



Annexure-II

SECTION – 2.32

Closed Circuit Television (CCTV)

1.0.0. INTENT OF SPECIFICATION

This section covers the requirements of adequate nos. of camera including complete system including Color IP Cameras, Digital Video recorder system, mounting arrangement for cameras, cables, LAN switches and other items/accessories required to complete the system with all hardware and software and necessary licenses as required for CCTV package of PSS-1 shall be in scope of PSS-1 contractor.

2.0.0. SCOPE OF WORK

The scope of work shall include engineering, supply, installation, testing and commissioning of the following:

Sl. No.	Area / Room Description	Type of Camera
1	All outdoor area including roof of all building, all equipments, all storage area, burn oil tank, transmission lines within PSS-1 boundary, Gates, boundary wall area such that no blind spot is left within PSS-1 area and its boundary/fencing.	High speed Dome type Day/Night IP PTZ cameras with adequate coverage and all latest features. Coverage of the cameras near fence area & security room of PSS-1 shall be at least 25 m from the PSS-1 fence/gate. Number of camera shall be decided during detailed engineering.
2	420kV GIS Building	High speed Dome type Day/Night IP PTZ cameras. Minimum 04 (four) nos. of such cameras shall be provided for GIS Building indoor area. Exact number of cameras required shall be decided during detailed engineering.
3	Control Room, Control & Relay Panel, SAS Room, Server Room, 33kV Prefab Building, LV Panel room, Electrical battery room, corridor, AHU room	Fixed Dome type cameras. Minimum – 02 nos. in each room. Exact number of cameras required shall be decided during detailed engineering.
4	All other indoor room / area expect above in this table & Toilet, Pantry, Conference Room	Fixed Dome type cameras. Qty: As required during detail engineering and security requirement of Owner.

All other associated recorder, servers, consoles, panels, hardware, cables/wires & softwares etc. as required for completion of CCTV surveillance system for the PSS-1 area and integrated up to Shift In-Charge room work station and HPCMS system in Main Control Room.



Tabular scope of supply is as per below:

Sl.no	Description	Bidder	Purchaser	Remarks
	Scope of Supply			
	Bidder shall follow the minimum requirements of the Owner as per the enclosed specification. However any other system which is not mentioned in the specification but required for completeness of the system and which is Standard engineering practice of the bidder shall also supplied by the bidder.			
1.	CCTV Cameras	√		
2.	Remote terminal Units	√		
3.	Network controllers and accessories	√		
4.	DVRMS Server (Redundant), Camera Servers	√		
5.	Operator workstations	√		
6.	Fibre optic cables, Co-axial cables, control cables, Data cables, power cables & any other cables with cable accessories such as cable trays conduits, supports etc as require for interfacing requirements	√		
7.	Junction boxes	√		
8.	Power supply (from PSS-1 UPS DB) as required for efficient operation of the system	√		
C	OTHERS			
1	Mandatory spares	√		As per specification Annexure C of GTS
2	Special tools & tackles	√		1 set as required. List to be furnished by the bidder in their bid proposal.
3	Commissioning spares and consumables	√		List to be furnished by the bidder in their bid proposal.
4	Recommended spare parts for a period of 3 years	√		List to be furnished by the bidder along with unit price in their bid proposal.
5	Shop test and inspection	√		Under Owner's Witness
6	Packing & Transportation to site	√		
7	Unloading at site	√		
8	Factory Acceptance Test (FAT), Site Acceptance Test (SAT)	√		Under Owner's Witness



Sl.no	Description	Bidder	Purchaser	Remarks
9	Color, paints and painting of Panels.	√		Exterior - RAL 7035 Interior - RAL 7035 However the same is subjected to Owner approval.
10	Erection	√		
11	Erection, testing and commissioning	√		
12	Panels/cabinets, DB's, base frame, bolts, nuts and gaskets etc. for installation	√		As required for Security surveillance system
13	Warranty for equipment	√		
14	Training for the O&M staff at site for 5 man-days	√		
15	I&C Engineers for 5 man-days	√		

2.1.0 Any other equipment / items not specifically mentioned in the specification but which are required for successful erection, testing, commissioning and satisfactory operation and maintenance of the Substation in all respects consistent with the best engineering practices are deemed to be included in the scope.

2.2.0 The scope of services shall include the following:

- Unloading and storage of all equipment and materials at site
- Erection, testing and commissioning
- Preparation and submission of drawings / documents in soft and hard form as per drawing / documentation submission schedule.
- Submission of Quality Plans and getting them approved by Owner
- Participation in project review / technical co-ordination meetings
- All necessary co-ordination with other vendors / Vendors on site for erection, testing and commissioning of equipment and accessories.
- Overall co-ordination with internal / external agencies
- Preparation and submission of all as-built drawings in soft and hard copies.
- Obtaining Owner's approval and written acceptance of satisfactory performance
- Collection of all site related data

3.0.0. Principal Element, System Design and Technical Specification of CCTV

3.0.1. The principal elements of a CCTV system are:

- Cameras.
- Mountings and covers.
- Communication media such as cables.
- Power supply and power cables.



- Switching and synchronizers.
 - Servers & Monitors.
 - Video recorders.
- 3.0.2.** The CCTV system shall be powered by UPS 230 VAC supply. No separate UPS is required for CCTV system.
- 3.0.3.** 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.
- 3.0.4.** The system should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users. The system shall use video signals from various types of indoor/outdoor CCTV colour cameras installed at different locations, process them for viewing on workstations/monitors in the HPCMS and Shift In-Charge work station and simultaneously record all the cameras after compression using H 264/MPEG 4 or better standard. Mouse/Joystick-Keyboard controllers shall be used for Pan, Tilt, Zoom, and other functions of desired cameras. The System shall provide sufficient storage of all the camera recordings for a period of 30 days or more @ 25 FPS, at 4 CIF or better quality using necessary compression techniques for all cameras. It shall be ensured that data once recorded shall not be altered by any means. The recording resolution and frame rate for each camera shall be user programmable. The surveillance VMS System shall operate on UPS 230 V, 50 Hz single-phase power supply.
- 3.0.5.** System must provide built-in facility of watermarking or Digital certificate to ensure tamperproof recording.
- 3.0.6.** All cameras may be connected through a suitable LAN which shall be able to perform in 400kV class sub-station environment without fail.
- 3.0.7.** All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password.
- 3.0.8.** Facility of camera recording in real-time mode (25 FPS)/15/12.5/10 or lower FPS as well as in any desired combination must be available in the system.
- 3.0.9.** Facility of Camera recording in HD (1280X720p), D1, 4CIF, CIF, VGA, as well as in any combination i.e. any camera can be recorded in any quality.
- 3.0.10.** System to have facility of 100% additional camera installation beyond the originally planned capacity.
- 3.0.11.** In order to optimize the memory, while recording, video shall be compressed using H 264/MPEG-4 or better standard and streamed over the IP network.
- 3.0.12.** System shall be triplex i.e. it should provide facility of Viewing, Recording & Replay simultaneously.
- 3.0.13.** The offered system shall have facility to export the desired portion of clipping (from a specific date/time to another specific date/time) on CD or DVD. Viewing of this recording shall be possible on standard PC using standard software like windows media player etc.



3.0.14. System shall have WAN connectivity for remote monitoring. Complete programming/work for remote viewing shall be in scope of the Contractor.

3.0.15. The equipment should generally conform to Electromagnetic compatibility requirements for outdoor equipment in EHV switchyards. The major EMC required for Cameras and other equipment shall be as under:

- i) Electrical Fast Transient (Level 4) – As per IEC 61000-4-4
- ii) Damped Oscillatory (1 MHz and 100 KHz) (level 3) – As per IEC 61000-4-18
- iii) AC Voltage Dips & Interruption/Variation (class 3) – As per IEC 61000-4-11
- iv) Electrostatic Discharge (Level 4) – As per IEC 61000-4-2
- v) Power Frequency Magnetic Field (level 4) – As per IEC 61000-4-8
- vi) Ripple on DC input Power Supply Port immunity test(level 4) - As per IEC 61000-4-17

Type test reports to establish compliance with the above requirement shall be submitted during detailed engineering.

4.0.0. Color IP Camera

4.1.0 All camera images shall be continuously recorded. System offered shall allow to record and hold camera images for a minimum period of 30 days. Facility for transferring camera images to separate recorders/ data storage devices and play back facility of the same shall be provided. Bidder shall also provide data storage devices to store the backup data for one year.

4.2.0 Camera image monitoring and viewing facility shall be provided at both Shift In-Charge room operating station and HPCMS at Control Room.

4.3.0 Alarm & Display monitors shall be provided in the operator stations of CCTV. PTZ (Pan, Tilt, Zoom) Cameras shall have:

- i. The cameras shall be rugged high speed PTZ dome cameras with inbuilt PTZ driver unit & RS 485 receiver unit, 1/4 inch image format fully performance color CCD dome cameras. These cameras should provide high resolution and high sensitivity suitable for operation in a Hybrid Park, both in natural and artificial sighted areas.
- ii. The cameras should have features as mentioned below:
 - a. Suitable for day and night-time surveillance having light intensity of Color: 0.5 Lux; B&W:0.05 Lux.
 - b. Manual or Automatic color/infra-red switching.
 - c. Automatic picture enhancement to give a balanced picture where there is too little/too much light.
 - d. Remote camera setup, with on screen menu display
 - e. Back light composition
 - g. Automatic white balance, with mode selection options
 - h. Contour correction and contrast compression control
 - i. Synchronization selection for Gen lock, external V-lock, Mains lock and internal free-running.
 - j. Cameras provided with auto IRIS lens, low lux density (0.05 lux or, better) suitable for functioning in darkness (night shot capability) and Infra-red illuminator.



- K It shall be possible to define at 128 selectable preset locations so that the camera gets automatically focused on selection of the location for viewing a predefined location.

iii. Detailed technical specifications of IP 66 PTZ HD Camera are as under:

- a. Imager Supply Interline transfer CCD, 1/4" image format.
- b. Image Sensor: 1/3 type solid state progressive scan CCD, WDR (High Definition)
- c. Security: Multiple user with password protection
- d. Effective Pixels: (PAL): Main Stream : 1280x720 , Sub Stream : 640x360, 320x280 selectable
- e. Compression : Dual Stream H.264 and MPEG 4 user selectable
- f. Signal System : 50 Hz
- g. S/N (signal to noise ratio) : Better than 50 dB
- h. Electronic Shutter : 1/60 ~ 1/10,000 sec. automatic or better
- i. Scanning System : Progressive/interlace
- j. Lens Size : Minimum 4.1 ~ 73.8 mm
- k. Lens Aperture : F 1.6 (wide) ~ F2.8 (tele), f=4.1 ~ 41.0 mm
- l. Panning Range : Complete 360 degrees (horizontal)
- m. Pan speed : Adjustable, 0.1 degrees / second ~ 250 degrees / second
- n. Tilt Range: Minimum 180° Tilt Rotation
- o. Tilt Speed: Adjustable, 0.1 degrees / second ~ 150 degrees / second
- p. Inbuilt storage: Camera should have inbuilt storage TF or SD format for recording and storing Pictures
- q. Horizontal resolution 470TVL in PAL B mode.
- r. Sensitivity (at f1.6-3.7) - 1 lux
- s. Light Range
- t. Signal-to-noise: >48dB.
- u. Dome Size 4.8"
- v. Pattern: 4 pattern, 240 s memory
- w. Optical Zoom 25 X
- x. Digital Zoom 8 X
- y. Power: 240V A C (From PSS-1 UPS)
- z. Working Humidity : 10 ~ 90%

iv. Camera Housing

- (a) All the cameras and accessories are to be housed in Weather Proof environmental housing made of aluminum. The housing with heater and blower installed should provide protection for camera/lens assemblies in the ambient temperature range of 0 deg. C to 60 deg.
- (b) The housing should also have thermostatically controlled heater kit, continuous duty blower kit, purge air arrangement, Window wipers available within the housing.
- (c) The minimum ingress protection for cameras shall be IP 66.



- 4.4.0 Fixed type cameras shall be dome type and with features mentioned below
- a) Image Sensor: 2-megapixel Progressive, 1 / 3" CMOS/CCD sensor, Minimum illumination 0.1 Lux.
 - b) Min Luminous: 0.5LUX(Color) 0.05Lux(Black)
 - c) Camera Enclosure Type : IP66 Grade
 - d) Iris/Focus: Auto/Manual
 - e) Video Compression: Dual Stream H.264 and MPEG 4 user selectable
 - f) Support Dual-stream: primary/secondary stream, H.264/MPEG 4 optional
 - g) Video Definition : Primary stream:1600x1200,1280x960,1280x720, Secondary stream:800x600,400x288,192x144
 - h) Video Parameters : Brightness, hue, contrast, saturation and image quality
 - i) Video Frame Rate : PAL: 1-25frames/second , NTSC:1-30frames/second
 - j) Video Compression BR : 32Kbit/S - 6Mbit/S
 - k) Video Output: One channel composite Streaming
 - l) Supported Protocols : TCP, UDP, IP, HTTP, FTP, SMTP, DHCP, DNS, ARP, ICMP, POP3, NTP, IPsec, UpnP, RTP, RTCP
 - m) Operating Temperature : -5 ~ +50°C
 - n) Operating Humidity : 10 ~ 90%

5.0.0. Servers

The Camera Server shall:

1. Manage live video from camera streamers
 2. Transmit live video to Operator Stations (Shift In-Charge Room & Control Room)
 3. Receive camera control commands from Operator Stations and then send the commands to cameras
 4. Store live video to hard disk
 5. Transmit previously stored video to Operator Stations
 6. Archive previously stored video to off-line storage media
 7. Retrieve archived video from off-line storage media
 8. Provide Video Analytics including Video Motion Detection
 9. Export the recordings into MPEG format so that it can be viewed using standard tools including Microsoft's Video Player.
- 5.1.0 The Camera Servers shall rely on the Database Server for all camera database information. Proprietary hardware platforms are not acceptable. The server shall also receive redundant signal from Master clock system which shall be in NTP protocol.
- 5.2.0 The Camera Server shall be able to operate with no performance degradation using the same hardware and operating system configuration of database server and also redundant same as database server.
- 5.3.0 Configuration of Operating stations shall be same as specified below with 29" sized LED monitors.

Operating Station shall have:

- On board Intel – Xeon quad core, 3.46 GHz processor with 1066 MHz bus with Hyper threading or higher.



- 4GB DDR3 RAM (min)
- 3 TB RAID 5 IDE Hard Disc Drive of 7200 RPM or higher
- 1024 MB Graphic Accelerator
- System chipset: Intel
- 2 x RS – 232 ports
- 1 x parallel port
- 4 nos. USB ports (2nos. on front side)
- 1 x 52X CD R/W Drive & 16 X DVD Drive
- 2 x Ethernet (10 / 100 / 1000MB) cards (Industrial Grade)
- UXGA graphics and monitor 1920 X 1080, 256 colors with MRPII compliant, viewing angle 178° vertical & Horizontal and fastest response time.
- 1 x windows XP Professional or latest & proven version of Windows OS with Multimedia
- Monitoring Option: Split screen 1,2,4,8,16,32 or more cameras
- Number of Video Channel: 32
- Number of Audio Channel : 32
- Playback option: search, still image capture
- Network Operation Capable: Using WAN and LAN
- Remote Internet Viewing: shall be provided using WAN or LAN routers
- Alarm/Event Recording Capable: yes, shall have built-in external alarm input/output ports minimum (8 in , 2 out)
- Ethernet adapter
- Third party operating system, graphical users interface and software, if required.
- Optical mouse
- Sound card
 - i. Internal speakers
 - ii. Wireless internet & Blue tooth Interface
 - iii. Redundant power supply (In built)
 - iv. General MS Windows latest, MS-Office Professional, Adobe
 - v. Acrobat, anti-virus McAfee or equivalent, AutoCAD etc.
 - vi. Application engineering & HMI software - to suit project Specific requirement
 - vii. All OWS shall be interchangeable

6.0.0. Software Features

- 6.0.1.** Digital CCTV control software should be capable to display and manage the entire CCTV system. It should be capable of supporting variety of devices such as cameras, video encoder, Servers, NAS boxes/Raid backup device etc.
- 6.0.2.** The software should have inbuilt facility to store configuration of encoders and cameras.
- 6.0.3.** The software should Support flexible 1/2/4/8/16/32 Windows Split screen display mode and scroll mode on the PC monitor.
- 6.0.4.** The software should be able to control all cameras i.e. PTZ control, Iris control, auto / manual focus, and color balance of camera, Selection of presets, Video tour selection etc.



- 6.0.5. The software should have user access authority configurable on per device or per device group basis. The system shall provide user activity log with user ID, time stamp, action performed, etc.
- 6.0.6. The users should be on a hierarchical basis as assigned by the administrator. The higher priority person can take control of cameras, which are already being controlled by a lower priority user.
- 6.0.7. It should have recording modes viz. continuous, manual, or programmed modes on date, time and camera-wise. All modes should be disabled and enabled using scheduled configuration. It should also be possible to search and replay the recorded images on date, time and camera-wise. It should provide onscreen controls for remote operation of PTZ cameras. It should have the facility for scheduled recording. Different recording speeds (fps) and resolution for each recording mode for each camera should be possible.
- 6.0.8. The software for clients should also be working on a browser based system for remote users. This will allow any authorized user to display the video of any desired camera on the monitor with full PTZ and associated controls.
- 6.0.9. Retrieval: The application software should allow retrieval of data instantaneously or any date / time interval chosen through search functionality of the application software. In case data is older than 30 days and available, the retrieval should be possible. The system should also allow for backup of specific data on any drives like DVD's or any other device in a format which can be replayed through a standard PC based software. Log of any such activity should be maintained by the system.
- 6.0.10. The Software shall provide the full functionality reporting tool which can provide reports for user login/logoff, camera accessibility report, server health check reports etc.

0.0.0 PTZ-Keyboards

The features of PTZ shall include:

- a) Fully functional dynamic keyboard/joystick controllers
- b) Controls all pan, tilt, zoom, iris, preset functions
- c) Control up to 255 units from a single keyboard
- d) Many preset options and advanced tour programming
- e) Compatible with all connected cameras

1	Key Application	wired keyboard control operation of PTZ functions for weatherproof dome cameras
2	Pan / Tilt / Zoom Protocol Languages Supported	Selectable
3	PTZ Data Transfer Baud Rates Supported	selectable 1200 bps / 2400 bps / 4800 bps / 9600 bps
4	Additional Features	dynamic joystick for smooth camera movements, preset location option for quick access to frequently monitored areas



8.0.0 Miscellaneous Items

All the required recorder, control system, panels, consoles, hardware, software, cables for power source etc. which are required to complete the CCTV etc.

9.0.0 SPARES, TOOLS & TACKLES

9.1.0 Spares

1. The Bidder shall include in his scope:
 - a) Commissioning spares as necessary.
 - b) Mandatory Spares
 - c) Recommended Spares
2. Bidder shall also state for each item of spares both mandatory and recommended, the normal expected service life.
3. The spares shall be delivered at the site well in time as per the schedule agreed during the award of contract well before the start up and commissioning of the system.
4. All spares supplied under this contract shall be strictly interchangeable with the parts for which they are intended to replace. The spares shall be treated and packed for long storage under the climatic conditions prevailing at site.
5. Each spare part shall be clearly marked or labelled on outside of the packing with the description as indicated elsewhere in the specification.
6. In all cases, containers or other packages are liable to be opened for examination as may be considered necessary by the Owner.

9.2.0 Commissioning Spares

Start-up spares (also termed as 'commissioning spares') are those spares which will be required during the start-up and commissioning of the equipment/ systems and until performance testing. It is the responsibility of the Bidder to supply all necessary spares as required until the equipment/ systems are handed over to the Owner. The price of the start-up spares should be included in the price of the respective equipment/ systems. An adequate stock of start-up spares shall be made available at the site such that the start-up/ commissioning of the equipment/ systems, performance testing and handing over the equipment/ systems to the Owner can be carried out without hindrance and delays. Bidder shall furnish the list of Start-up and Commissioning Spares to be brought by them to ensure smooth commissioning of the system.

9.3.0 Recommended Spares

In addition to the spares mentioned above, Bidder shall also furnish in the Schedule of Recommended Spares a detailed list of recommended spare parts for three (3) years normal operation with unit prices. The Owner reserves the right to buy any of the recommended spare parts as considered necessary by them.

9.4.0 Mandatory Spares



Refer Annexure C of GTS.

9.5.0 **Special Tools & Tackles**

Bidder must offer general tools and tackles and special calibration instruments required during testing/pre-commissioning, trial run, operation and maintenance of the system. A set of special tools and tackle which are necessary or convenient for erection, commissioning and putting into satisfactory operation, maintenance and overhauling of the equipment shall be supplied. The price of such special tools and tackles should be included in the price of the respective equipment/system.

The tools shall be brought in separate containers, clearly marked with the name of the equipment for which they are intended.

Bidder shall also note that the Owner, if required, shall approach directly the individual equipment manufacturers/ suppliers for procuring recommended spare parts. The Owner shall not necessarily procure these spare parts through the Bidder. All tools and appliances not listed in the respective lists and found to be necessary for maintenance of the Works shall be deemed to be included in the Contract Price. The tools shall be new and unused. These tools shall be a supplement to the tools available with the workshop, and shall be supplied in accordance with the Bidder's specific design and his experience.

10.0.0 **Power Supply:**

For CCTV cameras, Bidder shall provide 02 nos. UPS feeders from PSS-1 UPS with capacity as required for efficient operation of the system.

If the offered equipment is operating at voltage level other than available in the project, the Bidder shall provide all required hardware, within lump sum quoted price to make the offered system compatible with specified power supply arrangement.

11.0.0 **PACKING**

11.1.0 All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site. The Bidder shall be responsible for any loss or damage during transportation, handling and storage.

11.2.0 The successful Bidder/vendor shall prepare detailed packing list of all packages & containers, bundles & loose materials forming each & every consignment dispatched to 'Site'

11.3.0 All coated surfaces shall be protected against abrasion, impact, discoloration and any other damage. Surfaces which are damaged shall be replaced.

11.4.0 All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of valves, piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.



11.5.0 All equipment, especially electrical equipment, controls and insulations shall be provided with adequate protection against moisture / water.

11.6.0 The successful bidder shall prepare detailed packing list of all packages, containers, bundles and loose materials forming each and every consignment dispatched to 'Site'.

12.0.0 DRAWINGS, DATA AND MANUAL

12.1.0 To Be Submitted Along with Bid in three hard copies and soft copy in pen drive:

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

12.2.0 To Be Submitted After Award of Contract:

Sl. No.	Document title	Category
1.	Architecture diagram for CCTV monitoring System	Approval
2.	Technical data sheet of all items covered under BOQ	Approval
3.	Layout for CCTV monitoring System	Approval
4.	Bill of Material - Main Supplies	Approval
5.	Bill of Material - Mandatory Spares	Approval
6.	Power Distribution Diagram for the entire system	Approval
7.	UPS scheme drawing	Approval
8.	GA drawing of all items covered in the BOQ	Approval
9.	Mounting Arrangement drawing of all items	Approval
10.	Cable routing layout	Approval
11.	Test procedures	Approval
12.	Functional/Operational Write up	Approval
13.	Network wiring diagram	Approval
14.	GA of Panels and its Terminal details	Approval
15.	Foundation Plan & loading details	Approval
16.	Panel cutout details	Approval
17.	Manufacturing quality plan	Approval
18.	Field quality plan	Approval
19.	Test Certificates	Information
20.	O&M manual	Information
21.	Installation manual	Information

12.3.0 Drawing / documents distribution schedule will be firmed-up during finalization of Contract.



12.4.0 For all technical tables and diagrams, calculation results, drawings, test data and scales adopted in the design, the Standard International unit system (SI) as per International Standardization Organization (ISO) shall be uniformly employed.

12.5.0 All engineering documents and drawings shall be of international "A" series sizes (A0, A1, A2, A3 and A4).

12.6.0 All engineering drawings shall be supplies as AutoCAD soft copies.

13.0.0 TRAINING

Bidder will be responsible for providing training to Owner's personnel on offered systems at Bidder's Works / Bidder's Associate's Work. It shall include training operators in the use of system, in operation and maintenance of the equipment to the extent that the Owner's personnel can make maintenance of the systems.