KENYA REVENUE AUTHORITY

ISO 9001:2015 CERTIFIED

PUBLIC

ADDENDUM SET 2

10th June 2025.

To all Prospective bidders,

REF NO. KRA/HQS/NCB-040/2024- 2025 – SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF SOLAR POWER SYSTEM AT KENYA SCHOOL OF REVENUE ADMINISTRATION – MOMBASA CAMPUS

Kenya Revenue Authority wishes to inform prospective bidders of the following addendum:

NO.	Tender Document reference	Clarification	KRA Response/ Addendum
1.	Bill of quantities	Please clarify of the referencing made on the CCTV cameras Numbers 1.1 to 1.4 specific the phrase "per specifications attached". Going through the revised tender document we have not seen the said attached specifications.	**Prospective bidders are hereby advised that technical specifications are attached to this addendum as Annex 1 – CCTV Technical Specifications.**
2.	Cover page Tender Data sheet; ITT 24.1, ITT 27.1	Extension of tender closing date	**Prospective bidders are advised that the tender closing date has been extended from 11th June 2025 to Wednesday, 18th June 2025 at 11.00a.m.** **Bidders are also advised to align their tender securities to be valid for 365 days from the tender closing date with the revised tender closing date i.e. 17th June 2026.**

The Addendum forms part of the bidding document and is binding to all bidders. All other terms and conditions of the application remain the same. You are therefore required to immediately acknowledge the receipt of this addendum.

Regards,

Rhodah Nzovila

For: Deputy Commissioner - Supply Chain Management

ANNEX 1- CCTV TECHNICAL SPECIFICATIONS

A. PARTICULAR SPECIFICATIONS

1.00 DESCRIPTION OF THE SITE

The site of the proposed works is located at **Kenya School of Revenue Administration**

1.01 DESCRIPTION OF THE PROJECT

The works comprise but not limited to the Supply, Installation, Testing and Commissioning of thefollowing:

a) **IP CCTV Cameras**
b) **Network Video Recorder**
c) **Cabling**
d) **LED Monitors**

1.02 CLIMATIC CONDITIONS

Mean Maximum Temperature	as per Nairobi town Met data[c]
Mean Minimum Temperature	as per Nairobi town Met data[c]
Range of Relative humidity	as per Nairobi town Met data[c]
Salt in the atmosphere	as per Nairobi town Met data[c]
Altitude	as per Nairobi town Met data[c]
Latitude/Longitude	as per Nairobi town Met data[c]
Solar Radiation, February	as per Nairobi town Met data[c]

1.03 REGULATIONS

The contractor shall, in the execution and completion of the works in the detailed design for which he isresponsible comply with the provisions of the following as necessary and relevant:

- Communication Authority of Kenya (CAK)
- The Kenya Communications Act
- The Electronic Power Act and the Rules made there under.
- The Kenya Power and Lighting Company Limited's Bye-Laws.
- The current edition of the "Regulations for the Electric Equipment of Buildings" issued by theInstitution of Electrical Engineers.
- The requirements of the Chief Inspector of Factories for the Kenya Government.
- Kenya Bureau of Standards (KBS) Standard Specifications and Codes of Practice, or other equal andapproved standard specifications and codes.
- The Bye-Laws of the Local Authority.
- Any other regulations applicable to Electric and Electronic Installations or Communications systemsin Kenya.
- The Employer's Safety Regulations.

1.04 POSITION OF SERVICES AND EQUIPMENT

The route services and approximate positions shall be determined on site by the Project Manager.

The contractor shall ascertain on site that his work will not foil other services or furniture and all services through the ducts must be readily accessible for maintenance and arranged to allow maximum access along the ducts. Any work which has to be redone due to negligence in this respect will be the contractor's responsibility.

1.05 SETTING TO WORK AND REGULATING SYSTEMS

The contractor shall carry out such tests of the contract works as are required by KeBS Standard Specifications and Codes of Practice, I.E.E Regulations or equal and approved codes, or the competent Authority.

No testing or commissioning shall be undertaken except in the presence of and to the satisfaction of the P.M. unless approved otherwise by him (contractor's own preliminary and proving tests are exempted).

The contractor shall include in his tender for the costs for testing and commissioning the contract works as herein described. He shall submit for approval to the P.M. a suitable programme for testing and commissioning. The P.M. and the Employer shall be given ample warning as to the dates on which testing and commissioning will take place.

The proving of any system of plant or equipment as to compliance with the specification shall not be approved by the P.M. except at his discretion until tests have been carried out under operating conditions appertaining to the most onerous conditions specified except where the time taken to obtain such conditions is unreasonable or exceeds 12 months after practical completion of the contract works.

1.06 IDENTIFICATION OF PLANT AN COMPONENTS

The contractor shall supply and install identification labels to all plant and to all switches and items of control equipment with, where no excessive heating is involved, white Traffolyte or equal labels engraved in block lettering denoting the name/function and/or section controlled. Where heating is likely to distort Traffolyte approved aluminum labels with stamped or engraved lettering shall be used.

The labels shall be mounted on equipment and in most suitable positions. They shall be in English or in internationally understood symbols capable of being read without difficulty. The labels shall conform to descriptions used on record drawing. Details of the lettering of the labels and the method of mounts or supporting shall be forwarded to the P.M. for approval prior to manufacture.

1.07 WORKING DRAWINGS

The contractor shall prepare such working Drawings as may be necessary. The working Drawings shall be completed in such detailed not only that the contract works can be executed on site but also that the P.M can approve the contractor's designs and intentions in execution of the contract works.

Approved working drawings shall not be departed from except where provided for.
Approval by the P.M. of working Drawings shall neither relieve the contractor of any of his obligations under the contract nor relieve him from correcting any errors found subsequently in the approved working Drawings or elsewhere associated therewith or with the works.

1.08 **RECORD DRAWINGS**

During the execution of works on site the contractor shall, in a manner approved by the P.M. record on working or other Drawings at site all information necessary for preparing Record Drawings of the installed contract Works. Marked-up working or other Drawings and other documents shall be made available to the P.M. as he may require for inspection and checking.

Record Drawing shall include but are not restricted to the following drawings or information:-

- Working Drawings amended as necessary but titled "Record Drawings" and certified as a true recordof the as installed" contract works.
- Fully dimensioned drawings of all plant and apparatus.
- System Schematic and trunking diagrams showing all salient information relating to control andinstrumentation.
- Wiring diagrams of individual plant, apparatus and switch and control boards. These diagrams to include these particular to individual plant or apparatus and elsewhere applicable those applicable tosystem operation as a whole.

One reproducible copy of the Record Drawings of the contract works and Schematic Diagrams shall be provided not later that one month afterwards.

Notwithstanding the contractor's obligation referred to above, if the contractor fails to produce to the P.M.'s approval of the Record Drawings, within one month of partial or Practical Completion the Employer shall be at liberty to have these drawings produced by others. The cost of obtaining the necessary information shall be deducted from the out-standing payments due to the contractor.

1.10 **TESTS**

Both on completion of his work and at the end of the guarantee period the contractor shall carry out such tests as may be required in the presence of the P.M. or his representative, or the competent Authority and shall provide all necessary Instruments, labour and materials to do so. The Contractor shall pay such charges related to such tests if any.

1.11 **QUALITY OF MATERIALS**

Materials and apparatus required for the complete installation as called for in the specifications or Contract Drawings shall be supplied by the contractor unless specified otherwise.

Unless otherwise specified all materials (including equipment, fittings, cables) shall be new, of the best quality and approved origin.

1.12 **TRAINING**

In the direction and to the satisfaction of the P.M. the contractor shall arrange for the training of the attendant console operators, users and the administrators at the site or the contractor's office on the workings of the CCTV Surveillance System. The cost of such training shall be included in the contractor's prices.

1.13 **EQUIPMENT GUARANTEE**

The contractor shall undertake in writing to rectify free of charge, all faults arising from faulty components, materials, design or workmanship by the manufacturer or contractor whichever is applicable. This liability shall be for a minimum period of one calendar year from the date of acceptance of the equipment. Twelve months limitation notwithstanding, the period of liability shall not end until all defects which appear during the liability period have been rectified.

1.14.1 PATENT RIGHTS

The contractor shall fully indemnify the Kenya Revenue, against any action, claim or proceeding relating to infringement of any patent or design rights, and shall pay any royalties which may be payable in respect of any article or any part thereof which shall have been supplied by the contractor to the P.M. and in like manner the Kenya Revenue shall fully indemnify the contractor against any such action, claim on proceeding for infringement or alleged infringement under the works the design thereof which shall have been supplied by the P.M. to the contractor, but this indemnity shall apply to the works only, and any permission or request to manufacture to the order of the P.M. shall not relieve the contractor from liability should he manufacture for, or supply to other buyers.

B. TECHNICAL SPECIFICATIONS

EXTENT OF WORKS FOR SECURITY SURVEILLANCE SYSTEM

The security surveillance system should consider the following.

IP CCTV Camera. The cameras specified should be able to cover the distance with clear pictures. Consider whether there shall be need to support the fixed digital cameras with the Pan, Tilt and Zoom Cameras or not. Highly sensitive areas should be covered with more cameras able to take pictures of any person coming in both from the front and the rear. The resolution of the cameras should be able to give motion pictures that are clear.

LED Monitors. The color monitors must be of high resolution and preferably of plasma screen. The size of the monitor should be big enough to allow the operators make correct deductions both in real time operation and during playbacks.

IP Network Video Recording. The recording multiplexer resolution has to be equally high for the monitor to display the with a high resolution.

The IP Surveillance system should be able to support the following

- IP based recording system with motion detection.
- Digital zooming into recorded images/ life view
- Multi-level password protection and logging facilities
- Integrates with access control, burglar control, burglar alarms and Fire alarm system and other building management systems as may be specified by the engineer.
- Image compression for remote web live and playback viewing in case of IP.
- Multi display monitors
- Automatic daily archiving to hard drive or optical drive.
- Fully adjustable digital video motion detection with exclusion /inclusion multi regions per camera.
- Efficient video collection, storage and retrieval.
- Advanced and instant search capability
- Digitally signed recordings, with audit trails of all operator actions and system event.
- Storage capacity of the Network Video Recorder. Space to provide at least three months continuous recording and back up for automatic archiving for one year and redundancy
- Infra-red illuminators in poor lighting conditions
- Able to interface with other systems on the ground
- Support IP and PoE connectivity.

WORKING DRAWINGS

The Contractor shall submit to the Project Manager working drawings for the proposed system for approval. The drawings will show the locations for all cameras, cable routing and terminations, telecommunication outlets/connectors, location of NVR, monitors, core switch and Edge switches.

C. MINIMUM ALLOWABLE TECHNICAL SPECIFICATIONS FOR THE CCTV SYSTEM

GENERAL SPECIFICATIONS FOR THE CAMERAS

The cameras are classified into two main types

a) Fixed cameras –

These cameras have a fixed area of view depending on its angle of view and the focal length of the lens used. They can be used indoor and outdoor depending on the requirements. When used out door, the cameras are housed in a weather proof housing of IP66. Those used indoor come with different shapes of housings. The ex-view housings are used for cameras covering long distances like corridors and the dome housings are used for common areas like lobbies, security desks etc.

b) Pan Tilt and Zoom Cameras

These cameras are only used to support the static cameras. They are useful as they are able to pan 360 degrees, tilt over 90 degrees and zoom into an object for Min 16 times and above.
The cameras shall be indoor type and outdoor type with PoE/ 240V main supply with the appropriate power adaptors, 50Hz field frequency and operating according to the CCIR standard with minimum resolution of 2megapixels.
The camera shall be fixed on sliding rail track on the ceiling slab or walls as directed by the Electrical Engineer with an appropriate bracket.
It shall be possible to control the lens and the pan only head remotely via a remote control box at the control room. The Camera must be able to be controlled by a CCTV keyboard
They shall be linked to the Television Monitors and the Control Equipment through CAT 6A cables as appropriate and according to the project Engineers instructions.
The mounting height and position of cameras shall be such that the desired coverage shall be achieved as distinctly as possible.
The digital signal processing (DSP) camera shall be aesthetically styled. The DSP chip will enable advanced video processing and manipulation to be carried out in the camera head.

MINIMUM REQUIREMENTS FOR THE PROPOSED CCTV SYSTEM

The cameras shall have the following minimum specifications but cameras with higher specifications shall be accepted:

a) IP Bullet camera

- 6MP Outdoor Network Bullet Camera with 2.8-12mm Lens
- Color video down to 0.011 lux at f/1.4 with AGC on
- EXIR 2.0 IR range up to 165'
- IR cut filter for day/night functionality
- 2.8-12mm motorized varifocal lens
- H.265+, H.265, H.264+, and H.264 video compression for efficient storage and bandwidth use
- Up to five defined and five custom streams
- Camera pivots from 0 to 360° horizontally and from 0 to 90° vertically
- 0 to 360° rotation
- 120 dB wide dynamic range
- Automatic gain control
- Backlight compensation
- 3D digital noise reduction
- Video analytics include line crossing detection, intrusion detection, unattended baggage detection, object removal, face detection, and scene change detection
- microSD card slot for edge storage supports up to 128GB (microSD card available separately)
- Region of interest (ROI)
- PoE+ technology for easy, clutter-free installation
- IP67-rated weather-resistant metal housing
- IK10-rated vandal resistance

- FCC, CE, and UL certified
- ONVIF Profiles S and G compliant

b) IP Dome CCTV Camera-indoor

- 8MP Varifocal Dome Network Camera
- Image chip size:1/1.8"
- Image chip type: Progressive Scan CMOS
- Image Compression : H.265,H.264,MJPEG
- Max. Resolution: 3840 X 2160
- Aspect ratio: 4:3
- Max. Images per second 25
- Megapixels: 8 MP
- Supplied with lens: Yes
- Lens Mount: Φ14
- Lens Focal Length: 2.8~12mm
- Viewing Angle: 108° - 45° Horizontal Field of View
- Min. low-light lux: 0.003
- Colour / monochrome-True Day/Night
- IR Range-Up to 40m
- Audio-Audio input/output (full duplex)
- Auto-Focus- Yes
- Indoor / Outdoor- Indoors or Outdoors
- Ingress Protection- IP66
- POE built-in-Yes
- POE Class- Class 3 (6.49-12.95W)
- Supply Volts- 12V DC or PoE
- Power Consumption- max. 12.9W
- PSU included- No
- ONVIF Compatible- Yes
- Warranty =3 Years

c) IP Dome CCTV Camera-outdoor

- 6MP Outdoor Network Dome Camera with Night Vision
- DarkFighter sensor
- Color images down to 0.011 lux at f/1.4 with AGC on
- EXIR 2.0 IR technology for night vision up to 100'
- IR cut filter for day and night vision
- H.265+, H.265, H.264+, and H.264 video compression for efficient storage and bandwidth use
- Camera pivots from 0 to 355° horizontally and from 0 to 75° vertically
- 0 to 355° rotation
- 120 dB wide dynamic range
- Automatic gain control
- Backlight compensation
- 3D digital noise reduction
- microSD card slot for edge storage supports up to 128GB (microSD card available separately)
- PoE technology for easy, clutter-free installation
- IP67 rated for outdoor use
- IK10-rated vandal resistance
- cSA, FCC, CE, and UL certified

d) Fisheye CCTV Camera

- 6mp Network Fisheye Camera
- H.265+ video compression, which assures savings in bandwidth and storage.

- Minimum Illumination: Color: 0.047lux @ (f/2.6, AGC on), B/W: 0.0047lux @ (f/2.6, AGC on), 0 lux with IR
- 3072 x 2048 Resolution @ 30 fp
- Lens: 1.27mm, f/2.6; horizontal field of view: 180° (wall mount), 360°(ceiling mount), 360°(table mo
- Main stream: H.265+/H.265/H.264+/H.264;
- Main Stream: 30 fps (3072 × 2048, 2048 × 2048, 1280 × 1280)
- 12 VDC and PoE (802.3af), 12 W
- IP network capable
- PoE capability
- Accessible edge storage with 64GB internal MicroSD card slot
- True day and night vision capability
- Tampering detection, Audio Detection, Motion detection and event triggered alarm processing
- Masking Capability,
- Vandal proof IK-10 rating housing
- Weather proof IP66 rating
- ONVIF Compliant

e) IP Box CCTV Camera

- 6 Mega Pixel Full HD IP box Camera
- imaging sensor – 1/2.8" minimum
- Wide Dynamic Range – 120dB
- Auto Iris lens
- Day and night vision; Minimum illumination 0.1lux (colour), 0lux (B/W) IR on
- Focal Length – 3~8mm
- IP network capable
- PoE capability
- H.264 video compression
- Accessible edge storage with 64GB internal MicroSD card slot
- True day and night vision capability
- Tampering detection, Face detection, Audio Detection, Motion detection and event triggered alarm processing
- Masking Capability,
- Vandal proof IK-10 rating housing
- Weather proof IP66 rating
- ONVIF Compliant

f) IP PTZ CCTV Camera

- 5 Mega Pixel Full HD IP Dome Camera with Infrared
- Built in Infrared 100 meters minimum
- imaging sensor – 1/2.8" minimum
- Wide Dynamic Range – 120dB
- Varifocal Auto Iris lens
- Minimum Adjustable digital zoom 16x, optical zoom 32x
- Day and night vision; Minimum illumination 0.1lux (colour), 0lux (B/W) IR on
- Focal Length – 4.5~130mm
- IP network capable
- PoE capability
- H.264 video compression
- Accessible edge storage with 64GB internal MicroSD card slot
- True day and night vision capability

- Tampering detection, Face detection, Audio Detection, Motion detection and event triggered alarm processing
- Masking Capability,
- Vandal proof IK-10 rating housing
- Weather proof IP66 rating
- Heater, Blower and Defog
- Auto tracking
- ONVIF Compliant

g) MOUNTING BRACKETS

The Brackets shall:
Be suitable for wall or ceiling mounting of a single camera. Be at least 5.5"length
Have an auto lock facility.

h) CAMERA HOUSING

The camera housing shall:
Be IP66 rated with integral cable management.
Be Weatherproof and constructed from aluminum with epoxy coating.

i) COLOR VIDEO MONITORS

The monitor should be capable of providing high levels of picture quality 10MHz bars visible at low brightness and reliability stable synchronization, black level clamping, low sensitivity and high stability.
The monitors shall be high performance color video monitors for monitoring scenes from the above cameras and viewing playback scenes from the video cassette recorders. The monitors shall be located at places to be shown on site by the project manager.
The monitor shall give stable and interference free pictures of scenes being viewed. It shall also conform to the following specifications:

Type : LED; 50,000hours panel life
System : NTSC/PAL
Screen size : 55”
Resolution : 1,920 x 1, 080
Display Colour : 16.0 million
Brightness : 350cd/m²
Contrast Ratio : 5,000:1
Video input signal : 1.0 V pk-pk
Power consumption : Not more than 80W
Power input : 240V 50HZ
Interface : VGA, DVI, HDMI, RGB, Audio, Video

j) NETWORK VIDEO RECORDER

The network video recorder shall have the following minimum requirements:

- 64 Channels
- Recording speeds of at least 400Mbps
- Gigabit Ethernet connection
- Multi screen Display: Full/4/9/16 way or as appropriate.
- 10 Hot swap HDDs each of 4TB minimum capacity
- external storage support capability
- VGA/HDMI local monitor
- Redundant hot swap power supply
- Network management/viewer software
- In built intelligent video analysis
- H.264,MPEG,MJPEG Compression

- ONVIF compatibility
- Web viewer supported
- PoE enabled
- Smart Video Search Feature for streamlined Investigations
- Recording resolution of 5MP
- IP address filtering, user access log, authentication and encryption
- Auto Launch of Video on specified Alarms/Events
- LED status indicator
- CE,UL certification

k) CCTV MANAGEMENT SOFTWARE

CCTV management software with the following minimum specifications:-

- Event Recording Scheme
- Operate Motion-Detector-Recording
- NTSC-PAL video recording.
- Be capable of recording real time images at full resolution and frames rate.
- Features for connection for alarm system Automatic Recycling
- Users' passwords.
- Input, Output, Audio Alert Facilities
- Remote Viewing Facilities, TCP/IP, INTERNET, ISDN, modem
- Capability of streaming into the client's existing LAN / WAN infrastructure
- Ability to quickly search through thousands of hours of recorded video information
- Event-triggered video recording to reduce storage requirements
- Masks out disturbing areas, or areas of no interest, within the specified region
- Identifies & immediately alerts user to potential security breaches
- Features should be able to be used at very low frame rates
- Easy calibration for specific applications
- Color-matching matches user-specified colour to the video image
- Functions in outside environments with changing light conditions:
- Auto-learning of background feature
- Object saliency and object Consistency mechanisms to filter out phantom objects
- "Out of Focus" condition is user-calibrated by level of focus
- Automatic self-test of camera validity
- Motion Trajectory Analyzer provides advanced analysis of the motion of objects
- Seamless integration into Enterprise security knowledge management solution.
- Analysis of stationary objects

l) UNINTERRUPTIBLE POWER SUPPLY (UPS)

This shall be an on-line Un-interruptible power supply with output rating able to provide power to the security surveillance system a minimum of 8 hours in case of power failure.
It shall be microprocessor- based so that both output voltage and frequency are closely regulated and continuously monitored and also provide system diagnostic and shut down protection functions. It shall feature a maintenance by-pass to enable normal routine maintenance operations to be performed without interruptions to the system.
It shall be fitted with both visual and audible alarms to indicate any change in equipment status such as: input power problems ups faults ups overload and battery discharging

Other parameters are:

Input supply:	240VAC50HZ
Power factor:	0.8 lag at full load
Current limit:	125% of the normal
Output voltage:	240V AC 50 HZ

Output voltage tolerance: 2%
Output frequency tolerance: 0.05%

m) CABLING

- All cables must pass through conduits or trunking.
- All cables and connectors shall be labeled.
- No distortion due to kinks, sharp bends or excessive hauling tension shall be allowed.
- Cables shall be run in a manner eliminating any possibility of strain on the cable itself or on the terminations.
- Cables shall have no joints or splices.
- Cables shall be kept at a minimum distance of 150mm from items liable to become hot or cold.
- Bending radii shall be not less than eight times the overall cable diameter.
- The manufacturers hauling tension shall not be exceeded.
- All cable ties and fixings shall be tightened to support the cable loom without distortion of the cable sheath.
- The STP 4 pair shall be of Cat 6A grade and exceed ANSI/TIA/EIA-568-Aj and ISO/IEC 11001standards. Cat 6A structured cabling shall be used throughout the entire installation.

CABLE FEATURES

- FUTP • Nominal jacket OD: 6.8mm (0.27 in.),
- 23 AWG 0.57mm (0.022 in.) solid (non-tinned) copper

STANDARDS COMPLIANCE

- ISO/IEC 11801-1 Ed.1.0

APPLICATIONS SUPPORT

- 10GBASE-T,
- 1000BASE-T,
- 100BASE-T,
- 10BASE-T,
- IEEE 802.3af (Type 1 PoE),
- IEEE 802.3at (Type 2 PoE),
- IEEE 802.3bt (Type 3 PoE) ,
- IEEE 802.3bt (Type 4 PoE),

PHYSICAL PROPERTIES

- Power over HDBaseT (PoH)
- Pulling Tension- (max) 110N (25 lbf) 110N (25 lbf)
- Bend Radius (min) 27mm
- Installation Temperature 0 to 60°C
- Storage Temperature -20 to 75°C

ELECTRICAL SPECIFICATIONS

- DC Resistance – <8.5Ω in 100m
- DC Resistance Unbalance - ≤4% (@ 20°C)
- PoE- PoE Type 1,2,3,4 and PoE

n) PATCH PANELS

- Shall conform to ANSI/TIA/EIA-568A and rack mounted.
- Shall be equipped with RJ45 contacts of Cat 6A sockets with capacity of 12, 24 or 48 ports.
- Shall be earthed.
- All patch cords shall be labeled at each extremity with PVC support and intelligible marking. For other components the label shall be of stiff plastic PVC type.

o) NETWORK CONTROL EQUIPMENT AT THE NETWORK CORE

The active control equipment at the core should have the following features:

- Backplane/switch fabric Bandwidth Capacity of 150 GBPS or more.
- IEEE 802.3 compliant for power over Ethernet
- IEEE 802.1 based security compliant
- SNMP compliant for security
- Layer 2/3/4 switch
- Should support Gigabit Ethernet to the desktop
- Should have at least 24-slots
- The core switches should have two links to each edge switch configured in active/active configuration. The links should deliver 2GBPS throughput when all ports are active.
- The core switch should have redundant power supply, redundant fan tray and redundant CPU/ supervisor engine installed
- Fiber cable linking stacks on each edge switch to the core should be connected to 1000Base X(GBIC) port on the core switch using star topology
- Should be installed with the latest version of system software at the time of delivery.
- Should support Quality of service for various applications.
- Active devices shall be rack mounted.
- Active devices used at the LAN edge must be stackable and shall attach to the backbone cabling at 1000mbps.
- Where more than one active device is required to satisfactorily serve the floor data outlet distribution requirements they shall be stacked using interface operating at the backbone speed.

p) LABELING

- Horizontal and backbone cables shall be labeled at each end. The cable or its label shall be marked with its identifier.
- A unique identifier shall be marked on each faceplate to identify it as connecting hardware.
- Each port on the face plate shall be labeled with its identifier.
- A unique identifier shall be marked on each piece of connecting hardware to identify it as a connecting hardware.
- Each port on the connecting hardware shall be labeled with its identifier.
- A unique identifier shall be marked on each **port** on the connecting faceplate to identify it as a connecting hardware.

q) NETWORK CABINET

- The cabinet shall be metallic with front clear glass and of good finish and conveniently accessible by technical personnel for maintenance. The main cabinet shall be at least 42U and other cabinets housing edge switch should be at least 9U
- Power to the cabinet shall be switched off from within the cabinets. Proper power socket cables to be supplied with the cabinet.
- The cabinet for active devices shall conform to ANSI/TIA/EIA-568A specifications with forced cooling.
- Support small factor pluggable (SFP) and industry leading density up to 240 of IEEE 8033 for 1000 Base-SX ports per system.
- Cabinets shall have adequate room for additional components typically 3U free space.

r) ETHERNET FLOOR EDGE SWITCHES

Active control equipment at the LAN Edge should have the following features

- Active control equipment at the LAN Edge should support 10/100/1000 MBPS on all ports (RJ45) and Gigabit to the desktop connectivity
- The equipment should have at least two 1000BaseXGigabit uplink ports for terminating backbone Fiber.
- The equipment should support layer 3 routing.
- Should support IEEE 802.1, SSH, SNMP.
- Switch Fabric forwarding Bandwidth of 64GBPS or more.
- More than 12,000MAC addresses should be available on each switch.
- The switches should have 8/12/24/48 ports of 10/100/1000 MBPS.
- Each stack on the edge will have two links of Fiber to the core switch, totaling two fiber terminations from the core switch to the stack.
- Should support Jumbo frames.
- Total stack throughput bandwidth of 64 GBPS or more.
- Active Edge switches should be quoted with a minimum of One year of warranty covering free replacement of parts and units.
- The switches to be PoE plus

s) OPTICAL FIBRE CABLE

The fibre cable must be 8 core single mode fibre with the following specifications:-

- Cable size: 8 cores.
- Termination: SC Duplex connectors.
- Graded Index: Nominal 62.5/125 micron

t) FIBER PATCH PANELS

All Backbone Fiber links should be terminated on Fiber Patch Panels. Connector interfaces should support ST, Sc simplex, Sc duplex, FC, LC or MT-RJ.

u) BACK BONE

Backbone cabling inclusive of switches and all necessary accessories shall be carried out in readiness for the termination of edge switches. The Backbone cabling shall be flexible and allow for easy 'add ons' for future expansions. Hence enough capacity shall be allowed for future expansion. It shall be done using the star topology.

v) COLOR VIDEO MONITORS

The monitor should be capable of providing high levels of picture quality 10MHz bars visible at low brightness and reliability stable synchronization, black level clamping, low sensitivity and high stability.

The monitors shall be high performance color video monitors for monitoring scenes from the above cameras and viewing playback scenes from the video cassette recorders.
The monitors shall be located at places to be shown on site by the project manager.

The monitor shall give stable and interference free pictures of scenes being viewed. It shall also conform to the following specifications:

- Type: LED; 50,000hours panel life System: NTSC/PAL
- Screen Size: 50"
- Resolution: minimum 1,920 x 1, 080, UHD Display Colour: 16.0 million
- Brightness: 350cd/m2 Contrast Ratio: 5,000:1
- Video input signal: 1.0 V pk-pk
- Power consumption: Not more than 80W Power input: 240V, 50HZ
- Interfaces: VGA, DVI, HDMI x 3, USB x2, Audio, Video.

w) NETWORK VIDEO RECORDER

The network video recorder shall have the following minimum requirements:

- 64 Channels or as specified in the BoQ
- Throughput of at least 320Mbps
- Gigabit Ethernet connection
- Multi-screen Display: Full/2/4 way or as appropriate.
- Storage of 32TB minimum capacity
- HDD hot swap with RAID0, RAID1, RAID5, RAID6 and RAID10 storage scheme configurable
- external storage support capability
- VGA/HDMI local monitor
- Network management/viewer software
- In built intelligent video analysis
- H.265+,H.264, MPEG4 Compression
- ONVIF compatibility
- Web viewer supported
- PoE enabled
- Smart Video Search Feature for efficiency
- Recording resolution of 5MP
- IP address filtering, user access log, authentication and encryption
- Auto Launch of Video on specified Alarms/Events
- LED status indicator
- CE,UL certification

x) VIDEO WALL CONTROLLER

The video wall controller shall have the following minimum requirements:

- 1 × HDMI 4K input, 4 × HDMI outputs
- 4 device cascading, controlling up to 16-display video wall
- Accurate to 0.1° rotation for a single display
- 1 × RJ45 10M/100M/1000Mbps Ethernet interface
- Pix SYNC technology for synchronized image
- Bezel compensation technology for continuous image
- Video input Resolution: 3840 × 2160P60, 3840 × 2160P30, 3840 × 2160P25, 3840 × 2160P24, wuxgaP60(1920 ×1200), 1920 × 1080P60, 1920 × 1080P50, uxgaP60(1600 × 1200), wsxgaP60 (1680 × 1050), sxgaP60 (1280 × 1024)
- Serial interface: RS232, RS485
- 1x Audio output interface