three (3) Engineers in each team, shall have to conduct Technical Orientation and Quality Test Witness at the Contractor/Manufacturer's factory premises.

The cost of travelling inside Bangladesh, to place of Technical Orientation and Quality Test Witness and Hotel Accommodation, local transport, fooding etc. will be borne by the Contractor.

The period for this purpose is is more or less 5 (five) days (Excluding Journey time). All the cost of this purpose shall be deemed is included in the offered price.

7.8.1.7 Factory Acceptance Test - Details

The Contractor shall provide, on the first meeting in the Testing Laboratory, before the beginning of the FAT, one (1) hard copy for each Employer's representative and one (1) hard copy for Consultant's representative, of the following documentation:

- Final, Detailed Plan & Program of FAT
- Laboratory QC/QA Procedures
- Testing procedures for each of respective test
- Testing criteria
- List of testing / measuring equipment, meters, etc
- Valid Calibration Certificates, issued by competent authority, for all testing / measuring equipment, meters, etc
- Approved Technical Data Sheets
- Approved Drawings
- Final Drawings, with all details
- Routine Test Protocols, for all equipment, if available
- Empty, approved FAT Report, including Criteria

The Contractor shall be noted of the following:

- Before the test beginning, all equipment shall be presented
- The Employer's representative will select equipment to be tested
- If the calibration seal / certificate of the testing / measuring equipment, meters etc. are not found, or the calibration was not done within the due date, then WZPDCL's Engineering Inspection team will not witness the test
- Working time are only working days, from 9:00 to 17:00
- Testing shall be conducted on English language. During the complete testing, person fluent in English shall be present with the Employer's representatives.
- Testing can be conducted only in decent conditions. Temperature in the Laboratory shall be at least 18°C and not more than 28°C
- Room for inspectors, for the Employer's & Consultant's representatives, shall be provided. Non-restricted Internet access shall be provided
- Where the Contractor provides for tests on the premises of the Contractor or of any other Manufacturer of the Contractor, shall provide, free of charge, such assistance, labour, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently.

Those tests shall be performed as per relevant IEC Standard or equivalent IEEE standard or equivalent BS standard. Only routine tests, as agreed upon, will be performed, if not otherwise specified in Bidding documents.

The Tenderer/Manufacturer shall submit the valid Calibration Certificate from competent authority of the testing/ measuring equipment's, meters etc. used for Factory test with the tender. The Supplier/Manufacturer shall also submit the following documents along with the request letter for Pre-delivery inspection:

Updated valid Calibration Certificates of the testing/ measuring equipment's, meters etc. used for Factory test.
II. The factory test report (Routine test report) of each transformer to be supplied under the contract.

The Contractor shall, after consulting the Employer, give the Employer reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the Employer shall attend at the place so named on date, which the Contractor has stated in his notice, the Contractor may proceed with the tests, which shall be deemed to have been made in the Employer's presence, and shall forth with forward to the Employer duly certified copies of test readings.

When the Employer intends to attend the test he shall promptly inform the Contractor accordingly in writing, so that he can take action. The Employer shall give the Contractor timely notice in writing of his intention to attend the test.

Where the Contractor provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These tests shall be performed as per relevant IEC/BS Standard or equivalent and only routine tests as agreed upon, will be performed.

As and when the Employer is satisfied that any materials/equipment shall have passes the tests referred to in this clause, Employer shall notify the contractor in writing to that effect.

Should any inspected/tested goods fail to conform to the specification, the Employer shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Employer.

In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Employer.

7.8.1.8 Conformity

As and when the Employer is satisfied that any materials/equipment shall have passes the tests referred to in this clause, Employer shall notify the Contractor in writing to that effect.

7.8.1.9 Non-Conformity

Should any inspected/tested goods fail to conform to the specification, the Employer shall have the right to reject any of the item or complete batch if necessary. In that case Contractor must replace the Equipment and to make good of them without any financial involvement to the Employer.

In case any of the Equipment found not conforming with the specification, at the time of post landing Inspection, the Contractor will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the Contractor from any warranty or other obligations under the contract.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written

instruction have been received by the Employer.

7.8.1.10 Auxiliary Station Transformers

The Employer has the right to inspect, examine and test the materials to confirm the conformity to the specification at all reasonable time, before and during manufacture at the Manufacturer's premises.

The Manufacturer shall allow WZPDCL Engineering inspection team to inspect the manufacturing process and quality control and progress of the work, at any time need, by WZPDCL's inspection team.

The Employer may request for the purchase / import / shipping documents of copper, oil and transformer core material, and check in accordance with Guaranteed Technical Particulars (GTP).

Factory Acceptance Test shall be done in accordance with the relevant IEC standard. The below mentioned tests (not limited to) shall be carried out as per latest version of IEC Standard, unless otherwise mentioned in Bidding documents:

- Visual inspection
- Name plates & drawings & labels
- Measurement of turn ratio test
- Vector group test
- Measurement of winding resistance
- Measurement of insulation resistance
- Measurement of no load loss & no-load current
- Measurement of impedance voltage & load loss
- Power Frequency withstand voltage test
- Dielectric Test on transformer oil
- Temperature rise test
- Checking of creepage distance of HT/LT bushings
- Checking of dimensions of the tank, conservator, radiators, etc
- Hot Dip galvanization test, as per BS-129/EN ISO 1461:2009 standards, of all metallic parts, tank, conservator, radiators, etc, including bolts & nuts
- Induced Voltage withstand test
- Leakage Test.
- Documentation verification

The Manufacturer must have all required testing facilities at the Manufacturer 's premises, to carry out the all tests, in accordance with the relevant IEC / BS / ANSI Standards.

If, any test or tests are pending due to lack of testing facilities at the Manufacturer's premises, then, the WZPDCL Engineering inspection team can select transformer(s), as sample(s), and send the selected sample transformer(s) to an independent testing laboratory to carry out the test(s). All cost of testing of transformers including testing itself, insurance, carrying, loading, un-loading etc. will be borne by the Contractor.

7.8.1.11 33 kV GIS Switchgear

Factory Acceptance Test shall be done in accordance with the relevant IEC standard. The below mentioned tests (not limited to) shall be carried out as per latest version of IEC Standard, unless otherwise mentioned in Bidding documents:

- Visual inspection
- Name plates & labels
- Signal lamps, indicators, selector switches, counters, etc
- Mimic diagram, position indicators
- Control & signalization
- Measurement of the contact resistance

- Measurement of paint thickness
- Dielectric test (including partial discharge testing) on the main circuit and auxiliary circuit.
- Insulation Resistance Test
- Tests on auxiliary and control circuits
- Measurement of the resistance of the main circuit
- Vacuum integrity Test
- Design and visual (physical) checks
- Electrical and mechanical operation test
- Tightness Test
- Gas pressure leakage test
- Functional test
- Tools for operation & testing & maintenance
- Functional tests on Protection relays
- Functionality and accuracy test on Energy meters.
- Power frequency withstand test on primary side for CT and PT
- Accuracy and polarity test on CT and PT
- Winding resistance test for CT and PT
- Insulation resistance test for CT
- Knee point voltage test for CT
- Documentation verification

7.8.1.12 33 kV PCM

- Visual inspection
- Name plates & labels
- Signal lamps, indicators, selector switches, counters, etc
- Mimic diagram, position indicators
- Control & signalization
- Measurement of paint thickness
- Dielectric test on the main circuit and auxiliary circuit.
- Insulation resistance tests.
- Functional tests on Protection relays
- Functionality and accuracy test on Energy meters.
- Test on auxiliary and control circuits
- Tightness test
- Documentation Verification.

7.8.1.13 33 kV UG Cable

Factory Acceptance Test shall be done in accordance with the relevant IEC standard. The below mentioned tests (not limited to) shall be carried out as per latest version of IEC Standard, unless otherwise mentioned in Bidding documents:

- Measurement of Electrical Resistance of conducts.
- High voltage test
- Partial discharge test
- Capacitance test
- Verification of physical dimensions
- Hot set test
- Tensile strength and elongation test
- Document verification

7.8.1.14 33 kV Circuit Breaker (Outdoor)

Factory Acceptance Test shall be done in accordance with the relevant IEC standard. The below mentioned tests (not limited to) shall be carried out as per latest version of IEC Standard, unless otherwise mentioned in Bidding documents:

- Visual inspection, Design and visual (physical) checks
- Name plates & labels
- Signal lamps, indicators, selector & limit switches, counters, etc
- Position indicators
- Control & signalization
- Measurement of the contact resistance
- Measurement of paint thickness
- Dielectric test on the main circuit and auxiliary circuit.
- Insulation Resistance Test
- Tests on auxiliary and control circuits
- Measurement of the resistance of the main circuit
- Vacuum integrity Test
- Design and visual (physical) checks
- Electrical and mechanical operation test
- Functional test
- Tools for operation & testing & maintenance
- Earthing & Ground Continuity Test
- Measurement of creepage distance
- Documentation verification

7.8.1.15 33 kV Disconnectors (All Types)

- Visual inspection, Design and visual (physical) checks
- Name plates & labels
- Contact resistance measurement.
- Dielectric withstand test
- Mechanical and electrical operation test
- Test on auxiliary circuit
- Measurement of creepage distance of isolator insulators
- Documentation verification.

7.8.1.16 33 kV Current and Potential Transformers (Outdoor Type)

- Visual inspection, Design and visual (physical) checks
- Name plates & labels
- Power frequency withstand test on primary side (CT and PT)
- Accuracy and polarity test (CT and PT)
- Winding resistance test (CT and PT)
- Insulation resistance test for CT
- Knee point voltage test for CT
- Measurement of creepage distance of bushing (CT and PT).
- Documentation verification.

7.8.1.17 33 kV Lightning Arrester (LA)

Factory Acceptance Test shall be done in accordance with the relevant IEC standard. The below mentioned tests (not limited to) shall be carried out as per latest version of IEC Standard, unless otherwise mentioned in Bidding documents:

- Visual inspection, Design and visual (physical) checks
- Name plates & labels

- Insulation Resistance Test
- Leakage Test
- Residual voltage test
- Internal Partial discharge test
- Reference voltage test
- Measurement of creepage distance
- Documentation verification

7.8.1.18 Battery, Battery Charger, AC / DC Distribution Panels

The **Employer** shall have the right to inspect / test the goods / materials (**Battery and Battery Charger, DC Distribution panels and AC distribution Panels,**) to confirm their conformity to the specification.

Factory Acceptance Test shall be done in accordance with the relevant IEC standard. The below mentioned tests (not limited to) shall be carried out as per latest version of IEC Standard, unless otherwise mentioned in Bidding documents:

- Visual inspection, Design and visual (physical) checks
- Name plates & drawings & labels
- Insulation resistance
- Functional test
- Rated current test
- Over-current capability test
- Documentation verification

7.8.1.19 Substation Automation System (SAS)

Factory Acceptance Test shall be done in accordance with the relevant IEC standard. The below mentioned tests (not limited to) shall be carried out as per latest version of IEC Standard, unless otherwise mentioned in Bidding documents:

- Visual inspection, name plates & labels, control & signalization
- Device ID and configuration
- Routine tests
- Power-On Test
- Redundancy test
- Communication Configuration Test
- Sampled Value (SV) Test
- HMI & SCADA Interface Test
- Time Synchronization Test
- Functional Logic Test
- Cyber security Check
- Tests on auxiliary and control circuits
- Wiring continuity test
- Functional test
- Interlockings
- Controls
- Indications
- Signalization
- Alarms
- Earthing
- Functional simulation
- Documentation verification

The manufacturing phase of the SAS shall be concluded by the FAT. The purpose is to ensure that the

Contractor has interpreted the specified requirements correctly and that the FAT involves verifications to the degree required by the Employer/Engineer.

All (100% of the subject units, not only sampling) shall be subject to factory routine testing. The relevant routine test reports for each specific unit shall be submitted before any delivery.
The general philosophy shall be to deliver an SAS to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab.

The FAT shall be done for 10% of the subject panels/equipment (minimum two complete substations). If the FAT comprises only a certain portion of the system for practical reasons, it has to be assured that this test configuration contains at least one unit of each and every type of equipment incorporated in the delivered system.

If some parts of the SAS are already installed on site, the FAT shall be limited to subsystem tests. In such a case, the complete system test shall be performed on site together with the site acceptance test (SAT).

High temperature operation tests shall be performed at the maximum ambient temperature.

During FAT, the complete substation control system (e.g., substation level equipment while communicating with all bay level equipment) shall be tested. The FAT shall be performed to verify the performance of the system. The test shall apply to all aspects of the system, including communication to other systems, all Inputs/Outputs and the complete processing of all events, alarms, measuring and other information.

The Factory Acceptance Tests shall commence by switching on power to all equipment, bootstrapping and loading the software system for each computer terminal, verifying that each step is properly described in the operating instruction manual. The substation control system shall be tested with all software loaded and running.

The test shall include:

- Checks of proper functioning of all hardware, software and firmware by a thorough exercise of all system functions.
- Verification of compliance with operating speed requirements.
- Verification that orderly computer system shutdown procedures are initiated following an interruption of the DC supply.
- Verification that system performance is not affected by DC power source abnormalities involving voltage variations (+10%; −20%).
- Demonstration of all required performances.

This demonstration shall include verification of functional requirements and verify that programs are (not unduly) interdependent, and furthermore that incorrect manipulation via HMI is properly identified and causes no system lockups:

- Test of all discrete input points.
- Test of all control outputs.
- Test on bay interlock units.
- Test on assembled interlocking system.
- Check of analogue measurements accuracy.
- Test of SOE buffering, retrieval, and local logging.
- Demonstration of techniques and methods for modifying the database, including point additions and deletions.
- Demonstration of techniques for changing a communications port to use another protocol.
- Test of communication within protection monitoring system, and dialogue with distributed protection demonstration.

Test of communication towards and from the higher-level control centers based on verification of

correctness of the exchanged data traffic between the SAS and the control centers under application of suitable test equipment (e.g., test program for monitoring and exchange of IEC101 and/or IEC104 telegrams and frames).

7.8.2 Post Landing Inspection

Post landing inspection shall be done immediately after arrival of the equipment / goods /materials at the designated store of WZPDCL / project office / site. The quality witness team along with the engineers shall conduct Post Landing Inspection in presence of the Contractor.

The inspection team shall conduct the following test:

- Design and visual (physical) inspection and quantity checks
- Conformance with approved drawings with respect to dimensions and type, where possible.

Complete documentation must be available at each site office

If necessary, the inspection team may select randomly at least one item from each lot and carryout the test(s) in BUET/RUET/KUET/CUET at the cost of contractor in following manner.

The contractor may include the related costs with the equipment.

- Routine test (Tests which are available in Bangladesh)
- Special tests.

The program of such inspection shall be intimated to the Contractor by WZPDCL upon arrival of the materials at WZPDCL store / project office / site.

The contractor shall arrange the program of post-landing inspection. Any defect or damage have been found at post-delivery inspection, the defective or damaged equipment / goods / panels / materials, to be replaced by the Contractor at Contractor's own cost.

The equipment / goods / materials shall be under the custody of the Contractor for future use, installation, testing & commissioning. Contractor shall be responsible for the transport, insurance, loading / unloading, storage, safety and security of the equipment.

7.8.3 Third-Party Inspection

In the event that WZPDCL's nominated Engineering Inspection Team is unable to attend any scheduled Post Landing Inspection (PLI), Factory Acceptance Test (FAT), Quality Acceptance Test (QAT), or witnessing of any inspection/test due to unavoidable circumstances, WZPDCL may, with the prior written approval of the Project Director, require such inspection and/or test to be carried out or witnessed by an independent Third-Party Inspection Agency approved by WZPDCL.

The appointment of a Third-Party Inspection Agency shall not relieve the Contractor/Supplier or Manufacturer of any obligations, responsibilities, warranties, or liabilities under the Contract.

The Third-Party Inspection Agency shall be independent of the Contractor/Supplier and Manufacturer and shall not have been directly involved in the design, procurement, manufacture, fabrication, construction, installation, or commissioning of the Plant and Equipment being inspected.The Contractor/Supplier shall provide all necessary assistance, facilities, documents, and access required for conducting the inspection. The cost of Third-Party Inspection, where such inspection arises due to the Contractor's contractual inspection obligations or failure to facilitate the scheduled inspection, shall be borne by the Contractor/Supplier.

The Third-Party Inspection Agency shall submit a comprehensive inspection report directly to WZPDCL. The report shall include, but not be limited to, inspection findings, test results, observations, photographs, and video records showing the date and time of inspection/testing, where required by WZPDCL.

Subject to prior approval of WZPDCL, internationally recognized Third-Party Inspection Agencies may include:
1. Bureau Veritas;
2. SGS;
3. TÜV SÜD;
4. Intertek;
5. Lloyd's or other internationally recognized inspection organizations; and
6. Any other Third-Party Inspection Agency approved by WZPDCL.

WZPDCL reserves the right to approve, reject, revise, or supplement the list of acceptable Third-Party Inspection Agencies.

SECTION 7.9

TECHNICAL SPECIFICATIONS FOR CCTV SYSTEM

Table of Contents

7.9 TECHNICAL SPECIFICATIONS FOR CCTV SYSTEM 210

7.9.1 General 210

7.9.2 12-Channel Stand Alone Network video recorder (NVR) Specifications 210

7.9.2.1 The NVR shall comply with the following parameters:- 213

7.9.3 Camera Performance Requirements 214

7.9.3.1 Accessories 214

7.9.3.2 Warranty 214

7.9.4 LED Colour Monitor Specifications 214

7.9.5 Video Cable Specifications 215

7.9.6 Patch Cord (When Necessary) 216

7.9.7 RJ45 Connectors 216

7.9.8 Installation Requirements 216

7.9.9 Outdoor Installations 216

7.9.10 PVC Conduit Specifications 217

7.9 TECHNICAL SPECIFICATIONS FOR CCTV SYSTEM

7.9.1 General

The work under this system shall consist of designing, supply, installation, testing, training & handing over of all materials, equipment, appliances and labour necessary to Commission the said system, complete with fixed Dome cameras, outdoor fixed mount cameras, Monitors and Network video recorder (NVR).

It shall also include laying of cables necessary for installation of the system as indicated in the specifications and Bill of Quantities. Any openings/chasing in the wall/ceiling required for the installation shall be made good in appropriate manner.
In the bid, the Vendor shall also submit detailed catalogues, data sheets etc., for each of the Products quoted.

The Bidder necessarily shall submit in the technical bid their detailed point-by-point compliance/deviation to this tender document.
The Bidder shall submit copy of certification of all equipment i.e. UL / CE / FCC.
The Tenderer shall submit document of authorization from Manufacturer to Bangladesh Dealer and/or Bangladesh Dealer to the Bidder.

The bidder shall provide authorization from the manufacturer for providing test reports complying the specifications at the time of inspection
Provide authorization from the manufacturer that the items quoted by the tenderer are in production and would be serviceable for at least 3 years from the date of tender. No obsolete products should be quoted.

Letter from manufacturer for supporting the system for at least 3 years, for this an MOU between the manufacturer and Tenderer should clearly state support for products and systems for next 3 years.
The system shall be so set that it provides minimum 45 days recording for the cameras installed in the substations.

7.9.2 12-Channel Stand Alone Network video recorder (NVR) Specifications

1. The NVR shall be a digital image recording device with the functionality of 12 cameras video inputs.
2. The Network video recorder (NVR) shall be fully multitasking - capable of simultaneously recording whilst playing back.
3. The Network video recorder (NVR) shall incorporate 3 internal hard disk drives of 1 TB capacity each.
4. The Network video recorder (NVR) shall have an integral CD/DVD-Writer for archiving purposes.
5. The Network video recorder (NVR) should have mouse or keyboard control options through USB ports.
6. The Network video recorder (NVR) shall operate on an embedded Linux Operating System.
7. The Network video recorder (NVR) shall auto-detect connected cameras and be configured to record at the touch of a button. PTZ cameras must be configured manually.

8. The Network video recorder shall have software-controlled contrast and brightness adjustment settings for each camera.
9. The Network video recorder (NVR) shall have Automatic and Static Gain Control settings for each camera.

10. The firmware of the Network video recorder (NVR) shall be upgradeable remotely across a computer network and through USB port.
11. Operation of the Network video recorder (NVR) shall be from the front panel or via an infrared remote control.

12. The Network video recorder (NVR) shall have an easy to follow, logical menu system.
13. The Network video recorder (NVR) shall have the option to change the menus to different languages.
14. The Network video recorder (NVR) shall feature dual monitor outputs: a primary or main monitor output and a secondary or spot monitor output. The primary monitor output screen must have connections for HDMI port of monitors, any of which can be used simultaneously. The main monitor shall be able to provide any camera full screen, sequencing full screen, and 4, 6, 9, 12 ways multi-screen displays whilst full frame recording is taking place. The main monitor shall display a true live picture without digitization, on full screen or any of the multi-screens, up to and including 16-way camera displays. An on-screen coloured indicator shall show whether all individual cameras are recording.
15. The Network video recorder (NVR) shall provide a digital freeze frame and x2 digital zoom in full screen live and playback modes, including the ability to move around a zoomed image.
16. The Network video recorder (NVR) shall be capable of displaying user definable cameras in any of the multi-screen modes available. When sequencing, the Network video recorder (NVR) shall have the option to display specified multi-screen display as per the operator's requirements so that specific cameras can be programmed to remain on view even though other cameras around it may be sequencing.
17. The Network video recorder (NVR) shall have the option to remove cameras from normal viewing on the monitor, so that they are recorded but not viewed.
18. The Network video recorder (NVR) shall record the camera video signals as a full screen image from each of the cameras.
19. The Network video recorder (NVR) shall have the ability to alert the operator via an on-board buzzer should there be an error whilst writing images to hard disk.
20. Connected cameras shall be able to be removed from the recording sequence without affecting the ability to display that camera on the main or spot monitor.
21. The Network video recorder (NVR) shall provide a user-programmable character title for each camera and shall record time, date and title with each video image.
22. The Network video recorder (NVR) shall be capable of playing back one camera full screen.
23. The Network video recorder (NVR) shall have the ability to go to a particular time and date.
24. The Network video recorder (NVR) shall be able to playback, pause, frame advance / rewind and multi speed fast forward or rewind either using front panel buttons, IR remote control or mouse or keyboard.
25. The Network video recorder (NVR) shall have a History log feature displaying system events. This shall include power failures & recovery, menu access, network access (including user name), motion detection, sensor activation and video loss.
26. The Network video recorder (NVR) shall have a pre-set menu option which will determine whether the internal HDD will overwrite or stop recording once full. The current status of the HDD space remaining will be displayed on a status bar on the main monitor.
27. The Network video recorder (NVR) shall apply a digital signature to recordings contained on the internal hard disks, without affecting performance.
28. The Network video recorder (NVR) shall be able to provide a relay trigger on video loss, motion detection and sensor activation.

29. The Network video recorder (NVR) shall have the ability to sound a buzzer on alarm, motion detection, video loss, disk full or writing to HDD error.
30. The Network video recorder (NVR) shall be able to switch to a full screen image on both the main and / or spot monitors when an alarm / motion event happens, in addition to alerting a network operator. The operator shall be able to set the polarity of each individual alarm contact to either normally open or normally closed.
31. The Network video recorder (NVR) shall provide a history log for all the alarms/activity on the internal hard disk with time, date and camera name and/or number. The history log shall have a filter to be able to show the operator alarm, motion, video or other events only, as required.
32. The Network video recorder (NVR) shall have 12 internal programmable alarm inputs.
33. The Network video recorder (NVR) shall have a user definable schedule to allow multiple schedules to be set for each individual hour of the day for each camera. This shall include the ability to select different hours of the day for normal recording, motion recording, sensor recording, motion & sensor recording, and off. Recording schedules shall be able to be copied and pasted to other individual cameras, or copied and pasted to all cameras to assist the operator with the configuration of the unit.
34. The Network video recorder (NVR) shall feature individually programmable activity detection on all video channels, with an on screen min 16 x 12 set up grid, and 5 sensitivity level selectable on all channels.
35. The Network video recorder (NVR) shall have 3 different layers of Password for better authenticity and flexible level of control.
36. The Network video recorder (NVR) shall have both manual and automatic lock functions that will not affect the recording operation of the unit. This shall either be done manually or by using a pre-set menu option to automatically lock the unit after 30 seconds of no buttons being pressed on either the front panel or IR remote control. This will prevent unauthorized use and shall require an operator to input a password to unlock the unit.
37. The Network video recorder (NVR) shall be able to control telemetry cameras and should support multiple telemetry protocols. Cameras with telemetry shall be controllable using the Enterprise Viewing Software across an Ethernet network.

The Network video recorder (NVR) shall have the Minimum Tender Requirements:

- Embedded Linux operating system.
- Support for 12 IP cameras with built-in 12 PoE ports.
- IEEE 802.3af/at PoE with a minimum 150 W PoE budget.
- 4K HDMI video output.
- Support for 12 MP IP cameras.
- H.265+/H.265/H.264+/H.264 video compression.
- Minimum 160 Mbps incoming and outgoing bandwidth.
- Dual SATA HDD support with up to 20 TB per drive.
- Gigabit Ethernet uplink.
- ONVIF Profile S/G/T compliant.
- Simultaneous 12-channel live view and playback.
- HTTPS-secured remote monitoring via web browser and mobile application.
- Minimum 3-year manufacturer warranty.
- Each remote unit will have varying levels of password protection for remote access.
- Users logging on via the network will have their user names logged locally in the Network

video recorder (NVR) history log with their log on / off dates and times.

- The operator will have the option to be alerted via on-screen symbols and audible alarm for video loss, motion and sensor events as they happen.
- Optimum bandwidth settings shall be available for Ethernet network transmissions.
- License free Enterprise Viewing Software for Windows® shall be included with each unit.

7.9.2.1 The NVR shall comply with the following parameters:-

SI	Parameter	Minimum Technical Requirement
1.	Device Type	Embedded Linux Network Video Recorder (NVR)
2.	Video Input	Minimum 12 IP Camera Channels
3.	Built-in PoE Ports	Minimum 12 × RJ45 10/100 Mbps PoE Ports
4.	PoE Standard	IEEE 802.3af / IEEE 802.3at
5.	PoE Power Budget	Minimum 150 W
6.	Maximum IP Camera Resolution	Up to 12 MP
7.	Recording Resolution	Up to 12 MP
8.	Display Output	1 × HDMI (4K UHD, 3840 × 2160), 1 × VGA (1920 × 1080)
9.	Video Compression	H.265+, H.265, H.264+, H.264
10.	Incoming Bandwidth	Minimum 160 Mbps
11.	Outgoing Bandwidth	Minimum 160 Mbps
12.	Live View	Up to 12 channels simultaneously
13.	Playback	Minimum 12-channel synchronous playback
14.	Recording Modes	Continuous, Scheduled, Motion Detection, Alarm, Event
15.	Storage	Minimum 2 × SATA HDD Bays
16.	Maximum Storage Capacity	Up to 20 TB per HDD (40 TB Total)
17.	Audio Input	1 × RCA
18.	Audio Output	1 × RCA
19.	Two-Way Audio	Supported
20.	Network Interface	1 × Gigabit RJ45 Ethernet Port
21.	Network Protocols	TCP/IP, IPv4/IPv6, DHCP, DNS, DDNS, NTP, RTSP, HTTPS, SMTP, FTP, UPnP, SNMP
22.	ONVIF Support	ONVIF Profile S, G, and T
23.	Remote Access	Web Browser, CMS Software, Android & iOS Mobile App
24.	USB Ports	Minimum 2 × USB 2.0 and 1 × USB 3.0
25.	Alarm Interface	Minimum 4 Alarm Inputs, 1 Alarm Output (or equivalent)
26.	Intelligent Features	Motion Detection, Line Crossing Detection, Intrusion Detection, Face Detection, Human and Vehicle Classification (camera dependent)
27.	Cyber Security	HTTPS Encryption, User Authentication, Access Control, Security Logs
28.	Backup Methods	USB Storage, Network Download
29.	Power Supply	AC 100–240 V, 50/60 Hz
30.	Power Consumption	≤20 W (excluding HDDs and PoE load)
31.	Operating Temperature	-10°C to +55°C

32.	Operating Humidity	10%–90% RH (Non-condensing)
33.	Chassis	Rack-mount or Desktop Type
34.	Certifications	CE, FCC, RoHS

7.9.3 Camera Performance Requirements

- Minimum 4 MP image resolution.
- Full HD live viewing and recording at 25/30 fps.
- Support H.265+ compression to reduce storage and bandwidth.
- True 120 dB WDR for challenging lighting conditions.
- Integrated Smart IR with a minimum 30 m night vision range.
- Built-in motion detection and intelligent video analytics.
- Support for PoE (IEEE 802.3af) to allow a single Ethernet cable for power and data.
- Fully compatible with the specified 12-channel 4K PoE NVR and ONVIF Profile S/G/T.
- Suitable for both indoor and outdoor installation (minimum IP67).
- Audio supported.

7.9.3.1 Accessories

Each camera shall be supplied with:

- Mounting bracket (if required)
- Junction box for outdoor installations (where applicable)
- Stainless steel mounting screws and anchors
- Waterproof RJ45 connector kit
- Installation guide

7.9.3.2 Warranty

- Minimum **3-year manufacturer's warranty**.
- Firmware updates available during the warranty period.
- Local technical support and after-sales service.

7.9.4 LED Colour Monitor Specifications

The Colour display shall be suitable with the standards of the selected cameras. It shall be solid state and modular in design. It shall provide a bright, clear and well-defined picture display on the screen. All controls for brightness, contrast etc. shall be provided on the front panel for readily adjusting the levels of the video signal.

The rear panel shall be provided with input and output connectors for coupling the video output to other Monitors.
The video monitor installed shall be of 32" size.
The Monitor shall comply with the following parameters:

- Video: PAL / NTSC colour composite 1.0Vp-p/Must be compatible with supplied NVR
- LED: 32 diagonal, 0.66 mm Stripe pitch
- Resolution: 1920 / 1080 pixels /Full HD)
- Contrast Ration: 500: 1
- Viewing angle: 140-degree horizontal, 130-degree vertical
- Power Input: 90 – 260 VAC, 50 Hz
- Consumption: 40 Watts

7.9.5 Video Cable Specifications

Parameter	Minimum Technical Requirement
Cable Type	Category 6 (CAT6) UTP Cable
Standard	ANSI/TIA-568.2-D, ISO/IEC 11801 Class E
Conductor Material	23 AWG Solid Bare Copper (100% Copper)
Conductor Diameter	0.57 mm (23 AWG)
Number of Conductors	4 Twisted Pairs (8 Conductors)
Insulation	High-Density Polyethylene (HDPE)
Separator	Cross Filler (Preferred)
Pair Color Code	TIA/EIA Standard
Characteristic Impedance	100 ± 15 Ohms
Bandwidth	Minimum 250 MHz
Data Transmission	Up to 1 Gbps (1000Base-T)
Maximum Channel Length	100 m (90 m permanent link + 10 m patch cords)
Jacket Material	PVC or LSZH (Low Smoke Zero Halogen)
Jacket Rating	Indoor: CM/CMR; Outdoor: UV-Resistant PE
Flame Rating	IEC 60332-1 or equivalent
Operating Temperature	-20°C to +75°C
PoE Compatibility	IEEE 802.3af, IEEE 802.3at, IEEE 802.3bt Ready
Voltage Rating	300 V
Installation	In PVC conduit, GI conduit, cable tray, or trunking as applicable

Testing	100% Fluke-tested after installation
Compliance	ANSI/TIA-568.2-D, ISO/IEC 11801, IEC 61156

7.9.6 Patch Cord (When Necessary)

SI No	Parameter	Requirement
1.	Type	Factory-terminated CAT6 Patch Cord
2.	Length	1–3 m
3.	Connector	RJ45, 8P8C
4.	Performance	Category 6, 250 MHz
5.	Conductor	Stranded 100% Copper

7.9.7 RJ45 Connectors

- Category 6 compatible
- 8P8C modular plug
- Gold-plated contacts (minimum 50 micro-inch)
- Suitable for solid copper CAT6 cable

7.9.8 Installation Requirements

- Use **100% solid bare copper CAT6 cable; CCA (Copper-Clad Aluminum) cable shall not be accepted**.
- Maximum cable run from the PoE switch to each camera shall not exceed **100 meters**.
- All cables shall be properly labeled at both ends.
- Maintain a minimum separation of **300 mm** from power cables to minimize electromagnetic interference.
- All cable terminations shall comply with **TIA/EIA-568B** wiring standards.

7.9.9 Outdoor Installations

For cameras installed outdoors, the cable shall additionally meet the following requirements:

- UV-resistant polyethylene (PE) outer jacket.

- Water-resistant and suitable for direct sunlight exposure.
- Installed in UV-resistant PVC conduit or GI conduit where exposed to mechanical damage.
- Surge protection provided for outdoor Ethernet lines where required.

7.9.10 PVC Conduit Specifications

PVC Conduit of medium grade (ISI mark) with 20 mm dia will be used for laying Video Cables / Power cables.

SECTION 7.10
TYPE TESTS REQUIREMENTS

Table of Contents

7.10 Type Tests Requirements 218

7.10.1 Auxiliary Transformer 33/0.4kV 218

7.10.2 33kV GIS Switchgear 218

7.10.3 33kV AIS Circuit Breaker 219

7.10.4 Vacuum Interrupter 219

7.10.5 33kV AIS Disconnector without and with Earthing Switch 219

7.10.6 33 kV Current Transformer & Potential Transformer 220

7.10.7 33 kV Surge Arrester 220

7.10.8 Protection Relays 220

7.10.9 Energy Meters 220

7.10.10 Substation Automation System 221

7.10.11 Battery & Battery Charger 221

7.10.12 33 kV XLPE cables and Termination kit 221

7.10 Type Tests Requirements

For the following equipment, complete type test reports shall be provided in accordance with Section 4.

- Auxiliary Transformer 33/0.4 kV
- 33 kV GIS Switchgear
- 33 kV AIS Circuit Breaker
- 33 kV AIS Disconnector without and with Earthing Switch
- 33 kV Current Transformer
- 33 kV Potential transformer
- 33 kV Lightning Arrester
- Protection Relays
- Energy meters
- Substation Automation System
- Battery
- Battery Chargers
- 33 kV XLPE cables and Termination kit

7.10.1 Auxiliary Transformer 33/0.4kV

Type Test reports for offered type similar or higher KVA rating Station Auxiliary transformer for same voltage class from any short circuit liaison (STL) Member [http://www.stl liaison.org/web/03_Members.php] Testing Organization or Laboratory as per relevant IEC standard. The type test report shall include at least the following tests along with results:

- Temperature Rise Test
- Lightning Impulse Test
- Short circuit withstand Test

7.10.2 33kV GIS Switchgear

Type Test Certificates & Reports for offered type similar or higher Ampere rating Switchgear for same voltage class from any short-circuit testing liaison (STL) Member [http://www.stlliaison.org/web/03_Members.php] Testing Organization or Laboratory as per relevant IEC standard. The type test report along with results shall include at least the following tests:

- Dielectric Tests
- Temperature Rise Tests.
- Measurement of resistance of the main circuit.
- Internal Arc fault tests.
- Short-circuit performance tests (including short time and peak withstand current tests, verification of making & breaking capacities tests).
- Mechanical operation tests at ambient temperature.
- Gas tightness test

7.10.3 33kV AIS Circuit Breaker

Type Test Certificates & Reports for offered type similar or higher Ampere rating Outdoor Vacuum Circuit Breaker for same voltage class from any short-circuit testing liaison (STL) Member [http://www.stl-liaison.org/ web/ 03_Members.php] Testing Organization or Laboratory as per relevant IEC standard. The type test report along with results shall include at least the following tests:

- Dielectric Tests.
- Temperature Rise tests.
- Measurement of Resistance of the main circuit.
- Short-time withstand current and peak withstand current tests.
- Mechanical operation tests at ambient temperature.
- Internal arc fault tests.
- Out-of-phase making & breaking tests.
- Short circuit current making and breaking tests.
- Lightning impulse withstand test.
- IP55 tests.

7.10.4 Vacuum Interrupter

The Vacuum Interrupter incorporated in the offered Vacuum Circuit Breaker shall be of proven design and shall have successfully demonstrated compliance with the applicable performance requirements of IEC 62271-100 through the type testing of the complete Vacuum Circuit Breaker at an independent STL Member [http://www.stl-liaison.org/ web/ 03_Members.php] Testing Organization or Laboratory. The submitted type test report shall include but not limited to the following test results related to the performance of the Vacuum Interrupter:

- Lightning Impulse Withstand Voltage Test
- Temperature Rise Test
- Mechanical Endurance Test
- Short-Circuit Making Current Test
- Short-Circuit Breaking Current Test

If the above test results are included in the valid type test report of the offered Vacuum Circuit Breaker issued by an independent STL Member [http://www.stl-liaison.org/ web/ 03_Members.php] Testing Organization or Laboratory, submission of a separate qualification or test report for the Vacuum Interrupter shall not be required.

7.10.5 33kV AIS Disconnector without and with Earthing Switch

Type Test Certificates & Reports for offered type similar of higher ampere rating Disconnector for same voltage class from any independent testing laboratory as per relevant IEC standard.

- Lightning impulse voltage withstand dry test
- Power frequency voltage withstand dry test
- Short-time withstand current test

7.10.6 33 kV Current Transformer & Potential Transformer

Type Test Certificates & Reports for offered type similar or higher Ampere rating Current Transformer / Potential Transformer for same voltage class from any independent testing laboratory as per relevant IEC standard. The type test report along with results shall include at least the following tests:

- Short time current / Voltage tests.
- Lightning Impulse withstand tests.
- Temperature Rise tests.
- Measurement of errors tests.

7.10.7 33 kV Surge Arrester

Type Test Certificates & Reports for offered type similar or higher Ampere rating Surge Arrester (LA) for same voltage class from any independent testing laboratory as per relevant IEC standard. The type test report along with results shall include at least the following tests:

- Insulation Withstand tests on the Arrester housing;
- Long Duration Current Impulse withstand test;
- Power Frequency voltage tests;
- Internal Partial Discharge tests.
- Residual Voltage tests.
- Pollution housing tests.

7.10.8 Protection Relays

For protective relay type test reports or certificate need to submitted from an STL accredited laboratory or ISO/IEC 17025 accredited independent testing laboratory that covers IEC 60255 series testing.

7.10.9 Energy Meters

Type Test Certificates & Reports for offered type energy meter for same voltage class from any independent testing laboratory as per relevant IEC standard.

- Accuracy Test
- AC insulation withstand test
- Impulse voltage test
- No load (creep) test

7.10.10 Substation Automation System

Type Test Certificates & Reports for Substation Automation System from any short-circuit testing liaison (STL) Member [http://www.stl liaison.org/web/03_Members.php] Testing Organization or Laboratory for quality Supervision and test of Substation Automation System as per relevant IEC standard.

The following documentation shall be provided for the system during the course of the project and they shall be consistent, CAD supported, and of similar look/feel:

- Block Diagram
- Circuit Diagram
- Test Specification for Factory Acceptance Test (FAT)
- Logic Diagram
- Third Party cyber security certification.

7.10.11 Battery & Battery Charger

Type Test Certificates & Reports for offered type similar of higher ampere rating Substation Battery & 110V DC Battery Charger from any independent testing laboratory as per relevant IEC standard.

7.10.12 33 kV XLPE cables and Termination kit

Type Test Certificates & Reports for XLPE insulated Copper cable of similar or higher size of similar or higher voltage class from any short-circuit testing liaison (STL) Member [http://www.stl liaison.org/web/03_Members.php] Testing Organization or Laboratory for quality Supervision and test of electrical wire and cable as per relevant IEC standard.

The type test report along with results shall include at least the following tests:

- Partial Discharge test (both cable and termination kit)
- Bending test (XLPE Cable).
- Power frequency withstand test (both cable and termination kit)
- Heating cycle test (XLPE Cable).
- Lightning Impulse test (both cable and termination kit).

SECTION 7.11
TECHNICAL SPEFICATION OF FIRE DETECTION AND ALARM SYSTEM

Contents

7.11 Technical Spefication of Fire Detection and Alarm System 222

7.11.1 Fire Detection and Alarm System (FDAS) 222

7.11.1.1 Technical Requirements 222

7.11.2 Detectors 222

7.11.3 Addressable Photoelectric Smoke Detectors: 223

7.11.4 Addressable Heat Detectors: 223

7.11.5 Linear Heat Detection Cable: 223

7.11.6 Manual Alarm Devices 223

7.11.7 Fire Alarm Control Panel 224

7.11.8 Interface Requirements 224

7.11.9 System Features 224

7.11.10 Fire Alarm Annunciation 225

7.11.11 Testing 225

7.11.12 Scope of Supply 225

7.11.12.1 A. addressable Fire Alarm Control Panel (FACP): 225

7.11.12.2 B. Addressable Photoelectric Smoke Detector: 226

7.11.12.3 C. Addressable Heat Detector: 227

7.11.12.4 D. Linear Heat Detection Cable (Cable Trench): 227

7.11.12.5 D. Manual Call Point (MCP): 227

7.11.12.6 G. Audible & Visual Alarm Device 227

7.11.13 Additional Tender Requirements 228

7.11 Technical Spefication of Fire Detection and Alarm System

7.11.1 Fire Detection and Alarm System (FDAS)

The 33 kV GIS Switching Station shall be provided with a complete, intelligent, addressable Fire Detection and Alarm System (FDAS) for early detection of fire, alarm annunciation and interface with the station monitoring system. The system shall be complete in all respects and shall include all detectors, control panels, power supplies, batteries, wiring, communication interfaces, accessories and software required for satisfactory operation.

7.11.1.1 Technical Requirements

Sl. No.	Description	Requirement
1	Type of System	Intelligent Microprocessor-based Addressable Fire Detection and Alarm System
2	Applicable Standards	IEC 60079, IEC 60364, IEC 62642, IEC 54 Series (EN 54), NFPA 72 or equivalent international standards
3	Fire Alarm Control Panel (FACP)	Intelligent Addressable, minimum 2-loop expandable type
4	Power Supply	240 V AC, 50 Hz with automatic changeover to battery supply
5	Standby Battery	Sealed Maintenance Free Battery capable of operating for minimum 24 hours in standby followed by 30 minutes alarm condition
6	Communication	Ethernet/RS-485 with Modbus TCP/IP or IEC 61850 (where applicable)
7	Event Memory	Minimum 10,000 events with date and time stamp
8	Time Synchronization	GPS/NTP/SNTP compatible
9	Display	LCD display with event logging and graphical status indication
10	Alarm Levels	Fire Alarm, Pre-Alarm, Trouble, Supervisory
11	Fault Monitoring	Open circuit, short circuit, detector removal, power failure and battery failure monitoring
12	Output Contacts	Potential-free contacts for SCADA, BMS and Annunciation
13	Degree of Protection	Minimum IP42 for indoor equipment

7.11.1.2 Detectors

The Fire Detection System shall include, but not be limited to, the following detectors.

a. Addressable Photoelectric Smoke Detectors (min16 nos)

b. Addressable Heat Detector (min 4 nos)

c. Linear Heat Detection Cable or Heat Detector (As required depending on switching station requirement)

7.11.1.3 Addressable Photoelectric Smoke Detectors:

Intelligent addressable photoelectric (optical) smoke detectors complying with **EN 54-7** (or equivalent international standard), suitable for early detection of visible smoke from smouldering and flaming fires. The detectors shall be microprocessor-based with automatic drift compensation, self-diagnostics, electronic addressing, dual LED alarm indication (360° visibility), removable detector head, and plug-in base. The detectors shall be fully compatible with the proposed Fire Alarm Control Panel (FACP) and shall support remote alarm indication, alarm verification, contamination monitoring, and automatic sensitivity adjustment. The detectors shall be installed in the control room/relay room, battery room and other indoor areas as required by the applicable standards and the approved detector layout. The quantity shall be based on the room dimensions, ceiling height, ventilation conditions, and detector coverage in accordance with **EN 54-14**, **NFPA 72**, and the manufacturer's design recommendations. The scope of supply shall include all detector bases, mounting accessories, address labels, remote indicators (where required), interface modules, wiring, testing, programming, commissioning, and all accessories necessary for complete and satisfactory operation.

7.11.1.4 Addressable Heat Detectors:

Intelligent addressable heat detectors complying with EN 54-5 (or equivalent international standard), suitable for the detection of abnormal temperature rise and fixed temperature conditions in areas where smoke detectors may be affected by environmental conditions or where heat detection is more appropriate. The detectors shall be microprocessor-based, addressable, and capable of operating as fixed temperature and/or rate-of-rise type, with automatic self-diagnostics, electronic addressing, dual LED alarm indication (360° visibility), removable detector head, and plug-in mounting base. The detectors shall be fully compatible with the proposed Fire Alarm Control Panel (FACP) and shall support remote alarm indication, detector status monitoring, and fault reporting. The detectors shall be installed in the control room/relay room, battery room and other indoor areas as required by the applicable standards and the approved detector layout. The quantity shall be determined based on the room dimensions, ceiling height, environmental conditions, detector coverage, and installation requirements in accordance with EN 54-14, NFPA 72, and the manufacturer's recommendations. The scope of supply shall include all detector bases, mounting accessories, address labels, remote indicators (where required), interface modules, wiring, testing, programming, commissioning, and all accessories necessary for complete and satisfactory operation.

7.11.1.5 Linear Heat Detection Cable:

Digital linear heat detection cable complying with EN 54-28 (or equivalent), suitable for installation in cable trenches. One continuous run shall be installed throughout the entire length of each cable trench, with additional length for routing and termination. The total quantity shall be based on the actual trench layout and shall include all fixing clips, junction boxes, end-of-line devices, interface modules, and accessories required for complete installation and operation.

7.11.1.6 Manual Alarm Devices

The system shall include:

- Addressable Manual Call Points (Plexi Glass Type)
- Audible Hooters
- Electronic Sounders
- Flashing Strobe Lights
- Alarm Reset Stations
- Exit Sign

Manual Call Points shall be installed adjacent to all exit doors.

7.11.2 Fire Alarm Control Panel

The Fire Alarm Control Panel shall provide:

- Alarm indication
- Fault indication
- Zone indication
- Detector address identification
- Event logging
- Password protected operation
- Automatic detector sensitivity adjustment
- Detector contamination monitoring
- Remote communication
- USB port
- Ethernet Port

7.11.3 Interface Requirements

The Fire Detection System shall interface with:

- SAS (Substation Automation System)
- HMI
- BMS (if available)
- Remote Alarm Panel

The following signals shall be available:

- Fire Alarm
- Detector Fault
- System Healthy
- Battery Low
- AC Fail
- Panel Fault
- Communication Failure

7.11.4 System Features

The system shall have the following minimum features:

- Automatic detector addressing
- Automatic detector sensitivity compensation
- Loop short-circuit isolators
- Event history
- Password protection
- Self-diagnostics
- Detector contamination warning
- Battery monitoring
- Charger monitoring
- Remote diagnostics

7.11.5 Fire Alarm Annunciation

The Fire Alarm Panel shall provide separate indication for:

- Fire Alarm
- Pre-Alarm
- Detector Fault
- Loop Fault
- Communication Fault
- Battery Charger Failure
- Battery Low Voltage
- AC Supply Failure
- Earth Fault
- Power Supply Failure

7.11.6 Testing

The complete system shall be factory tested and site acceptance tested.

The Contractor shall perform:

- Detector Functional Test
- Alarm Test
- Fault Simulation Test
- Communication Test
- Battery Backup Test
- Loop Integrity Test
- Cause and Effect Test

7.11.7 Scope of Supply

The scope of supply shall include, but not be limited to:

- Fire Alarm Control Panel (1 Set)
- Addressable Photoelectric Smoke Detectors (Min 16 Nos)
- Addressable Heat Detectors (Min 04 Nos)
- Linear Heat Detection Cable for Cable Trenches (As Required)
- Manual Call Points (As Required)
- Audible & Visual Alarm Device (Min 2 Set)
- Power Supply Units (As Required)
- Standby Batteries (1 Set)
- Junction Boxes, Mounting Accessories and Wiring (Complete)
- Communication Modules (As Required)
- Software, Programming, Testing and Commissioning

9. Detailed specification of fire detection system.

7.11.7.1 A. addressable Fire Alarm Control Panel (FACP):

Sl. No.	Description	Requirement

1.	Type	Intelligent, microprocessor-based, addressable Fire Alarm Control Panel (FACP)
2.	Standards	EN 54-2, EN 54-4, NFPA 72, IEC 60364
3.	Number of Loops	Minimum 2 addressable loops, expandable to 4 loops without replacing the controller
4.	Loop Capacity	Minimum 50 addressable devices per loop
5.	System Capacity	Minimum 100 addressable devices
6.	Display	Minimum 7-inch colour LCD/TFT display with graphical interface
7.	User Interface	Keypad with password-protected access (minimum 3 user levels)
8.	Event Memory	Minimum 10,000 events with real-time clock and time/date stamp
9.	Power Supply	240 V AC ±10%, 50 Hz
10.	Battery Backup	24 V DC sealed maintenance-free batteries, capable of 24 hours standby followed by 30 minutes full alarm operation
11.	Battery Charger	Automatic float/boost charger with battery monitoring
12.	Fault Monitoring	AC fail, battery low, battery open, charger failure, earth fault, loop open/short circuit, detector removal
13.	Communication	Ethernet, Modbus TCP/IP, RS-485 and dry contacts; IEC 61850 gateway shall be provided if required for SAS integration
14.	Programmable Outputs	Minimum 8 programmable relay outputs
15.	Programmable Inputs	Minimum 8 monitored inputs
16.	Alarm Delay	Programmable from 0–600 seconds
17.	Sounder Circuits	Minimum 4 supervised sounder outputs
18.	Network Capability	Expandable to minimum 32 networked panels
19.	IP Rating	Minimum IP42 (Indoor)
20.	Operating Temperature	0°C to +50°C
21.	Relative Humidity	Up to 95%, non-condensing
22.	Programming	Laptop programmable via USB/Ethernet
23.	Event Printing	USB/Network printer support
24.	Time Synchronization	NTP/SNTP compatible
25.	Cyber Security	Password protection, user log, event history
26.	LED Indications	Power ON, Fire, Alarm, Fault, Disablement, Supervisory, Communication Healthy

7.11.7.2 B. Addressable Photoelectric Smoke Detector:

Sl. No.	Description	Requirement
1	Type	Addressable Photoelectric Smoke Detector
2	Standard	EN 54-7
3	Operating Voltage	Supplied from addressable loop
4	Sensitivity	Automatic drift compensation
5	Addressing	Electronic software addressing
6	LED Indicator	Dual LEDs visible through 360°
7	Alarm Verification	Built-in alarm verification
8	Self Diagnostics	Yes
9	Contamination Monitoring	Automatic
10	Operating Temperature	−10°C to +60°C
11	Humidity	Up to 95% RH
12	IP Rating	Minimum IP42

13	Reset	Remote reset from FACP
14	Detector Base	Plug-in type
15	EMC Compliance	EN 50130-4

7.11.7.3 C. Addressable Heat Detector:

Sl. No.	Description	Requirement
1	Type	Addressable Rate-of-Rise / Fixed Temperature Heat Detector
2	Standard	EN 54-5
3	Fixed Temperature	58°C or 78°C (as specified)
4	Rate of Rise	≥ 8°C/min
5	LED Indicator	Dual LEDs
6	Self Diagnostics	Yes
7	Drift Compensation	Automatic
8	Operating Temperature	−10°C to +70°C
9	Humidity	Up to 95% RH
10	IP Rating	Minimum IP42

7.11.7.4 D. Linear Heat Detection Cable (Cable Trench):

Sl. No.	Description	Requirement
1	Type	Digital Linear Heat Detection Cable
2	Standard	EN 54-28
3	Alarm Temperature	68°C (or as specified)
4	Maximum Zone Length	Minimum 200 m
5	Operating Voltage	Compatible with addressable interface module
6	Installation	Cable trenches, cable basements and cable galleries
7	IP Rating	Minimum IP67

7.11.7.5 D. Manual Call Point (MCP):

Sl. No.	Description	Requirement
1	Type	Addressable Plexi Glass Manual Call Point
2	Standard	EN 54-11
3	Reset	Resettable element with key
4	LED	Alarm indication
5	IP Rating	IP54 (minimum)

7.11.7.6 G. Audible & Visual Alarm Device

Sl. No.	Description	Requirement
1	Type	Addressable Electronic Sounder with LED Strobe
2	Sound Output	Adjustable, minimum 100 dB(A) at 1 m
3	Flash Rate	1 Hz
4	Operating Voltage	Addressable loop powered or 24 V DC
5	IP Rating	IP54 minimum

7.11.8 Additional Tender Requirements

The EPC Contractor shall, during the detailed engineering stage, prepare a comprehensive **Detector Location Schedule** for the complete Fire Detection and Alarm System (FDAS). The schedule shall include, as a minimum, the detector tag number, detector type, detector address, loop number, zone number, physical location, protected area and installation details of each detector. The schedule shall be based on the final approved fire protection design and the actual installed configuration.

Upon completion of the works and prior to final handover, the EPC Contractor shall submit the final Detector Location Schedule to the Employer for approval. The approved schedule shall be incorporated into the as-built drawings, Operation & Maintenance (O&M) Manuals and all handover documentation.

In addition, the EPC Contractor shall provide and permanently install **one (1) framed and laminated Detector Location Schedule** at a prominent location inside the Control Room or Fire Alarm Control Panel (FACP) room. The schedule shall be printed in a clear and durable format (minimum A1 size or as approved by the Engineer), showing the detector locations, tag numbers, addresses, loop numbers, zone numbers and protected areas to facilitate operation, inspection, maintenance and emergency response.

SECTION 7.12
PROCURING ENTITY'S REQUIREMENTS

Contents

Section 7.12 PE's Requirements 229
7.12 Scope of Supply of Plant and Installation Services by the Contractor: 229
7.12.1 MANUFACTURER'S EXPERIENCE CRITERIA 229
7.12.2 CONSTRUCTION OF 33KV GIS SWITCHING STATION IN BHANGA UNDER FARIDPUR S&D-02... 231
7.12.2.1 CIVIL & BUILDING WORKS: 231
7.12.2.2 SWITCHING STATION/ELECTRICAL WORKS: 233
7.12.3 CONSTRUCTION OF 33KV GIS SWITCHING STATION IN BHOLA UNDER BHOLA ESU. 235
7.12.3.1 CIVIL & BUILDING WORKS: 235
7.12.3.2 SWITCHING STATION/ELECTRICAL WORKS: 236
7.12.4 CONSTRUCTION OF 33KV GIS SWITCHING STATION IN CHARFASON UNDER BHOLA ESU..... 239
7.12.4.1 CIVIL & BUILDING WORKS: 239
7.12.4.2 SWITCHING STATION/ELECTRICAL WORKS: 241
7.12.5 CONSTRUCTION OF 33KV GIS SWITCHING STATION IN JHALOKATHI. 243
7.12.5.1 CIVIL & BUILDING WORKS: 243
7.12.5.2 SWITCHING STATION/ELECTRICAL WORKS: 245
7.12.6 CONSTRUCTION OF 33KV GIS SWITCHING STATION IN MAHESHPUR ESU UNDER JHENAIDAH S&D-02. 247
7.12.6.1 CIVIL & BUILDING WORKS: 247
7.12.6.2 SWITCHING STATION/ELECTRICAL WORKS: 249
7.12.7 CONSTRUCTION OF 33KV GIS SWITCHING STATION IN MEHERPUR ESU UNDER KUSHTIA S&D-02. 251
7.12.7.1 A. CIVIL & BUILDING WORKS: 251
7.12.7.2 SWITCHING STATION/ELECTRICAL WORKS: 253
7.12.8 Bill of Quantities (BOQ) 256
7.12.8.1 BOQ for Bhola 33kV GIS Substation of WZPDCL. 256
7.12.8.2 BOQ FOR CHARFASHION 33KV GIS SUBSTATION UNDER BHOLA ESU OF WZPDCL. 259
7.12.8.3 BOQ FOR MAHESHPUR 33KV GIS SUBSTATION UNDER JHRNAIDAH-02 OF WZPDCL 262
7.12.8.4 BOQ FOR MEHERPUR 33KV GIS SUBSTATION OF WZPDCL 265
7.12.8.5 BOQ FOR BHANGA 33KV GIS SUBSTATION UNDER FARIDPUR S&D-02 OF WZPDCL 268
7.12.8.6 BOQ FOR JHALAKHATI 33KV GIS SUBSTATION OF WZPDCL 271

Section 7.12 PE's Requirements

7.12 Scope of Supply of Plant and Installation Services by the Contractor:

The works covered by the Bid / Tender are supply, erection, installation, testing and commissioning, inspection and training of 6 Nos. GIS new 33 KV Switching stations at **Bhanga** under Faridpur S&D-02, at **Bhola** under Bhola ESU, at **Charfashion** under Bhola ESU, at **Maheshpur** under S&D-02 Jhenaidah, at **Meherpur** under Meherpur ESU and **Jhalakhati** under Jhalakhati ESU.

The scope of plant and services include design, manufacture, quality assurance, inspection & testing, packing for export, insurance & shipment to site, complete construction & installation, jointing, terminating, binding, earthing, painting, transportation, setting to work site and testing & commissioning of all the equipment necessary for operation of the switching-stations. **Moreover, existing equipment (used for WZPDCL temporary power evacuation) shall be dismantled from grid premises and shall be handed over and deposited to WZPDCL Central Store** / Project Store without any damage as per directions of Project Director or Engineer in Charge of this project.

The detail requirement is listed in the technical specification and Guaranteed Technical Particulars (GTP) in the tender document.

The scope also includes imparting training to WZPDCL's Engineers on offered system.

The contractor is responsible for ensuring that all and any items of work required for the safe, efficient and satisfactory completion and functioning of the works, landscaping of the substation area are included in the Bid price whether it will be described in the specification or not.

7.12.1 MANUFACTURER'S EXPERIENCE CRITERIA

SI No	Item Name	Experience Criteria
01	33KV VCB	• The manufacturer must have at least 15 years manufacturing experience of the goods. As a proof of evidence bidder must submit minimum 5 supply records (Except manufacturers own country) each having 30 (thirty) Nos of 33KV VCB. • The offered type 33KV VCB shall have a complete Type Test Report demonstrating compliance with the applicable standard specified in Section-7. • Furthermore, the bidder shall submit **at least three (3) successful performance certificates** for the offered type 33KV VCB, issued by the respective End User/Employer (Except manufacturers own country). The offered type/model shall have been successfully supplied, commissioned and operated in such projects **within the last ten (10) years preceding the date of bid submission.**
02	Substation Automation System (SAS)	• The manufacturer must have at least 15 years manufacturing experience of the goods. As a proof of evidence bidder must submit minimum 5 supply records (Except manufacturers own country) each having 03(Three) Nos of SAS. • The offered type SAS shall have a complete Type Test Report demonstrating compliance with the applicable standard specified in Section-7.

Sl No	Item Name	Experience Criteria
		• Furthermore, the bidder shall submit **at least three (3) successful performance certificates** for the offered type SAS, issued by the respective End User/Employer (Except manufacturers own country). The offered type/model shall have been successfully supplied, commissioned and operated in such projects **within the last ten (10) years preceding the date of bid submission.**
03	Protective Relay	• The manufacturer must have at least 15 years manufacturing experience of the goods. As a proof of evidence bidder must submit minimum 5 supply records (Except manufacturers own country) each having 50(Fifty) Nos of Protective Relay. • The offered type Protective Relay shall have a complete Type Test Report demonstrating compliance with the applicable standard specified in Section-7. • Furthermore, the bidder shall submit **at least three (3) successful performance certificates** for the offered type Protective Relay, issued by the respective End User/Employer (Except manufacturers own country). The offered type/model shall have been successfully supplied, commissioned and operated in such projects **within the last ten (10) years preceding the date of bid submission.**
04	Energy Meter	• The manufacturer must have at least 15 years manufacturing experience of the goods. As a proof of evidence bidder must submit minimum 5 supply records (Except manufacturers own country) each having 50(Fifty) Nos of Energy Meter. • The offered type energy meter shall have a complete Type Test Report demonstrating compliance with the applicable standard specified in Section-7. • Furthermore, the bidder shall submit **at least three (3) successful performance certificates** for the offered type energy meter, issued by the respective End User/Employer (Except manufacturers own country). The offered type/model shall have been successfully supplied, commissioned and operated in such projects **within the last ten (10) years preceding the date of bid submission.**
05	33KV GIS cubicle.	• The manufacturer must have at least 15 years manufacturing experience of the goods. As a proof of evidence bidder must submit minimum 5 supply records (Except manufacturers own country) each having 01(One) Set 33KV GIS Switchgear cubicles. • The offered type 33KV GIS cubicle shall have a complete Type Test Report demonstrating compliance with the applicable standard specified in Section-7. • Furthermore, the bidder shall submit **at least three (3) successful performance certificates** for the offered type 33KV GIS cubicle, issued by the respective End User/Employer (Except manufacturers own country). The offered type/model shall have been successfully supplied, commissioned and operated in such projects **within the last ten (10) years preceding the date of bid submission.**

End User Certificate about the satisfactory operation of the offered model shall be on the user's letterhead, indicating address, telephone, e-mail address, end user's name, description of work, commissioning date and contract date shall be provided in the bid.

All the evidence other than in English Language must be translated into English and the

9) A connecting road between the nearest highway road and the switching station's main gate shall be constructed.

10) Approach reads from the main gate or existing road to the control room entrance and internal roads for adjacent area and parking area as required shall be constructed.

11) Construction of septic tank, soak well, inspections pits, sewerage piping, and facilities for toilets and bathrooms shall be carried out.

12) Supply and installation of overhead water tanks underground water reservoir, and water supply system shall be done.

13) Supply and installation of Wall clocks operator working tables, chairs, curtains for windows, Steel File Cabinets and Steel Almirah for record keeping in the control room.

14) Installation of switching station Name Plate and switching scheme MIMIC Display board.

15) Supply and construction of Power cable trench and control cable rack inside the ground floor of the control room building. Proper sealing is required of the control cable entry at Control Room building, to prevent water entering from the switchyard/outside to Control Room Building, preventing entry of rats and reptiles.

16) Supply and installation of office room, Control room indoor illumination. Lighting levels within the building must be generally designed to meet the requirements of IEC Standards, and meet the following specific lighting levels:

- 400 lux between rows at switchgear front panels within the Control Building.
- 400 lux at the front of the control panel within the Control Building.
- 160 lux to the rear of switchgear in the Control building.
- 160 lux adjacent to the Battery Storage, Load Management Equipment, AC and DC panels.

17) Supply and Installation of Outdoor Lighting (LED) & Emergency Lighting (LED) Lighting in the switching station must meet relevant IEC standards.

18) Supply and installation of decorative LED street lighting for the connecting road (if any) after every 15-meter interval (distance).

19) All doors and windows shall be finished with aluminum frames and high-quality transparent 6 mm thick glass. Both indoor and outdoor surface finishing works of walls, roof, etc., shall be synthetic high-quality plastic paint and moisture-proof snowcem respectively, and treatment shall be made by lime terracing for rainwater leakage-proof of the roof.

7.12.2.2 SWITCHING STATION/ELECTRICAL WORKS:

1) Supply and installation of 03 (three) nos. 33 kV Incoming Feeders (to be installed at Grid Substation 33 kV Bus) comprising: 33 kV Outdoor Circuit Breaker (36 kV, 2500 Amps, 31.5 kA 3 sec VCB), LA & PI, DS, CT, Control cable, Cable termination kit, PCM & Signaling Panels, Supporting structures etc. In addition, for connecting the underground cable, the EPC have to provide 3000A copper bar for each phase that will be installed on steel structure supported by 2 (two) nos. 33 kV post insulator. The LA will also be connected to the copper bar. The length of the copper bar should not be less than 1.5 meters. All necessary cable connecting holes, appropriate copper lugs (800 sq. mm.), fixing nut bolts etc. should be within the scope of supply.

2) Supply and installation of 33 kV, GIS Indoor Switchgear with 3000A bus with KV Protection Control and Metering (PCM) in same 33 kV GIS Panel with Indoor Surge Arresters and other related accessories.

   - Incoming feeder with Line PT (2500A)-3 Unit
   - Outgoing feeder (1250A)-12 Unit
   - Bus Coupler with Riser (2500A)-2 Unit
   - Spare feeder (1250A)-1 Unit
   - 33 KV Bus PT Panel-3 Sets
   - Station Auxiliary Transformer panel (LBS OR VCB)-2 Sets

3) Supply and instillation of 02 (two) nos Station use Auxiliary transformer 200 kVA 33/0.415 KV. ONAN, Dyn-11 including 0 415 AV MCCB 4CX150 Sq mm PVC LV power cable, cable terminating kits with structures, ets complete in all respect.

4) Supply and installation of 03 (three) set (three nos in one set) 33 KV Bus Potential Transformer of ratio $33/\sqrt{3}/0.11/\sqrt{3}/0.11/\sqrt{3}$ kV, to be installed on the grid substation's 33 KV bus structure.

5) Supply and installation of Switchyard-grounding materials for whole sub-station area and equipment to be installed for grounding the neutrals of station transformers, their bodies, the lightning arrestor sets, the steel supporting structure, all indoor & outdoor panels etc. The grounding system is to be implemented on approved design Earth resistance of the switching station shall be less than 0.5 ohm.

6) Supporting steel RCC structure for connecting the XLPE Power Cable with accessories as required. The indoor 33 KV XLPE copper cables will be connected to 33 KV GIS panel by requisite cable termination kit. The outdoor cable terminations of the 33 kV cables (where required) will be heat shrink type and supported by steel structure.

7) 33 KV 2x1Cx800mm2 cable per phase will connect 33 kV GIS Incoming Breaker (Supply of Cable, Indoor and outdoor termination its and connection work is under this scope).

8) 33 kV 1x1Cx500mm2 cable per phase will connect 33 KV GIS Outgoing & Spare Breaker (Supply of Cable, Indoor and outdoor termination kits and connection work is under this scope).

9) 33 kV 3x1Cx95mm2 cable per phase will connect 33 KV GIS panel to Auxiliary transformer (Supply of Cable, Indoor and outdoor termination kits and connection work is under this scope).

10) Supply and installation of control room indoor Illumination with energy efficient LED light. The switching station control room building shall have an emergency automated DC lighting system in case of power failure.

11) Supply and installation of Fire Detection & Alarm System including firefighting equipment.

12) Supply and installation of IPTV Camera System.

13) Supply and installation of Exhaust Fan for battery room.

14) Supply and Installation of 06 (six) nos. Split type Air Conditioner of capacity 40000 BTU/Hr. including MCB and all other accessories.

15) Supply and installation of Control-Relay Panel for 33 KV Incoming Feeders at Grid Substation 33 kV Bus. Conventional protection to incoming feeders are to be provided. However, a total protection scheme must be prepared and approved before commencing work.

16) Supply & installation of GIS Panel for 33kV Incoming & Outgoing Line feeders of the proposed 33kV Circuits to be instated in the control room building.

17) Supply and installation of AC Distribution Panel and DC Distribution Panel with interlocking facilities.

18) Outdoor lightning protection system for the switching station shall be installed.

19) Supply and installation of Separate AC distribution Box, wall mounting for control room internal & external illumination switching extra power supply arrangement for testing purpose, different operation and maintenance use.

20) Supply and installation of switch boards to be installed in each room for functioning of fans, lights, Air cooler etc.

21) Design, manufacture, supply, installation and commissioning of Substation Automation System (SAS) for 33 kV system with provision for interfacing with SCADA System. The Substation Automation System (SAS) shall comprise full station and bay protection, control, monitoring and communication facilities. It shall enable local station control via PC by means of Human Machine Interface (HMI) and control software package and perform the necessary system control and data acquisition functions.

22) Supply and installation connection of Control Cables.

23) Supply and installation of Ni-Cd Battery and Battery Charger.

24) Supply and installation digital electronic sign board.
25) As-built drawings together with operation and maintenance manual, relevant IEC standards of the installed equipment shall be submitted.

26) Transportation of all equipment and materials, all installations, connections and testing, commissioning, inspection.

7.12.3 CONSTRUCTION OF 33KV GIS SWITCHING STATION IN BHOLA UNDER BHOLA ESU.

(Not limited but at least the following works to be done by the turnkey contractor)

7.12.3.1 CIVIL & BUILDING WORKS:

1) Indoor GIS switching station should be constructed at a minimum height of 1.0 meters above the highest flood level or 1.0 meters above the nearest highway/road level, whichever is higher. The Indoor GIS switching building will need approximately 550 square meter land inside the PGCB's Bhola 230/33 kV Grid Substation. Prior to designing and constructing switching station building, it is essential to conduct soil testing to assess soil resistivity and soil bearing capacity. The soil testing results will guide the final leveling, consolidation, surfacing, and compaction of the control room area.

2) The landscaping and gardening for the area adjacent to the control room building should be carried out. The layout plan for the landscaping work must be created and approved before commencing the work.

3) Construction of cable trenches including cable tray/rack for power cable and control cable (where required):

   a. Grid substation 33 kV bus to switching station Incoming.
   b. 33 kV outgoing cable laying inside grid substation & switching station compound.

4) Boundary wall and retaining wall need to be built around the proposed control room area .

5) RCC foundations are required for station transformers, switchyard towers, circuit breakers, and other equipment and structures.

6) 600 square meters complete two storied (with 3 storied foundation) Control room building (300 Sq-m each floor) shall be constructed. For the Control room building, the Cable trench space, Storeroom, Toilet, office room shall be installed on the Ground floor level (Clear Height 12'-0"), Control room, Battery Room shall be installed on the 1st floor level (Clear Height 14'-6")

7) A properly insulated False Ceiling suitable for the Air conditioning system shall be installed in the control room.

8) The construction of drainage and sanitary systems for the control room and the adjacent area shall be carried out.

9) Operation Keyboard. All Steel frame front cover glass with locking device, dustproof shall be supplied and installed.

10) A connecting road between the nearest highway/road and the switching station's main gale shall be constructed.

11) Approach roads from the main gate or existing road to the control room entrance and internal roads for adjacent area and parking area as required shall be constructed.

12) Construction of septic tank, soak well inspections pits sewerage piping, and facilities for toilets and bathrooms shall be carried out.

13) Supply and installation of overhead water tanks underground water reservoir and water supply system shall be done.

14) Supply and installation of Wall clocks operator working tables chairs, curtains for windows, Steel File Cabinets and Steel Almirah for record keeping in the control room.

15) Installation of switching station Name Plate and switching scheme MIMIC Display board.

16) Supply and construction of Power cable trench and control cable rack inside the ground floor of the control room building. Proper sealing is required of the control cable entry at Control Room building, to prevent water entering from the switchyard/outside to Control Room Building, preventing entry of rats and reptiles.

17) Supply and installation of office room, Control room indoor illumination. Lighting levels within the building must be generally designed to meet the requirements of IEC Standards, and meet the following specific lighting levels:

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18) Supply and Installation of Outdoor Lighting (LED) & Emergency Lighting (LED). Lighting in the switching station must meet relevant IEC standards.

19) Supply and installation of decorative LED street lighting for the connecting road (if any) after every 15-meter interval (distance).

20) All doors and windows shall be finished with aluminum frames and high-quality transparent 6 mm thick glass. Both indoor and outdoor surface finishing works of walls, roof, etc., shall be synthetic high-quality plastic paint and moisture-proof snowcem respectively, and treatment shall be made by lime terracing for rainwater leakage-proof of the roof.

7.12.3.2 SWITCHING STATION/ELECTRICAL WORKS:

1) Supply and installation of 02 (two) nos. 33 kV Incoming Feeders (to be installed at