standards:
1. EN 55024.
2. EN 61000-6-1.

16.3 PERFORMANCE REQUIREMENTS

A. Standards:
1. Video Standards: H.264 / MJPEG / HDSM SmartCodec technology.
2. Image Standards: MPEG-4 - ISO/IEC 14496-10 AVC (H.264).
3. Networking Standards:
a. IEEE 802.3af (Power over Ethernet).
b. IEEE 802.1X (Authentication).
c. IPv4 (RFC 791).
d. IPv6.

B. Video Requirements:
1. Provide cameras capable of simultaneously delivering at least two individual video streams, for use when connecting to the Video Management Software for recording and live viewing.
2. Provide cameras with a primary stream capable of supporting the video resolution and aspect ratio and capable of generating the image framerates noted in this section.
3. By generating a secondary stream at fractional resolutions of the primary stream, Video device must support HDSM-High Definition Stream Management and/or Dynamic Bandwidth Management.

C. Encoding Requirements:
1. Support compression and image quality settings from 1 to 20 to configure bandwidth utilized by the camera and desired image response. Provide user configuration of compression quality and image rate per camera.
2. Provide independently configured simultaneous H.264 and Motion JPEG streams (multi-stream).
3. Support Motion JPEG encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
4. Support H.264 encoding in a selectable range from 1 up to 12 frames per second based on resolution configured.
5. Support Variable Bit Rate (VBR) in H.264 with a configurable maximum bit rate threshold.
6. Provide user configuration of compression format, compression quality, maximum bit rate, key frame interval, and image rate per camera.
7. Support motion compensation and motion vector during motion estimation in H.264, able to maintain frame rate, regardless of scene complexity, when bandwidth is capped at 12mbps at 30 FPS for 1-3MP and 20mbps at 30 FPS for 5-8MP .
8. Support G.711 PCM 8kHz audio compression.

D. Provide cameras that allow video and audio signals to be transported over:
1. HTTP (Unicast).
2. HTTPS (Unicast).
3. RTP (Unicast & Multicast).
4. RTP over RTSP (Unicast).
5. RTP over RTSP over HTTP (Unicast).
6. RTP over RTSP over HTTPS (Unicast).

E. Image Control Requirements:

1. User Configurations Supported:
    a. Automatic and manual white balance control.
    b. Automatic and manually defined exposure zones operating in the range 1/6 and 1/8000 second.
    c. Flicker control (50 Hz, 60 Hz).
    d. Automatic and manual iris control.
    e. Color saturation and sharpening.
    f. Motion detection sensitivity and threshold.
    g. Digital rotation of the image when used with control center software.
    h. Minimum Dynamic Range:
    i. 67db for 1-3MP, 83dB for 5MP and 91dB for 8MP. Dynamic Range shall not change based on configured encoding resolution.
2. Adaptive Video Analytics Specifications:
    a. Configured Behaviors: Unlimited number of configured behaviors per video source supported.
    b. Automatic Analytic set up and tuning of behavior identification:
        1) Upon selection of analytic and Region of Interest (ROI), the device will automatically configure behavior identification.
        2) The device will constantly monitor changes in the scene and perform a tuning of the behavior identification parameters as the scene environment changes.
3. Include detection of the following behaviors:
    a. Object present in ROI.
    b. Object enters ROI.
    c. Object leaves ROI.
    d. Object appeared.
    e. Object disappeared.
    f. Object crosses a line of interest or beam.
    g. Object Movement Direction.
    h. Object loitering.
    i. Multiple objects in ROI over specified dwell time.
    j. Dwell Time.
    k. Number of objects exceeds limit in ROI.
    l. Number of objects below limit in ROI.
    m. Camera tampering.

F. Network Requirements: Provide video cameras that have the following network capabilities:
1. Supports both fixed (static) IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
2. Supports user configuration of network parameters including:
    a. Fixed (static) IP address.
    b. Subnet mask.
    c. Gateway.
    d. Control port.
3. Are automatically detected when using a Video Management Application (VMA) or Network Video Recorder (NVR) supporting this feature.
4. Provides support for both IPv4 and IPv6 Networks.

G. Video Motion Detection Functionality Requirements: Provide video cameras capable of detecting motion based on:
1. Motion Detection Mask: Defined areas within the camera’s field of view for the camera to detect motion.

2. Sensitivity: How much each pixel within the masked areas must change before it is considered in motion.
3. Threshold: Percentage of pixels that must detect change.

H. Event Functionality Requirements: Equip cameras with an integrated event functionality, which may be trigged by:
1. Alarm input terminal.
2. Video motion detection.
3. Camera temperature outside operative range.
4. Schedule.

I. Protocol Support Requirements: Provide video cameras that incorporate support for at least the following:
1. IPv4.
2. IPv6.
3. HTTP.
4. HTTPS.
5. SOAP.
6. DNS.
7. NTP.
8. RSTP.
9. RTCP.
10. RTP.
11. TCP.
12. UDP.
13. IGMP.
14. ICMP.
15. DHCP.
16. Zeroconf.
17. ARP.
18. SNMP v2c.
19. SNMP v3.

J. Streaming Support Requirements: Provide video cameras that incorporate support for at least the following:
1. RTP/UDP.
2. RTP/UDP multicast.
3. RTP/RTSP/TCP.
4. RTP/RTSP/HTTP/TCP.
5. RTP/RTSP/HTTPS/TCP.
6. HTTP.

K. Video Overlay Requirements: Provide video cameras with the following overlay requirements:
1. 64 individually configurable privacy zones to conceal defined areas in image as non-viewable. Masks required to be dynamically adjusted based on current zoom-factor, without capability of operator bypass.
2. Video masked by privacy zones must be obscured prior to streaming.

L. Security Requirements: Provide video cameras with the following security requirements:
1. Support the use of the following:
    a. Password protection.
    b. HTTPS Encryption.
    c. Digest authentication.
    d. WS authentication.

e. User access Log.
f. SSL encryption.
2. Restrict access to the built-in internet server by usernames and passwords at three different user group levels.

M. Electrical Power: Cameras capable of being powered by the following power sources:
1. PoE: IEEE 802.3af Class 3 PoE Compliant.
2. AC Power: 24 V +/- 10%, 19 VA min.
3. DC Power: 12 V +/- 10%, 13 W min.
4. Battery Backup: 3V manganese lithium.

N. Installation and Maintenance Requirements: Provide video cameras with the following installation and maintenance requirements:
1. Allow firmware updates via network.
2. Store customer-specific settings in a non-volatile memory which cannot be lost during power cuts or soft reset.
3. Provide Microsoft Windows based management software, allowing camera configuration, upgrade of firmware, and backup of individual camera configurations.

O. Diagnostics:
1. Equipped with LEDs, indicating the camera's functional status, which may be user enabled or disabled.
2. Monitored by functionality which automatically reinitiates processes or restarts the unit if a malfunction is detected.

P. Connectivity:
1. 100BASE-TX Fast Ethernet-port with RJ-45 socket, auto negotiation of network speed and transfer mode.
2. Terminal for receiving line level analog audio from an external microphone.
3. Terminal for providing line level analog audio for connection to an external speaker.

Q. Operational Range:
1. Temperature (1.0 – 5.0MP): -40 degrees C to +55 degrees C [-40 F to +131 F].
2. Temperature (8.0 MP): -35 degrees C to +50 degrees C [-31 F to +122 F].
3. Relative Humidity: 0–95 percent (non-condensing).

16.4 1 MEGAPIXEL IP CAMERAS

A. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 3-9mm lens:
1. Basis of Design Product: 1.0C-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).

2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.

B. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 3-9mm lens:
1. Basis of Design Product: 1.0C-H4A-12G-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.
k. Solid State Drive: 128 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

C. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 1.0C-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 14 degrees to 29 degrees.

D. 1.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 9-22mm lens:
1. Basis of Design Product: 1.0C-H4A-12G-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1280 x 720.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].

e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 14 degrees to 29 degrees.
k. Solid State Drive: 128 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

16.5 2 MEGAPIXEL IP CAMERAS

A. 2.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 3-9mm lens:
1. Basis of Design Product: 2.0C-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.

B. 2.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 3-9mm lens:
1. Basis of Design Product: 2.0C-H4A-25G-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 30 degrees to 91 degrees.
k. Solid State Drive: 256 GB.

l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

C. 2.0 MP H4 Camera, Wide Dynamic Range, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 2.0C-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 14 degrees to 29 degrees.

D. 2.0 MP HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 9-22mm lens:
1. Basis of Design Product: 2.0C-H4A-25G-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 1920 x 1080.
d. Imaging Area (H x V): 4.8 mm x 2.7mm [0.189 inches x 0.106 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 14 degrees to 29 degrees.
k. Solid State Drive: 256 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

16.6 3 MEGAPIXEL IP CAMERAS

A. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 3-9mm lens:
1. Basis of Design Product: 3.0C-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.

d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 30 fps (20 fps with WDR enabled).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 32 degrees to 98 degrees.

B. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 3-9mm lens:
1. Basis of Design Product: 3.0C-H4A-25G-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.
d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.04 lux (F1.3).
2) Monochrome: 0 lux (F1.3) with IR.
j. Field of View: 32 degrees to 98 degrees.
k. Solid State Drive: 256 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

C. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 3.0C-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.
d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 30 fps (20 fps with WDR enabled).
f. Dynamic Range: 67 dB.
g. Dynamic Range - WDR Enabled:
1) 120 dB triple exposure at 20 fps or less.
2) 100 dB double exposure at 30 fps.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).

2) Monochrome: 0 lux (F1.6) with IR
j. Field of View: 15 degrees to 31 degrees.

D. 3.0 MP H4 HD Camera, Wide Dynamic Range, Self-Learning Video Analytics, ES and 9-22mm lens:
1. Basis of Design Product: 3.0C-H4A-25G-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2048 x 1536.
d. Imaging Area (H x V): 5.12 mm x 3.84 mm [0.202 inches x 0.151 inches].
e. Imaging Rate: 12 fps (30 fps in High Framerate mode).
f. Dynamic Range - Linear: 67 dB.
g. Dynamic Range - WDR Enabled: 120 dB triple exposure.
h. Resolution Scaling: Down to 768 x 432.
i. Minimum Illumination:
1) Color: 0.08 lux (F1.6).
2) Monochrome: 0 lux (F1.6) with IR.
j. Field of View: 15 degrees to 31 degrees.
k. Solid State Drive: 256 GB.
l. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables WDR.

16.7 5 MEGAPIXEL IP CAMERAS

A. 5.0 MP H4 HD Camera, Self-Learning Video Analytics and 4.3-8mm lens:
1. Basis of Design Product: 5.0L-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/1.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2592 x 1944.
d. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range: 83 dB Linear.
g. Resolution Scaling: Down to 1792 x 1344.
h. Minimum Illumination:
1) Color: 0.033 lux (F1.8).
2) Monochrome: 0 lux (F1.8) in IR.
i. Field of View: 46 degrees to 86 degrees.

B. 5.0 MP H4 HD Camera, Self-Learning Video Analytics and 9-22mm lens:
1. Basis of Design Product: 5.0L-H4A-BO2-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/1.8 inch progressive scan CMOS.
b. Aspect Ratio: 4:3.
c. Active Pixels (H x V): 2592 x 1944.
d. Imaging Area (H x V): 6.22 mm x 4.66 mm [0.245 inches x 0.183 inches].
e. Imaging Rate: 30 fps.
f. Dynamic Range: 83 dB Linear.
g. Resolution Scaling: Down to 1792 x 1344.

h. Minimum Illumination:
1) Color: 0.026 lux (F1.6).
2) Monochrome: 0 lux (F1.6) in IR.
i. Field of View: 18 degrees to 41 degrees.

16.8 8 MEGAPIXEL IP CAMERAS

A. 8.0 MP HD Camera, Self-Learning Video Analytics and 4.3-8mm lens:
1. Basis of Design Product: 8.0-H4A-BO1-IR-B, by Avigilon.
2. Performance:
a. Image Sensor: 1/2.3 inch progressive scan CMOS.
b. Aspect Ratio: 16:9.
c. Active Pixels (H x V): 3840 x 2160.
d. Imaging Area (H x V): 5.95 mm x 3.35 mm [0.234 inches x 0.132 inches].
e. Imaging Rate: 20 fps (30 fps in High Framerate mode).
f. Dynamic Range: 91 dB Linear.
g. Resolution Scaling: Down to 3072 x 1728.
h. Minimum Illumination:
1) Color: 0.29 lux (F1.8).
2) Monochrome: 0 lux (F1.8) with IR
i. Field of View: 44 degrees to 81 degrees.
j. Operating Modes:
1) Full Feature Mode: Full camera functionality.
2) High Framerate Mode: Uses maximum possible imaging rate and disables HDSM 2.0 and video analytics.

PART 17 EXECUTION

17.1 EXAMINATION

A. Verification of Conditions: Do not begin installation until substrates have been properly prepared.
B. Evaluation and Assessment: If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

17.2 PREPARATION

A. Surface Preparation: Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

17.3 INSTALLATION

A. Install all products in this section following the product manufacturer's published installation and application manuals and guidelines.

17.4 SYSTEM STARTUP

A. Test equipment and configure system in accordance with instructions provided by the manufacturer prior to installation.
B. Review configurable features of the device with the Owner's Representative and establish a punch list for standard, device specific, location specific and VMA/NVR specific configuration of device(s).
1. Program and configure devices in accordance with this punch list so no additional programming is required for operation by the user.
C. Configure equipment requiring users to log on using a password with user/site-specific credentials. Default passwords are not acceptable and must be configured prior to project closeout.
D. Provide products with the latest and most up-to-date firmware by the manufacturer or provide firmware of a version specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

17.5 ADJUSTING

A. Fine Tuning: Perform field software changes after initial programming session to "fine tune" operating parameters and sequence of operations based on any revisions to Owner's operating requirements.

17.6 CLOSEOUT

A. Demonstration:
   1. Demonstrate administration and operation of devices described by this section.
   2. Demonstrate how to authorize users and applications to operate and configure installed devices.
   3. Demonstrate how an authorized user can gain access to and make changes to configuration.
   4. Demonstrate how to operate functionality configured for this project as defined by configuration punch list.

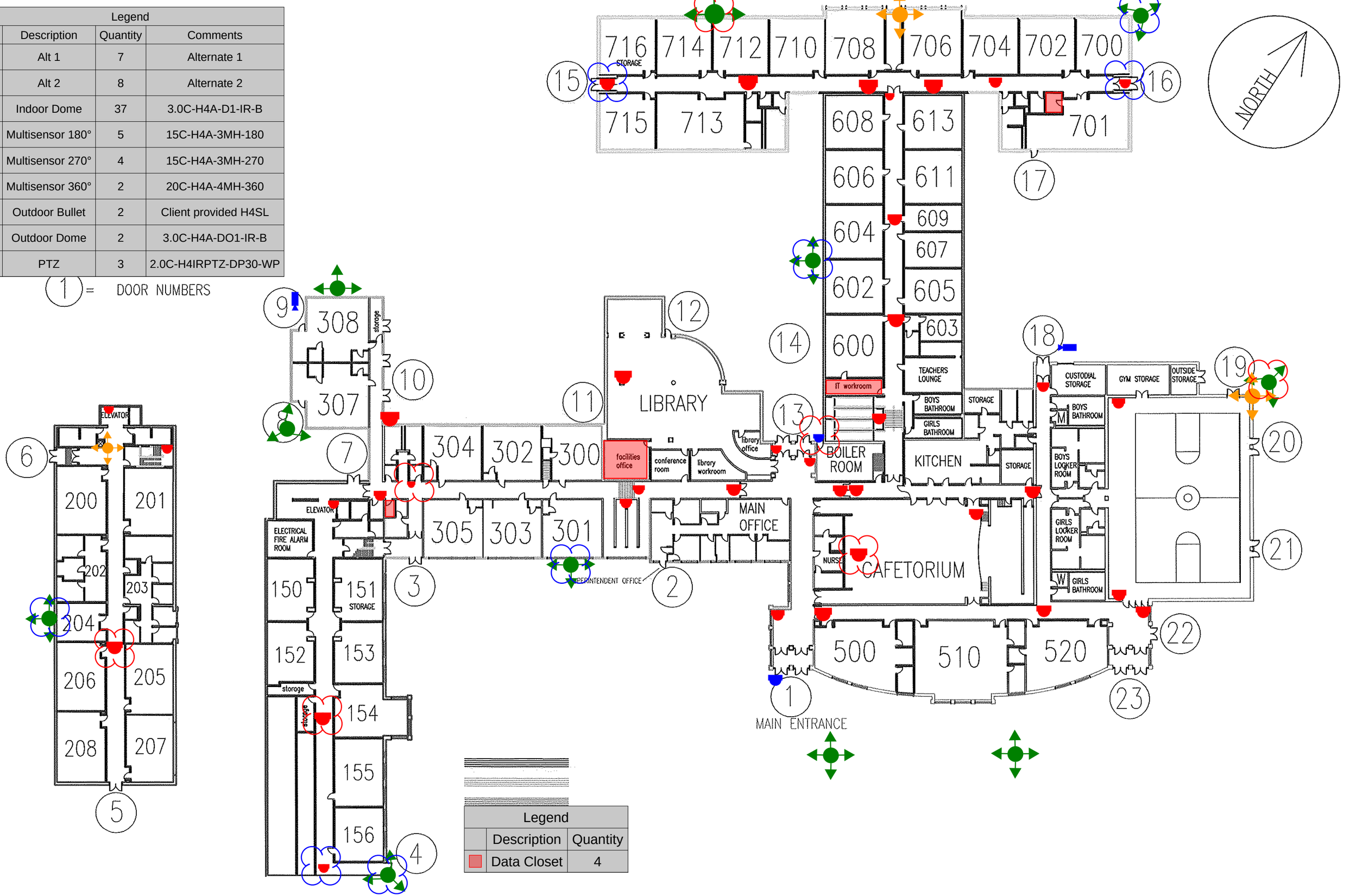
B. License Assignment:
   1. Register software, hardware, firmware, operational or administrative licenses necessary for to operate or administer devices to Owner.
   2. Deliver to Owner's Representative proof of license registration from product manufacturer.

C. Device Configuration Backup:
   1. Using manufacturer's backup software tool or VMA/NVR, perform a full system back-up at completion of initial programming.
   2. Deliver configuration backup files, restoration application and instructions detailing for restoration of back-up configuration.

END OF SECTION

Legend			
	Description	Quantity	Comments
	Alt 1	7	Alternate 1
	Alt 2	8	Alternate 2
	Indoor Dome	37	3.0C-H4A-D1-IR-B
	Multisensor 180°	5	15C-H4A-3MH-180
	Multisensor 270°	4	15C-H4A-3MH-270
	Multisensor 360°	2	20C-H4A-4MH-360
	Outdoor Bullet	2	Client provided H4SL
	Outdoor Dome	2	3.0C-H4A-DO1-IR-B
	PTZ	3	2.0C-H4IRPTZ-DP30-WP

1 = DOOR NUMBERS



Legend		
	Description	Quantity
	Data Closet	4

SAMPLE

1. Technical Standards

The Firm shall perform all work in accordance with good engineering practice and all applicable local, state and federal industry standards.

2. Term of Contract

The term of this Contract shall be from July 17, 2019 to September 30, 2019, inclusive.

3. Compensation

3.1 Negotiated Fee

The fee proposal shall include the lump sum cost to the Town of Columbia for providing the proposed services, unless another cost basis is approved by the Town (e.g., unit cost). If applicable, the costs shall be listed for each task or phase. If requested by the Town, additional information such as the estimated number of man-hours of each position classification per task or phase shall be submitted. The fee proposal shall include an allowance for estimated reimbursable expenses for normal reimbursable out-of-pocket costs such as outside printing costs and approved subconsultant and subcontractor fees. All anticipated reimbursable expenses for each specific project shall be itemized in the fee proposal, with unit and estimated total costs listed for each expense. Reimbursement shall be for actual out-of-pocket costs including the services of subconsultants and shall not include a mark-up and shall not be made for normal overhead expenses such as office supplies, telephone charges, mileage, and inside copying and printing.

Once the scope of services, schedule, proposed staffing plan, and the proposed compensation have been accepted by the Town, the Town will authorize the Firm to proceed with the work, which shall be performed in accordance with the accepted proposal and the terms and conditions of this Contract.

The Firm shall prepare and submit invoices accompanied by such documentation as may be required by the Town. Payments will be made to the Firm within 30 days of Town approval of each invoice. Payments are conditioned upon the satisfactory performance of all work. In the event that the Town determines the Firm to be in nonconformance with the terms of this Contract or if in the Town's judgment the Firm's work is not satisfactory, the Town may take corrective action, including, but not limited to, the following:

1) Delay of payment
2) Adjustment of payment
3) Suspension or termination of this Contract

SAMPLE

The Firm agrees to meet with representatives of the Town, at no cost to the Town, to discuss billing issues as the Town deems necessary. Payments to the Firm will be made on a periodic basis in accordance with the percentage of work actually completed. Payments for each phase of the work within the project will be prorated based upon the amount of work actually completed within that phase. Except in the case of work which is performed on an hourly rate basis, the amount of the payment for a fixed fee task will not be based simply on the amount of hours expended by the Firm on the task.

4. Management and Administration of the Contract

The Town's designated Managing Authority for this Contract will be the Town Administrator, or his authorized designee, who will have complete authority to act for and on behalf of the Town and control, supervise, and direct the Firm's activities hereunder. The Managing Authority will make all arrangements for services by the Firm. All proposals for work to be done under this Contract and any resulting expenditures must be approved by said Managing Authority before any work is initiated or any expenditure made. Services are to be provided by the Firm, except where the use of specific subconsultants or subcontractors has been approved in writing by the Town for a particular project.

The Firm's primary contact person will be _____, who will communicate and report directly to the Town's Managing Authority, be responsible for directing and coordinating the activities of the firm's personnel and approved subconsultants and subcontractors, provide information for projects assigned under this Contract as may be required from time to time by the Town and shall be authorized to prepare and execute proposals, including scopes of services, fee proposals, proposed staffing plans, and schedules as requested by the Town under this Contract.

The Firm and the Town shall work closely together in all aspects of this program, and each shall follow the reasonable suggestions of the other to improve the operation of the program.

5. Relationship Between the Parties

It is mutually agreed that the Firm, including its employees, is an independent contractor and not an officer, employee, or agent of the Town, and that this Contract is a contract for services and not a contract of employment, and that, as such, the Firm and its employees shall not be entitled to any employment benefits from the Town such as, but not limited to: vacation, sick leave, insurance, workers' compensation, pension and retirement benefits. All personnel matters affecting Firm's staff will be the responsibility of the Firm.

SAMPLE

In no event shall anything in this Contract be deemed to confer upon any person or entity agency status or third-party beneficiary rights against the Town.

6. Indemnification and Hold Harmless Contract

To the fullest extent permitted by law the Firm shall at all times indemnify and save harmless the Town and its officers, agents, and employees on account of and from any and all claims, damages, losses, workers' compensation payments, judgments, litigation expenses, and legal counsel fees arising out of injuries to persons (including death) or damage to property alleged to have been caused in whole or in part by the willful, wanton, or negligent acts or omissions of the Firm, his employees, subconsultants, subcontractors, or materialmen. The existence of insurance shall in no way limit the scope of this indemnification. The Firm shall reimburse the Town for damage to property of the Town caused by the Firm, or his employees, subconsultants, subcontractors, or materialmen.

7. Insurance

The selected Firm shall furnish a Certificate of Insurance evidencing the following insurance coverage in effect on or before the date of execution of this Contract. Insurance coverage shall remain in full force for the duration of the Contract term, including any extensions. Renewal certificates shall be furnished at least thirty (30) days prior to policy expiration. Failure to maintain insurance coverage as required and to name the Town as an Additional Insured will be grounds for termination of the Contract. The interest of the Town shall be included in all insurance policies required herein, except Workers' Compensation and Professional Liability, as Additional Insured as its interest may appear, which shall be noted on the Certificate of Insurance, and shall include, but not be limited to, investigation, defense, and payment of settlement or judgment. Such insurance must be written by companies of recognized standing, qualified and licensed to engage in the insurance business in the State of Connecticut. All deductibles are the sole responsibility of the Firm to pay and/or indemnify.

The Firm awarded this proposal must provide a current Certificate of Insurance to the Town Administrator PRIOR to commencement of work, with the following requirements:

Insured Limits and Coverage:

A. To the extent applicable, the amounts and types of insurance will conform to the minimum terms and conditions and coverages of the national Insurance Services Office (ISO) policies, forms, and endorsements.
B. If the contractor/insured has self-insured retention' s or deductibles under any of the following minimum required coverage's, the contractor/insured must

SAMPLE

C. identify on the certificate of insurance the nature and amount of such self-insured retention's or deductibles and provide satisfactory evidence of financial responsibility for such obligations. All self-insured retention's or deductibles will be the contractor/insured's sole responsibility.

D. Commercial General Liability: The contractor/insured will maintain commercial general liability insurance covering all operations by or on behalf of the contractor/insured on an occurrence basis against all claims for personal injury (including bodily injury or death) and property damage (including loss of use).

   Such insurance will have these minimum limits:
   - $ 1,000,000 each occurrence.
   - $ 1,000,000 each occurrence if blasting is required.
   - $ 2,000,000 general aggregate with dedicated limits per project site.
   - $ 2,000,000 products and completed operations aggregate.
   - $ 1,000,000 personal and advertising injury.

E. Automobile Liability: The contractor/insured will maintain business auto liability coverage for liability arising out of any auto, including owned, hired, and non-owned autos.

F. Workers' Compensation: The contractor/insured will maintain workers' compensation and employer's liability insurance in the following minimum limits:

   - Workers' Compensation: statutory limits.
   - Employer's Liability: $1,000,000 bodily injury for each accident.
   - Employer's Liability: $1,000,000 bodily injury by disease each employee.
   - Employer's Liability: $1,000,000 bodily injury disease aggregate.

G. Professional Liability: $1,000,000

H. Governing Law: This agreement shall be governed by the laws of the State of Connecticut.

I. These are, minimum insurance limit requirements only. Additional insurance coverage's and amounts may be required by the Town of Columbia on a per project basis.

8. Indemnification and Hold Harmless

The Firm shall defend, indemnify and hold harmless the Town, its officers, officials, employees and volunteers from any and all claims, injuries, damages, losses or suits including attorney fees, arising out of or in connection with the performance of services hereunder, except for injuries and damages caused by the sole negligence of the Town.

SAMPLE

9. Ethics and Conflict of Interest

In order to avoid perceived or actual conflicts of interest, the Firm shall disclose to the Town any known special personal or financial interests, beyond those applicable to the general public, of the Firm, its employees, subconsultants, or subcontractors, regarding any matter that they are working on under this Contract. The Town will determine if a significant conflict of interest exists, and if necessary, will assign the work to others to avoid the conflict of interest.

10. Events of Default and Remedies

10.1 Events of Default

Any of the following occurrences or acts shall constitute an Event of Default under this Contract:

10.1.1 If in the opinion of the Town, default shall have been made by the Firm, its successors or assigns, in the performance or observance of any of the covenants, conditions or Contracts on the part of the Firm set forth in this Contract; or

10.1.2 If in the opinion of the Town, the Firm fails to deliver services by the dates agreed upon for any specific project and the Firm has not received written approval from the Town for an extension to the agreed upon schedule; or

10.1.3 If any determination shall have been made by a competent authority such as, but not limited to, any authorized federal, state or local government official, or a certified public accountant, that the Firm's management or any accounting for its funding, from whatever source, is improper, inadequate or illegal, as such management or accounting may relate to the Firm's performance of this Contract; or

10.1.4 If a decree or order by a court having jurisdiction in the matter shall have been entered adjudging the Firm as bankrupt or insolvent or approving as properly filed a petition seeking reorganization, readjustment, arrangement, composition or similar relief for the Firm under the federal bankruptcy laws, or any other similar applicable federal or state law.

SAMPLE

10.2 Election of Remedies

If any Event of Default hereunder shall have occurred and be continuing, the Town may elect to pursue any one or more of the following remedies, in any combination or sequence:

10.2.1 Take such action as it deems necessary, including, without limitation, reduction of payment or temporary withholding of payment;

10.2.2 Require the Firm to pay Liquidated Damages in the amount of five hundred dollars ($500), or one percent of the total compensation for the project on which it has contracted to work, whichever is less, per calendar day to the Town until the work is complete;

10.2.3 Suspend work under the Contract;

10.2.4 Require the Firm to correct or cure such default to the satisfaction of the Town; and Board of Education.

10.2.5 Terminate this Contract for cause in accordance with Section 11 hereof.

The selection of any remedy shall not prevent or stop the Town from pursuing any other remedy and shall not constitute a waiver by the Town of any other right or remedy.

11. Termination of Contract

11.1 Termination

"Termination", for purposes of this Contract, shall mean the cessation, upon the effective date of termination, of the following obligations only: The Firm's obligation to perform the services described in Section 1, Scope of Services, of this Contract, and the Town's obligation, as described in Section 4, Compensation, of this Contract, to pay for such services.

11.2 Termination for Cause

Upon the occurrence of any Event of Default, as set forth in Section 10.1 hereof, the Town may terminate this Contract by giving five (5) days' written notice thereof to the Firm.

11.3 Termination for Program Change

In the event the on-call engineering program shall be terminated or significantly changed, the Town may terminate this Contract by giving ten (10) days' written notice thereof to the Firm.

11.4 Termination for Non-availability of Funds

In the event the Town shall not have funds available for this program, the Town may terminate this Contract by giving ten (10) days' written notice thereof to the Firm.

SAMPLE

11.5 Termination for Convenience

The Town may terminate this Contract for convenience at any time, and for any reason, or for no reason, by giving ten (10) days' prior written notice thereof to the Firm.

11.6 Payment upon Termination

In the event this Contract is terminated as herein provided, the Town shall make full payment to the Firm for all authorized services performed up to and including the date of termination.

12. Amendments

This Contract may be amended by written instrument executed by the parties hereto, acting therein by their duly authorized representatives. The Firm's duly authorized representative shall be_____, and the Town's duly authorize representative shall be the Managing Authority.

13. Establishment and Maintenance of Records

The Firm agrees to establish and maintain fiscal control and accounting procedures that assure proper accounting for all funds paid by the Town to the Firm under this Contract. The Firm agrees that all records with respect to all matters covered by this Contract shall be maintained during the term of this Contract, including any renewal or extension, and for one full year following termination or expiration.

14. Audits

At any time during normal business hours, and as often as may be deemed necessary, the Firm shall make available to the Town, for examination, all records with respect to all matters covered by this Contract.

15. Reports and Information

The Firm shall furnish the Town with such information and reports concerning the progress and management of this project as may be required from time to time. The form of said reports shall be determined by the Town.

16. Non-Assignability

The Firm shall not assign or transfer any interest in this Contract without prior written consent of the Town.

SAMPLE

17. Severability

If any provision of this Contract is held invalid, the remainder of this Contract shall continue in full force and effect.

18. Cumulative Remedies

All rights and remedies of the Town hereunder shall be cumulative and the exercise or beginning of the exercise by the Town of any of its rights or remedies hereunder shall not preclude the Town from exercising any other right or remedy granted hereunder or permitted by law.

19. Governing Law

This Contract shall be governed by, and construed in accordance with, the laws of the State of Connecticut.

20. Subconsultants and Subcontractors

Portions of this work may be subcontracted, provided that:

20.1 The Town shall give prior approval to such subcontract in writing.

20.2 All of the terms, covenants, conditions and provisions of this Contract shall have been incorporated in such subcontract(s) and the subconsultant(s) and subcontractor(s) shall have agreed in writing to assume, perform and be bound by this Contract and all the terms, covenants, conditions and provisions hereof.

20.3 The Town shall not be liable for payment of any wages, materials, or other expenses of any subconsultants or subcontractors.

21. Gender/Number/Title

Words of any gender used in this Contract shall be held and construed to include any other gender, and words in the singular shall be held and construed to include the plural, unless the Contract requires otherwise. In the event of any discrepancy or conflict between the name and title of any person referred to in this Contract, the title shall prevail.

22. Notices

All notices, approvals, demands, requests, or other documents required or permitted under this Contract, other than routine communications necessary for the day-to-day operation of this contract, shall be deemed properly given if hand delivered or sent by United States mail, first class postage, to the following addresses:

SAMPLE

As to the Town:

(The Managing Authority designated
in Section 5 of this Contract)
323 Route 87
Columbia, CT 06237

As to the Firm:

_____
_____
_____
_____

23. Non-Waiver

Any failure by the Town or the Firm to insist upon the strict performance by the other of any of the terms and provisions hereof shall not be a waiver, and each party hereto, notwithstanding any such failure, shall have the right thereafter to insist upon the strict performance by the other, of any and all of the terms and provisions of the Contract and neither party hereto shall be relieved of such obligation by reason of the failure of the other to comply with or otherwise enforce any of the provisions of this Contract.

24. Delinquency in Obligations

The Firm hereby agrees that throughout the period of the Contract, all taxes, debts, contractual obligations, and audit responsibilities owed to the Town shall be and shall remain current.

25. Ownership of Work Product

All work produced under this Contract shall be the property of the Town. The Firm shall turn over to the Town all original documents and other work products upon completion or demand.

SAMPLE

26. Entire Contract

This Contract, and its exhibits attached hereto and referenced herein, contain the entire understanding between the parties hereto and supersedes any and all prior understandings, negotiations, and Contracts, whether written or oral, between them respecting the written subject matter.

IN WITNESS THEREOF, the TOWN OF COLUMBIA and the FIRM have executed this Contract on this _____day of _____, 2018.

TOWN OF COLUMBIA

Reviewed: _____
By: Michael Sylvester
Title: BOE, Facilities Manager

Approved: _____
By: Mark B. Walter
Title: Town Administrator

Witness: _____

FIRM

Approved: _____
Signature

Title:_____

Witness: _____
Signature

Title:_____