TENDER DOCUMENT

NIT No. - DLI / C&E / WI-665 / 756

FOR


VOLUME- 2B

(Scope of Work & Technical Specification)

ENGINEERING PROJECTS (INDIA) LIMITED

(A GOVT. OF INDIA ENTERPRISE)
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TEL NO: 011-24361666   FAX NO. 011- 24363426
Scope of Work - CLOSED CIRCUIT TELEVISION SYSTEM

Scope of work for CCTV System & associated Works shall include but not limited to:

- Design, engineering, manufacture, shop fabrication, assembly, testing, inspection at manufacturer’s works, packing, supply, dispatch, transportation, delivery at site, loading/unloading/handling of Closed Circuit Television equipments/materials, all type of cables, required fabrication & assembly at site, completion of facilities, erection, testing & commissioning.

- Submitting Basic engineering, detailed engineering and reference category of drawings, operating software and documents in requisite copies for approval of BSP / MECON. Further the successful bidder will furnish final basic & detailed engineering drawings, manufacturing drawings of fast wearing items and non-standard items, as built drawings, erection drawings/documents, operating software, operation and maintenance manuals in soft editable format.

- Receipt of material, loading / unloading, storage, watch & ward, complete erection, testing, commissioning, handing over to BSP, demonstration of performance guarantee. Preparation and approval of erection survey / alignment schemes, grouting clearances, painting clearances, testing of welds, pressure testing protocols and other related site protocols.

- Supply of all commissioning & start-up spares, special tools & tackles and insurance spares. A list of such commissioning & start-up spares and insurance spares shall be indicated separately in the offer. Bidder shall furnish separately priced list for two years O&M spares.

- Specialized training to BSP’s / Consultant’s personnel for operation, maintenance, for smooth handing over shall be included in bidder’s scope.

- Testing of systems/ sub - systems and integrated testing as per applicable standards, accuracy and performance testing shall be carried out by the successful bidder on continuous basis along with associated facilities followed by commissioning.

- Getting BSP/ MECON approval of the drawings, documents to be submitted by the successful bidder, obtaining required approval from statutory authorities, providing
adequate personnel, equipment, tools & tackles for timely completion of the project.

- Providing all drawings and documents with operation & maintenance manuals.

- The scope of bidder shall be deemed to include all such items which although are not specifically mentioned in the specifications but needed to make system complete in all respect with all mountings, fittings, fixtures and standard accessories.

- All the required cables (Power, control, video cables etc.) for CCTV operation and associated accessories shall be in the bidders scope. Cables shall be laid on the existing / purchaser’s new cable route. Locations and tentative distances for cameras have been shown in CCTV Camera layout drawing (Drawing No. BSP-EPI-01-061-013-29-BE-03154 Rev-00)

240V +/-10%, 50Hz AC Power Supply shall be made available by purchaser at the following points:

  1) LTSS-2 (Despatcher-4)
  2) LTSS-3 (Despatcher-5)
  3) Despatcher-2
  4) Despatcher-3

Further distribution of power for the CCTV System and its accessories shall be in the scope of bidder.

- Bidder to consider in their offer the all type cables requirement for CCTV system and cameras with required accessories as per the distances given in Camera Layout Drawing (Drg No. BSP-EPI-01-061-013-29-BE-03154-Rev-00) Cables are to be laid on purchaser’s cable route. For Additional requirement of cables if any, bidder to quote UNIT RATE of cables in Price Bid (Volume-3).

- Drawings/Documents Submission:

  (1) Documents/Information to be submitted by bidder with offer:

    - List of commissioning spares and start up spares
    - List of special tools and tackles,
    - List of recommended spare parts for 2 (Two) years trouble free operation and maintenance ..
    - Technical specifications of CCTV componebts, and Catalogues/Leaflets.
- Reference list of customers for similar supply of items.
- Unpriced copy of price schedules (with technical bid).
- No deviation declaration to NIT technical and commercial terms and conditions and duly signed with date and stamped copy of NIT Vol-1, Vol-2(2A, 2B&2C) and Vol-3.

(2) Documents/Information to be submitted by successful for Approval/Reference

- General arrangement and layout drawings for CCTV System
- Mounting arrangement Drawings
- Bill of materials
- Technical specifications
- Pre requirements for Installation of CCTV system
- Cable and conduit layout drawings
- Earthing layout drawing
- Cable schedule
- Wiring Diagram and termination drawings.
- Technical data sheet of all components, cables; electronic devices etc. for CCTV System
- Total power consumption details
- Approximate weight of the equipment
- Internal test reports and certificates
- Performance check reports
- Test reports for degree of protection on enclosure of sensing element.
- Quality assurance
- Operation and maintenance manuals
- Other drawings/documents as per BSP/MECON requirement for the system and drgs as per the recommendation of manufacturer.

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Technical Specification: CCTV SYSTEM & ASSOCIATED WORKS

Total 20 Nos CCTV cameras with cleaning facility will be provided with monitors at Despatchers/ Control Rooms/HOD Rooms for extensive monitoring of Ore Handling Plant (OHP).

Microprocessor based CCTV system with motorized zoom camera, control units, 21 inch monitors to be located in Junction House Control room for monitoring of important areas like Gallery, J.H & other important area, as indicated in the enclosed layout drawing. Final locations/ change in locations if any, shall be as per the detailed engineering drawing.

The system consists of colour cameras (CCD type) with fixed/zoom lens, colour monitor console, water cooling jacket/ blower unit/ wiper & washer unit of the weather proof housing as required, remote controlled Pan & Tilt unit, Receiver Driver unit, matrix switcher, Digital Video recorder, camera mounting platforms / structures, control console with control units for complete control of the cameras. Inter connecting video and control cables, Video distribution amplifiers / Video cable equalizers (if required), & all other auxiliary equipment, connectors & erection accessories, including structures etc. as required for completeness of the system.

Power supply for CCVM system shall be obtained from nearby local power supply feeder by suitable MCB.

No. of cameras = 20

No. of monitors = 10.

For other technical details of CCTV system, equipment shall be as per the General Technical Specification (GTS) given below:
GENRAL TECHNICAL SPECIFICATION (G.T.S.) for CCTV System

01.00 General

The Closed Circuit Video Monitoring (C.C.V.M) System will be provided for comprehensive round the clock surveillance for control and supervision of technological processes at points which are difficult to be observed directly or which require monitoring from a remote control center by operational people.

The system consists of colour cameras (CCD type) with fixed/zoom lens, 21” TFT color monitor, monitor console, water cooling jacket, blower unit, wiper & washer unit of the weather proof housing, remote controlled Pan & Tilt unit, Receiver Driver unit, matrix switcher, Digital Video recorder, camera mounting platforms/structures, control console with control units for complete control of the cameras. Inter connecting video and control cables, Video distribution amplifiers / Video cable equalizers (if required), & all other auxiliary equipment, connectors & erection accessories etc. as required for completeness of the system.

02.00 System requirements.

The cameras will be of Charge Coupled Device (CCD) type and these will be mounted in such a manner as to provide continuous monitoring of the critical processes / operation of the shop floor as required.

The system will provide clear and sharp picture on monitors in industrial lighting conditions at any time of the day or night

The complete CCVM Systems will work on 240 V ± 10%, 50Hz ± 2 Hz, single phase AC supply. In case any other power source is required, the same will be arranged from the above available source. The CCVM system will be provided with an uninterrupted power supply system for feeding stabilized and continuous power supply to all equipment

All equipment for C.C.V.M systems covered in this specification will comply with the CCIR standards. All control functions related to the CCVM Systems comprising Cameras, Monitors, Water cooling jacket, blower unit and wiper & washer unit of the weatherproof
housing will be effected from the control units, which are to be installed in the control rooms of the shop.
All the CCTV Cameras shall be multiplexed to suitable number of monitors. The CCTV Cameras along with multiplexing & control shall be interfaced to the operator stations.

03.00 Equipment details

The C.C.V.M. system will comprise of the following.

- Colored cameras with vari focal length/motorized zoom lenses.
- Camera mounting platforms / structures.
- Water cooling jackets, complete with wiper and washer units, compressed air arrangement
- Remote controlled Pan & Tilt units.
- Receiver Driver unit
- Matrix switcher
- Key board unit
- Digital video recorder
- Control console
- Color video monitors
- Interconnecting power, video and control cables
- Video distribution amplifiers/ Video cable equalizers, as per requirement.
- Alarm annunciator
- All other auxiliary equipment, connectors, erection accessories etc. as required.

03.01 Camera

The cameras will be compact, of rugged design and suitable for industrial continuous monitoring applications.

These will be specially designed and tested to provide continuous good quality video output throughout wide variations in environment conditions like temperature, humidity, shock and vibrations and varying light condition prevalent in the industrial steel plant..

The cameras will use 1/3” format interline transfer CCD imager and
have virtually zero lag, no image burns and no geometric distortion. These will be of latest state of art technology ensuring high operational reliability.

The cameras shall deliver well defined, clear, high resolution colored picture, with sufficient contrast to allow for good object recognition even in poor light conditions. A highly sensitive automatic light compensation circuit will ensure constant video signal independent of wide variations in light levels.

The cameras will have long life and require virtually zero maintenance in adverse environmental conditions prevalent in the steel plant.

**The Cameras will also possess the following features:**

- High resolution.
- Low power consumption.
- Phase adjustable line lock facility.
- All controls like back focus, lens select, phase adjustment, power ON/OFF etc.
- The camera unit will be complete with all electronic circuitry, devices, components, control switches, standard mount for lenses, mounting assemblies etc. The mounting assemblies of the cameras will be individually selected depending upon the special requirements as per actual site conditions.

Color cameras of 1/3” format with Auto iris remote zoom focal lenses are envisaged to suit different requirements of site. The camera shall be color CCD type, high resolution of minimum 450 TV lines. All outdoor cameras shall be provided with sun shield.

- **Pick-up device** -- 1/3-inch format, interline transfer, CCD image sensor
- **Minimum illumination** – 0.01 lux at f 1.2
- **Signal to noise ratio** -- 46dB minimum
- **Electronic Shutter** -- Automatic, On/off selectable.
- **Video outputs** -- Composite video -1.0 V p-p, 75 ohm
  - **AGC** -- On/Off selectable
  - **Aperture Correction** -- Horizontal & Vertical
- **Synchronization** ---Line lock -for roll-free vertical interval
Switching -Crystal lock

- Connectors --Video out: BNC Video/DC-Iris connector: 4-pinEIAJ
- Operating Temperature -- as per location indicated
- EMC --CE/UL certification

03.02 Camera lens

The camera lens will be suitable for the camera on which it is to be mounted. The lenses chosen will be Auto iris remote zoom controlled so as to meet the operational requirements. The choice of lenses, their focal length and viewing angle will be judiciously done for effective monitoring suited to the specific application requirements.

Technical Parameter of Motorised zoom lens

<table>
<thead>
<tr>
<th>SL.</th>
<th>DESCRIPTION</th>
<th>Motorized Zoom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Make</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Model no.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type of lens -</td>
<td>Motorized Zoom</td>
</tr>
<tr>
<td></td>
<td>Lens format</td>
<td>1/3 “, ½”</td>
</tr>
<tr>
<td></td>
<td>Focal length and aperture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Iris type</td>
<td>Auto IRIS</td>
</tr>
<tr>
<td></td>
<td>Type of mount</td>
<td>C / CS</td>
</tr>
</tbody>
</table>

03.03 Camera mounting platform:

The camera mounting platform will be suitable for mounting the camera assembly on walls / column / structures as per the actual requirements at site and keeping in view the area to be covered by the individual camera. The mounting will be with adjustable support so as to have flexibility to move the camera assembly as and when required. Wherever necessary, structures / vertical poles to mount the cameras shall be fabricated.
03.04 Water cooling jacket for the camera.

At the locations where the ambient temperature is high, the protective camera housings will be provided with water cooling jacket to protect the camera against high temperature. Cooling water will be supplied to the jacket continuously to cool the camera and keep it fully efficient & operational.

Double walled stainless steel housing will be provided for protection of cameras from high temperature. Back cover of the water cooled housing will be detachable so that the camera can be taken out/installed from the rear for service and inspection. Piping for cooling water and purging air must be suitably protected against high ambient temperature/radiation heat. The glass panes of the housing will be resistant to influences like quick changes in radiation temperatures.

The cooling jacket will have temperature sensor to monitor the temperature of the camera, a toughened glass front, filter & an annunciator. Whenever the camera temperature crosses the upper threshold limit of the desired temperature there will be audio visual indication in the control room for the attention of operator.

Compressed air and a wiper & washer unit will be installed with the water cooling jacket to keep the front glass of the cooling jacket clean from dust & dirt.

The housing will have enclosure as per IP 65.

Technical Parameter

<table>
<thead>
<tr>
<th>SL.</th>
<th>DESCRIPTION</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material of housing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of camera mounting</td>
<td>C / CS</td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressed Air</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
03.05 Receiver Driver Unit

The receiver shall be able to receive pan & tilt, camera and lens positioning and adjust command signals from the operators keyboard through the CPU/Matrix and execute them. The unit shall generate the power for the enclosure, camera, zoom lens etc. Receiver driver unit shall comply min IP 65 for outdoor. The equipment shall be CE/UL certified.

The receiver driver unit shall withstand the temperature indicated for the corresponding area.

03.06 Pan and Tilt unit

The pan and tilt unit will comprise of pan & tilt head and control unit. The pan and tilt head will be remotely controlled from the control unit.

The pan & tilt head will be heavy/ medium duty type/light duty type, rugged in construction and smooth in operation. The unit shall be able to cater the load of weather proof housing with water cooling jacket, wiper & washer unit and compressed air pipe line arrangement. The unit will be used to cover large area of interest for surveillance in different directions, as required by the operator. The unit will be suitable for mounting on walls / column / structures / hanging from ceiling as per the site requirements. The unit will have complete freedom of movement throughout the entire pan & tilt scan. The unit will be completely sealed for all weather proof use.

The pan and tilt units will be designed so as to ensure long operational life. The units will employ electric motors with quick reversibility and dynamic braking characteristics, have rugged worm gears assembly to minimize backlash and ensure drift free operation. It will be possible with ease to reposition the cameras field of view at any time. The unit will have manual over ride on the auto mode to enable the operator to choose the area of scan as and when required.

The Pan & Tilt unit shall withstand the temperature indicated for the corresponding area.
A) Technical Parameter of Pan and Tilt unit

<table>
<thead>
<tr>
<th>SL.</th>
<th>DESCRIPTION</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td>Model no.</td>
<td>Angular travel in horizontal plane 0-355 deg.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Angular travel in vertical plane +/-90 deg.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating speed–Panning 6 deg./sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating speed – Tilting 3 deg./sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum load (Load rating to be compatible for camera, lens and housing fitted)</td>
</tr>
<tr>
<td></td>
<td>Braking</td>
<td>Mechanical friction type</td>
</tr>
<tr>
<td></td>
<td>Construction material</td>
<td>Main body – Aluminium casting</td>
</tr>
<tr>
<td></td>
<td>Whether heavy-duty/medium duty/light duty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Whether suitable for indoor /outdoor use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated temperature range</td>
<td></td>
</tr>
</tbody>
</table>

03.07. MICROPROCESSOR BASED MATRIX SWITCHER:

To control the C.C.V.M system microprocessor based matrix switchers are envisaged. The system shall have matrix switchers at control rooms.

At control rooms matrix switchers of suitable inputs and outputs and alarm interface units are provided for switcher to handle the alarm events.

The switcher system shall provide minimum the following basic features

- Full matrix switching.
- Synchronized video switching
- A logging printer port which provides a hardcopy printout of either the system status changes or system Tables and Sequences.
- Keyboard log-on/log-off with password protection.
- 16 character camera titling.
- Accommodation of alarm points.
- CE/UL certification
The matrix switcher must be modular in construction i.e. should have Main base having CPU, power supply and main bay, and required number of input and output cards must be put in the bay for configuring a solution. The system should allow multiple number of keyboards to be directly connected to it in star configuration. It should allow prioritizing the keyboards as per the requirement.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Inputs</td>
<td>-- as per bill of quantities</td>
</tr>
<tr>
<td>Video outputs</td>
<td>-- as per bill of quantities</td>
</tr>
<tr>
<td>RS-232 Ports</td>
<td>--1 each for PC, printer and alarm signals</td>
</tr>
<tr>
<td>Input voltage level</td>
<td>-- 0.5 V p-p to 2.0 V p-p, Composite Negative Sync</td>
</tr>
<tr>
<td>Gain</td>
<td>--Unity (75 ohm terminated)</td>
</tr>
<tr>
<td>Switching</td>
<td>--Cross point Matrix</td>
</tr>
<tr>
<td>Features</td>
<td>--Full matrix switching, any camera to any monitor</td>
</tr>
<tr>
<td></td>
<td>- Programmable switching sequences.</td>
</tr>
<tr>
<td></td>
<td>- Salvo switching capability</td>
</tr>
<tr>
<td></td>
<td>- P/T/Z control outputs in the form of Biphase/RS 485/RS-422 etc.</td>
</tr>
<tr>
<td></td>
<td>- min 40 character on screen display for time-date, camera number, camera ID, monitor or status information &amp; 16 character alarm titling</td>
</tr>
<tr>
<td></td>
<td>- With the keyboard, following P/T/Z controls shall be available:</td>
</tr>
<tr>
<td></td>
<td>a) Pan, tilt, auto pan and random pan</td>
</tr>
<tr>
<td></td>
<td>b) Zoom, focus and iris control</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>--as per locations indicated</td>
</tr>
<tr>
<td>Humidity</td>
<td>--0 to 95 % relative, non-condensing.</td>
</tr>
<tr>
<td>EMC</td>
<td>--CE / UL certified</td>
</tr>
</tbody>
</table>

**Alarm Interface units**

An additional alarm interface unit shall be also supplied along with the above switcher. The unit shall have the ability to automatically display video under alarm conditions. It shall accept upto 64 contact closures or logic level inputs from remote sensing devices. The unit shall also provide 8 relay closure outputs upon alarm conditions.

**03.08 Key Board for matrix switcher**

Keyboard is envisaged for full function, for system control and
programming at control rooms. The keyboard includes integral pan/tilt/zoom joystick for controlling cameras features.

Features
- Control of Matrix switcher
- Soft backlit keys with user friendly menu and easy to read display
- Joystick for P/T/Z control of camera
- Shall be interfaced to Matrix switcher for control of Camera selection and P/T/Z control.
- LCD display of complete menu for selection of various functions
- CE/UL certification

Connector
- RJ11 connector for matrix switcher (power/ data)
- Aux. power, for extended distances.
- RS-232 port for remote programming
- Other standard connectors.

03.09. DIGITAL COLOR MULTIPLEXER CUM RECORDER

This multiplexer and integrated digital recorder provides multi-camera recording and playback with the added capability of multi screen viewing. Programming is easily accomplished via front panel control keys and on-screen display menus.

The duplex multiplexer/recorder can encode up to 8/16 color video inputs on its internal hard drive while simultaneously displaying video in the full screen or any of the multi-screen modes.

GENERAL REQUIREMENTS

The multiplexer specified shall be designed to record (encode) and playback (decode) up to 8/16 color cameras. The unit shall also have the added capability of multi screen viewing.

In playback (DECODE mode), the multiplexer shall provide a full screen display of any of the sixteen previously recorded cameras or it can display a selection of any of the cameras in various multi-screen
modes

The multiplexer/recording shall allow instant access to critical recordings by alarm, time, date, and camera searches.

The multiplexer/recorder, in addition to camera video, shall provide the time & date, camera number, and a user programmable 16 character camera title, which is recorded.

The multiplexer/recorder shall provide, but not be limited to, the additional following features:

- On-screen menu programming,
- Sequencing of cameras,
- Video loss with on-screen indication,
- Freeze function,
- Action/Alarm output relay contacts,
- Password access protection.

The multiplexer/recorder shall use good compression technology for high quality video, and shall include a minimum hard drive capacity for storing data for 24hrs X 15 days.

The multiplexer/recorder shall include a SCSI-2 / USB port for archiving video to external media.

A 21” color monitor shall also be supplied along with above for viewing multiplexed / recorded video.

The multiplexer / recorder shall be designed for use as a desk top unit or may be rack mounted using an optional rack mount kit.

<table>
<thead>
<tr>
<th>Video Standard</th>
<th>--PAL, 625 line, 50 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Memory</td>
<td>--720H x 576 V</td>
</tr>
<tr>
<td>AGC</td>
<td>--Automatic or manually adjust for each video input</td>
</tr>
<tr>
<td>Inputs</td>
<td>--Camera: 8/16inputs; 16/32 BNC connectors. Automatic looping termination</td>
</tr>
<tr>
<td>Outputs</td>
<td>--min 2 composite monitor outputs</td>
</tr>
<tr>
<td>Recording</td>
<td>--extremely high quality video recording for 15 days storing capacity</td>
</tr>
</tbody>
</table>
Recording modes --Selectable from 0.1 IPS to real time recording, max recording speed 50 IPS for 16 cameras (max)

Resolution of recording --High, medium and low quality.

Input voltage level --0.5 V p-p to 2.0 V p-p, Composite Video signal

Display Modes -- On monitor A -Full, quad and various combinations of multi-screen viewing

Features --P/T/Z controls with keyboard
- Motion detection with direction sensing.
- Programming via included software
- Sequencing of cameras
- Video loss with on-screen indication
- Instant access to critical recording by alarm, time, date and camera searches.
- Display of time, date, camera number and user programmable 16 character camera title for viewing and recorded information.

Ethernet port (RJ-45) --For network video access, shall be provided. Remote viewer software to allow simultaneous access shall be also provided.

EMC --CE / UL certified

03.10. CCVM Monitors

The CCVM monitors will be suitable for industrial applications and compatible for the cameras. These will be of fully solid state type, modular in design, have low radiation and provide a bright, clear, well defined and high resolution picture display on the Screen.

All controls for power supply on/off, brightness, contrast, color, vertical hold, horizontal hold, etc. will be provided on the front panel behind the flip open protective cover for readily adjusting the video
signal. The input and output video connectors for coupling the video input/output to other equipment, DC restoration switch and power supply connections will be provided on the rear panel. The monitor will have easy access for servicing and other adjustments.

The video monitor will be housed in a dust-proof metal enclosure with anti-dazzling light shield. It will be suitable for rack mounting / mounting on control console / ceiling hang type as per the site requirement at a convenient viewing angle.

The monitor will be designed to produce high resolution.

**The monitor will have the following features:**

All controls for power supply on/off, brightness, contrast, color, vertical hold, horizontal hold, etc. Provided behind the flip open protective front cover.

Automatic degaussing at power on.

Desk type/rack mountable with rack mountable kits. Quick start. Easy access for servicing and adjustments.

**Technical Parameter**

<table>
<thead>
<tr>
<th>SI</th>
<th>DESCRIPTION</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model no.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture tube size</td>
<td>21”</td>
<td></td>
</tr>
<tr>
<td>Scanning system</td>
<td>PAL</td>
<td></td>
</tr>
<tr>
<td>Horizontal resolution</td>
<td>460 TV lines (Centre)</td>
<td></td>
</tr>
<tr>
<td>Vertical resolution</td>
<td>420 TV lines</td>
<td></td>
</tr>
<tr>
<td>Video input</td>
<td>1.0 V pp</td>
<td></td>
</tr>
<tr>
<td>Input impedance</td>
<td>75 ohms</td>
<td></td>
</tr>
</tbody>
</table>

**Controls:** Power on/off, LED pilot light, brightness, color, contrast, V: hold, H-hold, impedance – 75 ohm/ high SW, DC restoration SW etc.
03.11 Control Console

The control console shall house matrix switcher, Keyboard, Multiplexer & recorder and other control equipments, interfacing modules required for control of complete system. The console shall be of industrial usage, dust & vermin proof. It shall be located in control room. The console shall be of pre-wired ready for installation and commissioning. Required protections and cooling arrangements shall be incorporated. The equipment shall meet IP 54.

Control of blower unit, wiper & washer unit of the water cooling jacket, temperature indication of camera and audio visual alarm indication in case the temperature violates the desired limits shall also be housed.

03.12 Video cable equalizers

The video cable equalizers will be used to compensate for high frequency losses due to long runs of coaxial cable used between the camera and video monitor.

03.13 Surge Protection

Surge protection for video, power and control signals shall be given for cameras and associated equipment at both ends. The equipment shall protect cameras and associated equipment incase of surge. It shall be as per BS6651.

Required junction boxes and associated equipments shall be supplied to complete the installation in all respects.

Surge capability shall be of min 10kA
UL /CE listed

03.14. CABLES

For connecting the control room equipment with field equipment following cables are envisaged. Co-axial cable for video signal transmission, twisted pair shielded cable for controlling cameras are envisaged.
a) Co-axial cables are envisaged for video signal transmission for cameras which are up to 500 mts distance. Beyond 500 mts post equalizing amplifier shall be used.

b) Independent control and video cables are envisaged for these cameras.

c) Power cable can be looped for maximum 2 cameras only.

d) Booster amplifier shall be used wherever video signal is weak.

e) The following criteria shall be used for selection of cables.

- Power supply cable: min 2.5 sq.mm
  - Control cable: min 2.5 sq.mm

While designing cable layout and selection of multi core cable the following criteria must be satisfied.

- Minimum 20% of pairs shall be considered as spare subject to min one pair.
  - All cables shall be armoured and of FRLS type

03.14.01 Video Cable:

The specifications shall be as under:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center conductor size</td>
<td>7/0.4 mm Annealed Tinned Copper (ATC)</td>
</tr>
<tr>
<td>Di-electric material</td>
<td>Polyethylene (PE), White color.</td>
</tr>
<tr>
<td>Shield material</td>
<td>Copper braided</td>
</tr>
<tr>
<td>Jacket material</td>
<td>FRLS PVC BLUE</td>
</tr>
<tr>
<td>Armour</td>
<td>1.4 mm GI wire round</td>
</tr>
<tr>
<td>Outer jacket thickness</td>
<td>1.2 mm FRLS</td>
</tr>
<tr>
<td>Outer jacket</td>
<td>FRLS PVC BLUE</td>
</tr>
<tr>
<td>Nominal impedance</td>
<td>75 ohms</td>
</tr>
</tbody>
</table>

03.14.02. POWER SUPPLY CABLE:

The specifications shall be as under:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of cores</td>
<td>min 3 (three)</td>
</tr>
<tr>
<td>Conductor size</td>
<td>min 2.5 sq mm, 7/0.68 multi strand with standard annealed electrolytic</td>
</tr>
</tbody>
</table>
copper conductor.

Primary insulation -- PVC insulated of 85º C PVC as IS 5831 Type C

Thickness of PVC insulation -- 0.8 mm

Color code -- Red, Black and Green

Inner and Outer Jacket -- Extruded Flame retardant and 90º C PVC to IS 5831-Type ST2

Armoring -- Galvanised Steel Wire / flat as per IS1554 part-I

The above cables shall also have the following:

1) Fire retardant shall be as per standard IEC 332 part III Cat A.
2) The insulation grade shall be 600 V/1100 V as a minimum and shall meet insulation resistance, voltage and spark test requirement as per BS-5308 Part –III.
3) Armour over inner jacket shall be of galvanized steel wire/ flat as per IS5544 Part I.

03.14.03. TWISTED PAIR CABLE.

No of pairs -- as required

Conductor size -- 2.5 sq mm standard annealed electrolytic copper conductor.

Primary insulation -- Low density polyethylene (LDPE)/PE as per IS 6474

Thickness of insulation -- 0.5 mm

Pair shielding -- Aluminium backed by mylar/ polyester

Drain wire -- 0.5 sq mm multistrand bare tinned

Inner and Outer jacket -- Extruded flame retardant and 90º C PVC to IS 5831-type ST2

The cable shall be as per IS – 1554. Part – I.