



## Section 2-22

### SURVEILLANCE SYSTEM

#### CLOSED CIRCUIT TELEVISION SYSTEM (CCTV)

##### 1.0.0 General Requirements

The intent of this specification is to define the functional and design requirements for the IP-based CCTV System used for video surveillance at the VRFB plant area / Switchyard / buildings / switchgear rooms / control rooms. The system shall support high-resolution video capture, recording, night vision capability, motion detection, and secure remote monitoring.

The Contractor's scope includes complete design, supply, installation, testing, commissioning, and demonstration of all functional requirements specified herein.

All equipment shall perform satisfactorily under the specified variations in voltage and frequency. Components of identical type and rating shall be interchangeable.

Contractor's scope shall Ensure that all CCTV cameras Purchased/supplied are compliant with the Ministry of Electronics and Information Technology (MeitY) Circular No. W-18/26/2025-IPHW dated 04.02.2026. The equipment must strictly adhere to the Essential Requirements (ER) for cybersecurity as specified by the STQC (Standardization).

Contractor's Scope shall provide a valid STQC Certificate and a Cybersecurity Test Report from an approved Indian lab. This report must prove the camera has no backdoors or hidden ways for unauthorized remote access.

The number and location of camera units, servers, network switches, PoE switches, wireless equipment, and related components shall be finalized during detailed engineering to achieve the required functional coverage.

Any additional equipment, software, or accessories required for safe, reliable operation, control, monitoring, testing, and maintenance shall be included within the bidder's quoted lump-sum price.



All equipment furnished shall comply with the latest applicable international standards. Camera certification shall be CE / FCC / UL or equivalent.

A 10-year comprehensive warranty shall be provided for the complete CCTV system.

## **2.0.0 CODES AND STANDARDS**

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable.

IEC 62676-3:2013	Video surveillance systems for use in security applications-IP interoperability implementation based on Web services
IEC 62676-2-2	Video surveillance systems for use in security applications-IP interoperability implementation based on HTTP and REST services
IEC 61000-4	Electromagnetic compatibility EMC –Testing and measurement techniques-Radiated, radio frequency, electromagnetic field immunity test
ISO /IEC 30137-1	Information technology- Use of Biometric in Video surveillance system specification
IS: 13947	Degree of Protection provided by enclosure for Low voltage appliances
IEC 60079	Electrical apparatus for explosive gas atmospheres
EN 55022	Information technology equipment, ITE for the radio disturbance characteristics for electromagnetic compatibility compliance
EN 55024	Immunity test requirements for information technology equipment in relation to continuous and transient conducted and radiated disturbances
IEC 60950	Information technology equipment – Safety
IEEE-802.3z	Standard for Gigabit Ethernet
ITU-T G.652 D	Characteristics of a single-mode optical fiber and cable
BS-5308 PART I	Specification for Polyethylene insulated cables



BS EN 50290-2	Specific requirements for Crosslinked Polyethylene (XLPE) compounds to be used for the insulation of instrumentation, control, and field bus cables.
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Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE, NEMA etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards along with copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

### **3.0.0 SCOPE OF WORK**

3.1.0 The system shall include Dome, Bullet, and PTZ cameras located at:

- VRFB plant area (containers, stacks, tanks, PCS, transformers, local switchgear rooms)
- SCADA control room
- Switchgear areas

Note: Above locations are tentative and may varied based on requirement and shall be finalized during detailing.

3.2.0 All required Recorders, Servers, Network switches (PoE), Storage systems, Consoles and panels Cables (CAT6A/ Fiber), Software, Mounting hardware, etc., shall be supplied to integrate the CCTV system up to the main control room.

3.3.0 The scope of services shall include the following:

- Unloading and storage
- Erection, testing, commissioning
- Preparation and submission of drawings and documents
- Quality plan submission and approval
- Coordination with other contractors/vendors
- Participation in technical review meetings

### **4.0.0 Principal Element, System Design and Technical Specification of CCTV**

4.1.0 The principal elements of a CCTV system are:

- IP Cameras (Fixed and PTZ)



- Mounts and protective housings
- Network cabling (CAT6A/Fiber)
- PoE switches
- UPS power supply
- Network video recorders (NVR) / Video servers
- Operator workstations and monitors
- Video Management Software (VMS)

4.2.0 The CCTV system shall be powered by a 230 VAC UPS supply. The UPS power supply shall be fed from the main plant UPS.

4.3.0 All outdoor cameras and enclosures shall be suitable for high humidity, dust, and elevated temperature environments.

4.4.0 It is the Bidder's responsibility to determine and select the correct material / protection specified for the environmental and service conditions involved.

4.5.0 The CCTV system shall be an integrated system with IP network centric functional and management architecture aimed at providing high-speed manual/automatic operation for best performance, with high reliability and availability.

4.6.0 The CCTV system shall be an IP-based, network-centric system supporting:

- Live viewing and playback
- Remote monitoring
- User authentication
- Camera control
- Event recording and alarms

4.7.0 The system shall support:

- H.265 / H.265+ compression or better
- 25 FPS recording capability
- Minimum 30 days retention
- Configurable frame rate and resolution



- Watermarking and tamper-proof recording
- Triplex operation (live, record, playback)
- Export of recordings in standard formats playable on Windows systems

4.8.0 The bidder shall provide sufficient storage for 30-day retention and an additional storage solution for 1-year backup archiving.

4.9.0 All equipment shall comply with IEC 61000 series (ESD, EFT, dips, magnetic fields, conducted/radiated immunity).

4.10.0 Colour IP Camera

General Requirements :

- Continuous recording for all cameras
- 30-day minimum storage
- One-year backup through archiving storage
- Monitoring through Main Control Room workstations

4.11.0 PTZ Cameras (IP66 or better) Specifications

- 1/3" Progressive Scan CMOS sensor
- Full HD (1920×1080) or higher resolution
- Min illumination: Color  $\leq 0.05$  lux; B/W  $\leq 0.005$  lux
- 25–30 FPS
- H.265 / H.265+ compression
- 25× optical zoom or better
- 360° continuous pan,  $-15^\circ$  to  $+90^\circ$  tilt
- Pan speed: up to 300°/s, Tilt speed: up to 200°/s
- 128 preset positions
- IR distance  $\geq 150$  m
- IP66 ingress protection
- IK10 vandal resistance for outdoor models
- PoE+ (IEEE 802.3at) or 24VAC input
- Onboard SD/TF storage



## Housing

- Aluminum weatherproof housing
- IP66 minimum
- Sunshield
- Wiper (where required)

### 4.12.0 Fixed Dome/Bullet Cameras

- 4MP Progressive Scan CMOS
- Min illumination  $\leq 0.05$  lux
- Dual stream (H.265/H.264)
- Resolution: 1920×1080 or 2688×1520
- 25 FPS
- PoE (IEEE 802.3af)
- IP66/IP67 enclosure
- Operating temperature:  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$
- ONVIF Profile S/G/T compliant

### 4.13.0 Servers & Workstations

#### Video Server/NVR:

- Manage live/recorded video
- Receive camera control commands
- Provide video analytics (motion, intrusion, line crossing)
- Export recordings in MP4/MKV/AVI format
- Support RAID-5/6 storage

#### Server Requirements:

- Non-proprietary hardware
- Redundant power supply
- NTP time synchronization



#### 4.14.0 Operator Workstations

- Intel Xeon / Core i7 or better
- 16 GB RAM minimum
- 1 TB SSD + 4 TB HDD
- Dual monitor support (27" LED, 1080p or higher)
- Windows 11 / Windows Server 2022
- USB/HDMI/DisplayPort interfaces
- Licensed anti-virus and office tools

#### 4.15.0 Camera Mounting

Mounting brackets/poles shall:

- Provide clear, unobstructed views
- Allow easy maintenance access
- Be rigid and corrosion-resistant

#### 4.16.0 Camera Enclosures

All outdoor enclosures shall be:

- IP66 or better
- With sunshield, heater, blower
- With cable glands and adjustable mounting plates

#### 4.17.0 Network Switches

- Layer-2/Layer-3 managed PoE switches
- PoE/PoE+ ports for all cameras
- Uplink via fiber where applicable
- CAT6A copper / Fiber cabling

#### 4.18.0 Software Features (VMS)

- Multi-screen display
- PTZ control
- User access hierarchy
- Event logs
- Scheduled/continuous/manual recording modes



- Browser and mobile app access
- Backup and export capabilities
- Health monitoring reports

#### 4.19.0 PTZ Keyboards

- Joystick controller
- Preset selection and tour programming
- Adjustable baud rates

#### 4.20.0 Miscellaneous Items

All required cables, connectors, panels, racks, conduits, and accessories shall be supplied.

#### 4.21.0 Spares, Tools & Tackles

- Mandatory spares
- Special tools and testing equipment included

#### 4.22.0 Packing

All equipment shall be packaged to prevent transit damage and moisture ingress.

### **5.0.0 DRAWINGS, DATA AND MANUAL**

#### **5.1.0 To be submitted along with Bid:**

- Technical offer
- Technical schedules duly filled up and stamped and signed on all the sheets.
- Catalogs /drawings leaflets for major items.

#### **5.2.0 To be submitted after award of Contract:**

- Architecture diagram for CCTV monitoring System
- Technical data sheet of all items covered under BOQ
- Layout for CCTV monitoring System
- Bill of Material
- Power Distribution Diagram for the entire system
- GA drawing



- Mounting Arrangement drawing of all items
- Cable routing layout
- Test procedures
- Functional/Operational Write up
- Manufacturing quality plan
- Field quality plan
- Test Certificates
- Installation manual
- O&M manual

All engineering documents shall be submitted in AutoCAD and PDF formats.

#### **6.0.0 TRAINING**

The Bidder will be responsible for providing training to the Owner's personnel on the offered systems at site. This shall include training operators in the use, operation, and maintenance of the equipment to ensure that the Owner's personnel are capable of independently maintaining the systems.