TENDER DRAWINGS

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

FOR


VOLUME- 2C

(TENDER DRAWINGS)

ENGINEERING PROJECTS (INDIA) LIMITED

(A GOVT. OF INDIA ENTERPRISE)
Core-3, Scope Complex, 7, Institutional Area,
Lodhi Road, New Delhi-110003
TEL NO: 011-24361666 FAX NO. 011- 24363426
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**NIT No. DLI/C &E/WI-665/756**

### CCTV SYSTEM & ASSOCIATED WORKS

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1. CO-AXIAL CABLES ARE ENVISAGED FOR VIDEO SIGNAL TRANSMISSION FOR CAMERAS WHICH ARE UPTO 500 MTS DISTANCE. BEYOND 500 MTS POST EQUALIZING AMPLIFIER SHALL BE USED.

2. THE CCTV SYSTEM & SPECIFICATION OF DIFFERENT EQUIPMENT, COMPONENTS & CABLES WILL BE IN LINE WITH CONTRACT & GENERAL TECHNICAL SPECIFICATION.

3. THE EXACT LOCATION OF CCTV CAMERA WILL BE FINALIZED DURING DETAIL ENGINEERING.

4. THE TWO MONITORS AT HOOD'S ROOM WILL BE ABLE TO ONLINE MONITOR ALL AREA WHERE CAMERAS ARE INSTALLED. THE APPROXIMATE DISTANCE BETWEEN HOOD'S ROOM & DESPATCHER-14 WILL BE 200 MTR.
GENERAL SPECIFICATION
FOR
INFORMATION TECHNOLOGY
(GS – 12)

MECON LIMITED
RANCHI – 834002

No. MEC/S/1901/11/38/00/00/F1889/R2    JULY, 2007
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01 LEVEL- II AUTOMATION

01.1 CONTROL PHILOSOPHY

State-of-the-art Level-II process control automation system shall be provided for various plant units of Bhilai Steel Plant (Purchaser). The Level-II automation system shall be interfaced with the level-III system under purchaser’s scope.

At Level-I is the basic automation and field devices, which measures the process parameters continuously. At Level-II are the process models which cyclically calculate the desired set points from the Level-I inputs, confirms and downloads them through PLC/DCS/Integrated Control System for optimum quality and productivity. Some shop supervisory functionalities such as material specification, plant practice data, tracking, scheduling etc are included under Level-II system. The level-II system shall be connected to the Level-III system and other relevant plant units. All these systems shall seamlessly integrate over the plant wide TCP/IP based Ethernet network with fiber optics backbone (under purchaser’s scope).

The applications shall be modular, multi layered and real-time systems with facilities for secured remote web based access.

01.2 GENERAL

01.2.1 The tenderer shall provide complete and State-of-the-art Level-II automation system for the plant. The new system shall incorporate the latest open system technology with TCP/IP network.

01.2.2 The tenderer shall satisfy themselves thoroughly regarding hardware, networking and software specified in the tender document and take full responsibility for suitability thereof for output, reliable working as well as ease of operation and maintenance including replacement with minimum down time.

01.2.3 All equipment / systems shall be complete in all respects and any hardware, networking equipment and software not covered in the technical specification, but essential for proper design and operation, shall be deemed to be included in the scope of the tenderer.

01.2.4 All software shall be delivered in English language only.

01.2.5 Only licensed copies of operating system, system software, utility software, language compilers, database, development tool, application software including process model and/or any other software necessary for development of application software along with requisite number of user licenses shall be provided for each server.

01.2.6 Requisite number of licenses of operating system, utility software, front-end development tool and application software shall be provided for each client PC’s.

01.2.7 Model set-up (initialization ) data shall be provided.

01.3 SPECIFICATION OF EQUIPMENTS AND SOFTWARE

The general specification for equipments and software are given below:
01.3.1 Hardware

1. SERVER TYPE- I

Servers excluding web server shall conform to the following minimum specification:

- Main Memory – minimum 4 GB DDR SDRAM upgradeable to 32 GB
- Minimum 146 GB x 4 hot pluggable SCSI 15000 rpm hard drive
- RAID 0 +1 or RAID-6 features
- External Hard Drive for Backup (Min 200GB) – 1 No.
- DVD- Writer
- DVD- ROM
- DAT Drive 80 GB
- 10/100/1000 MBPS Network adapter teaming (minimum two numbers)
- 19” TFT LCD monitor with multimedia keyboard and optical mouse
- Redundant hot swappable power supply. If a power supply unit fails, operation shall continue with the remaining power supply without any disruption.
- Redundant fan
- 4 high speed USB ports (2 in front), 2 serial ports, 1 parallel port, 1 PS/2 port, keyboard interface and console interface.
- The main memory and hard disk shall have at least 50% of reserve capacity at full load. Additional main memory and hard disk shall be provided to meet the above criteria if required. However minimum main memory and hard disk shall be provided as specified in the technical specification.
- CPU scaleable by 100 %. Enough Main Memory (RAM) with free slots to scale it up by 100 % by adding memory
- Antivirus Software with minimum 3 years up gradation license.
- Two fibre channel host bus adapter for connecting to SAN
- 64 bit processors
- Processor shall be minimum from following configuration
  - Two way Intel 64 bit Xeon dual core processors (minimum 3.2 GHz with 2x2 MB L2 cache and 1066 MHz FSB) or equivalent
  - Four way Itanium II 64 bit processor (minimum 1.6 Ghz with 4 MB L3 cache and 533 MHz FSB)
  - Two way 64 bit AMD Opteron dual core processors (minimum 2.8 GHz with 2x2 MB L2 cache)

2. SERVER TYPE- II

Xeon based Web servers shall conform to the following minimum specification:

- 64 bit Intel Xeon dual processor (min 3.0 GHz with 1 MB L2 cache and 800Mhz FSB) or equivalent AMD Opteron server
- Main memory – minimum 2 GB expandable up to 16 GB
- Minimum 146 GB x 2 SCSI 15000 rpm hard drive.
- RAID 5 features
- DAT drive of 80 GB
- DVD- Writer
3. Storage Area Network (SAN)
Storage Area Network (SAN) system wherever required shall be as follows:
- Dual fiber channel RAID controller
- 146 GB x 6 (15000 rpm) fiber channel SCSI Hard disk drive (Hot Swap disk)
- RAID 0+1 and RAID-6 controller
- Minimum 8 port storage area network switch
- Required software as applicable for storage area network such as SAN management software, data replication, volume and file management software.
- Redundant RAID controllers
- Redundant Hot pluggable power supply
- Redundant Hot pluggable Fan
- Facility for taking backup

The location and size of the plant server room shall be decided during detail engineering stage.

4. Client PCs:
The PC shall conform to the following minimum specifications:
- Pentium IV or equivalent with 3.0 GHz (min) cycle time with Hyper Threading Technology
- 1 GB main memory – DDR2 RAM
- 80 GB hard disk
- 1 No. 3.5” floppy drive
- 1 No. DVD-ROM/ CD R/W Combo Drive
- 19” TFT LCD colour monitor
- Multimedia keyboard
- Optical mouse
- 10/100 MBPS Ethernet Card
- 4 USB ports (with minimum 2 in front side), 2 Serial ports, 1 Parallel port, 1 PS/2 Port, keyboard interface, VGA interface
- Graphics accelerator card
- Windows XP professional with service pack 2 or latest with media CD
- Antivirus Software with minimum 3 years upgradation license.
5. Laptop:
The laptop shall conform to the following minimum specifications:
- Pentium IV mobile or equivalent with 1.5 GHz (min) cycle time
- 512 MB main memory – DDR2 SDRAM
- 80 GB hard disk
- 1 No. CD R/W/ DVD-ROM Combo Drive
- Integrated wireless LAN 802.11b/g
- Multimedia keyboard
- Optical mouse
- 10/100/1000 MBPS Ethernet Card
- 4 USB ports, 2 Serial ports, 1 Parallel port, 1 PS/2 Port, keyboard interface, VGA interface
- Graphics accelerator card
- Windows XP professional with service pack 2 or latest with media CD
- Antivirus Software with minimum 3 years upgradation license.

6. A3 coloured laser printers:
- A3 and A4 Coloured printing
- 16 ppm, heavy duty
- 1200 x 1200 dpi
- Postscript and barcode capability
- Network printing capabilities with hardware (network interface card)
- Interface: Centronics and USB

7. A3 Black and white laser printers:
- A3 and A4 printing
- 21 ppm, heavy duty
- 1200 x 1200 dpi
- Postscript and barcode capability
- Network printing capabilities with hardware (network interface card)
- Interface: Centronics and USB

8. A4 black and white laser printers:
- 14 ppm heavy duty
- 1200 x 1200 dpi
- A4 black and white printing
- Postscript and barcode support
- Interface: Centronics and USB

9. A4 black and white combi laser printers:
- A4 printing
- Min. 20 ppm
• 1200 x 1200 dpi
• Copying and scanning capabilities
• Fax functionality
• Network printing capabilities with hardware (network interface card)
• Interface: Centronics and USB

Industrial enclosures which shall maintain dust-free environment and temperature of 22°C +/- 2°C at an ambient temperature of 50°C shall be provided for housing all PCs not located in air-conditioned environment.

Power distribution boards, switches, emergency switches, and power cabling for supplying power to computer equipment shall be provided.

Location of server room, PCs/printer and other peripherals shall be decided at detail engineering stage.

Hardware shall be of latest prevailing version.

01.3.2 Network Configuration

1) The TCP/IP (with full quality of service -QoS features) gigabit Ethernet network shall be essential for the implementation of the process control system and interfacing with Level-III system of the purchaser. The gigabit plant LAN shall have multimedia capability with multiple concurrent video conferencing with panning and zooming. Necessary connectivity shall be provided for plant wide gigabit network (under purchaser’s scope). Communication link with redundancy shall be provided between Level-II and Level-I system. Necessary hardware, software and network equipments shall be provided for the same.

2) Methodology for assigning the actual IP address for equipments shall be finalized during the detail design stage.

3) Adequate number of switches with necessary fiber module will be available through plant wide gigabit network (under purchaser’s scope) in the server room of respective new shops(upcoming) to facilitate communication with other shops and the Level-III system(under purchaser’s scope). None of the switches/hubs of the plant wide network shall be used for connecting the servers/clients of the Level-II automation system. The necessary connectivity of new LAN of different new shops with plant wide network shall be provided by the Tenderer.

4) The network shall be designed to support multi-vendor communication based on international standards organization’s open system interconnection standard (OSI). It shall be easily expandable to keep pace with growing application requirements.
5) The LAN shall be based on 1000 Mbps (TCP/IP gigabit Ethernet) network with single mode fiber optic cable and Cat 6 UTP (unshielded twisted pair)/ STP (shielded twisted pair) cable as the medium of communication. Cat 6 cable may be used inside the control rooms/buildings for short distances (limited to 90 meters) wherever required. Where as, for the clients located outside the building premises or for longer distances FO cable shall be used to provide the connectivity.

6) The actual cable length of fiber optics cable and Cat 6 UTP/STP cable shall be calculated only at the detail engineering stage.

7) At each of the client location, the PCs shall be connected through Information Outlets. There shall be enough provision for additional clients in future. PCs and the network equipment shall be powered from 5/15 ampere UPS socket outlets with proper Earthing. The information outlets shall be connected to the network switch. Switches shall be connected point-to-point making a ring of redundancy. Network cable shall trace separate/ alternate routes for making ring of redundancy. 100% redundant Fiber module shall be provided in each switch. Number of switches shall be decided during detail engineering stage.

8) Clients and servers located at designated places shall be connected through a structured cabling of single mode fiber optic and Cat 6 UTP/STP to form a gigabit LAN. Servers shall be connected using 1000 Mbps network interface card port of server and 1000 TX port of switch in a structured fashion using information outlet. The FO cable shall be of minimum 6 core single mode with heavy duty PVC sheathing and shall be laid in cable tray/trenches /pipe away from High Tension lines running between the various designated buildings / control rooms.

9) Supplier shall provide spare racks for all the cable trays at all the places.

10) Indoor cabling between switch and PCs shall be of Cat 6 UTP/STP cable in PVC pipes in a structured fashion from information outlet to patch panel and from patch panel to switch in wall mounted racks. For shop floor over head laying of Cat 6 UTP/STP cable medium duty GI conduit shall be used.

11) All pulpits, control rooms, shift rooms including maintenance post and designated rooms in administrative buildings shall have network connectivity

12) The minimum specification of the Layer 2 switches shall be:
   - Modular and Scalable with full expansion capability managed L2 Switch
   - Configurable up to 8000 MAC addresses with Power over Ethernet
   - Switching Fabric >= 8 Gbps.
   - Forwarding rate >= 6 Mpps
   - Redundancy
- Redundant Power Supply
- Redundant Switching fabric

Protocols/Standards support:
- Ethernet IEEE 802.3, 10 Base T
- Fast Ethernet
- Gigabit Ethernet-(IEEE 803z, 802.3ab)
- 802.1 p/q - VLAN Tagging
- 802.3x - Flow Control
- Port Mirroring
- L2, access control filters.
- Rapid Spanning Tree Protocol (RSTP)(802.1w)/ equivalent
- Multiple Spanning Tree Protocol (MSTP)(802.1s )/ equivalent
- Bandwidth aggregation of up to 8 Gbps through Gigabit Ether Channel technology
- 802.1x - IBNS-Identity Based Networking Services
- Port Aggregation Protocol (PAgP )/ equivalent
- Link Aggregation Control Protocol (LACP )/ equivalent
- Unidirectional Link Detection Protocol (UDLD). )/ equivalent
- Up to 32 VLANs per switch
- 128 spanning-tree instances per switch.)/ equivalent
- Per-port broadcast, multicast, and unicast storm control
- IGMP (Internet Group management protocol)
- Multicast VLAN Registration/ equivalent

Network Management features:
- Web based
- Telnet and TFTP access
- RMON
- SNMP agent

Architecture Features:
- Layer 2 switching (managed)

Quality of Service (QoS)
- 802.1 p prioritization with minimum 4 priority queues
- Provision for IP telephony & VOIP support
- Differentiated services as defined in RFC 2474
- Traffic policing
- In-profile and out profile packet making
- Traffic shaping
- Integrated services for client and server applications as defined in RFC 1633
- RSVP signaling (RFC 2205)
- Guaranteed service(RFC 2212)
- Controlled Load service (RFC 2211)
- RAPI shared library for application
Expandability

- Minimum 4 slots shall be available for future expansion

All equipments shall support TCP/IP with full QoS features.

01.3.3 System Software

01.3.3.1 Operating system for server

Process control servers shall have operating system with real time features. All process control servers shall have preferably UNIX based O/S. However, Windows Server – 2003 or latest prevailing version can be considered in case application software package supplied by tenderer does not support UNIX based OS.

01.3.3.2 Utility Software:

- Language compilers like C/C++ for servers/clients for development of application software (wherever required).
- ORACLE 10g (or latest version) with RAC (real time clustering features) - Relational data base management system for data base server, process control server, standby server (wherever required)
- Web server software
- Front end development tools for GUI (preferably MS .NET, Visual Basic)
- Any special software /development tool necessary for development of application software including models, graphics for server/clients.
- Any special software /development tool necessary for development of web based applications.

01.3.4 Application Software - General

01.3.4.1 The general features of the application software are given below:-

- Variable names and all comments used in the application software shall be in English language only.
- The latest software shall provide easy to use user interface with multi windowing support.
- Application software shall have menu driven form/display.
- Uniform software design and programming standard shall be used for all automation system.
- Ease of software maintenance, so that parameters can be changed without changing the source code. No hard coding shall be allowed.
- Error logging system shall be provided in the application software
- The application system running on clients shall be developed under a common software platform, with multi-windowing capability and shall have following features:
  - Easy to use user interface
  - Display of real time process value
  - Process and equipment control parameters
• Menu driven forms
• Display screen for equipment/plant status at multiple places
• Data entry/change of control parameters
• Generation of reports
• Display of alarms
• Continuous logging and continuous hard copy printout of all alarms, process data, set points, equipment failure etc. as necessary.

01.3.4.2 Data Logging and Recording into History File (Logs and History)
The system shall perform data logging of process and set values. One-year data shall be kept in database. Other data shall be backed up for historical purposes. It shall be possible to retrieve the data as and when required. Actual duration of log shall be decided during engineering.

01.3.4.3 Trending / Debugging
• Graphical display of set points and process values.
• Graphical trends of process values.
• Historical graphical trends

01.3.4.4 Communication with Level-III system (Under purchaser's scope)
Requisite data regarding production results, alarm logs, quality logs, delay logs, material usage information, maintenance details, any other necessary events & logs shall be transmitted to Level-III system. The details shall be worked out at requirement specification/detail engineering stage. In order to prevent the loss of data in case of a link failure, Level-II automation system shall be capable of storing these logs for at least fifteen (15) days and shall retransmit the same to Level-III system after communication link resumes. Necessary interface to receive production plan and any other information from Level-III system shall be provided.

01.3.4.5 Production and Quality reporting system
• Recording of periodical production target
• Recording of production
• Generation of MIS reports
• Generation of periodical deviation report
• Generation of Test and Inspection reports

Necessary Internet connectivity will be provided through plant wide gigabit network (under purchaser’s scope) to achieve the secured web based access.

01.3.4.6 Alarm logging, Display and Print out
The computer shall monitor alarm conditions for the parameters monitored, display it on a PC, log it and generate printouts as and when required.
01.3.4.7 Operator Interface
Operator interface shall be provided for visualization and over-riding with appropriate security in following areas:-
- Control pulpts
- Computer room
- Laboratory
- Shift In-charge
- Managers

01.3.4.8 Clock Synchronization
Tenderer shall designate a time server which shall synchronize with specified clock source of existing plant wide network. All systems of the unit / package shall synchronize to this designated time server. Necessary hardware and software shall be provided for clock synchronization of all computers, network equipments and Level-I system. There should not be any data loss or application error during clock synchronization. The tenderer shall specify the clock synchronization interval.

In case of linkage failure with the specified clock source of existing plant wide network, tenderer shall provide clock synchronization between level-I and level-II system.

01.3.4.9 House Keeping
Software shall be provided to perform housekeeping services such as archiving taking backups / restoration of data from backup/archives etc.

Complete backup (including setup data, tuning data, etc.) shall be provided after the acceptance of hardware and software and tenderer shall restore the backup and run the server with restored copy.

Automatic deletion of temporary files (generated by application software) shall be provided.

The software offered shall fulfill all the requirements as specified in technical specification. Any additional software, utilities and protocols for meeting the project requirement and system performance shall be provided at no extra cost.

The tenderer shall fulfill all requirements of the application software as per technical specification (partially described here above) and process & production requirements.

01.3.5 Operating Environment
All hardware and networking equipment shall operate under the following environment:
- Temperature up to maximum 50° Celsius.
- Relative humidity up to 90%.
· Voltage range : 230 V (+/-) 10 % or as prevailing in purchaser’s premises.
· Frequency range : 50Hz (+/-) 0.1% or as prevailing in purchaser’s premises.
· Earth to neutral shall be 5 V
All equipment shall run continuously.

01.3.6 Communication Cable:
Communication cable for connecting server, PCs, printers (local as well as remote), PLC/DCS/ICS, any other instrumentation system shall be provided by the supplier.

Specification of Fibre Optic Cable (SMF Outdoor)
- Single Mode fiber 9µm/125µm
- Attenuation@1310nm <= 0.35dB/km
  @1550nm <= 0.25dB/km

01.3.7 Cable laying - as required for
- Communication cables
- Power Cables in the computer premises for individual equipment

01.3.7.1 Cable laying method:
UTP/STP cable laying & termination:
1) For indoor surface cable laying, medium duty PVC channel/pipe (ISI) of adequate size shall be used.
2) For shop floor overhead cable laying, medium duty GI conduits shall be used. The conduits shall be laid along the structural columns, girders, trusses etc. and shall be clamped properly at every meter of the pipe run.
3) The cables shall be dressed and terminated in accordance with the recommendations made in the relevant TIA/EIA standard document, manufacturer’s recommendation and/or best practices.
4) Cable shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack.
5) Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed clearly without removing the bundle support ties. Cables shall be properly marked and distinctively coloured for ease of identification.
6) An axial spacing of 150 mm (minimum) shall be maintained between power and network cable.
7) Cables shall not be attached to ceiling grid or lighting support wires.
8) Holes in walls, ceiling etc. shall be made and plugged to their original finish after drawing the cable.
9) Adequate heat insulation shall be provided for cables passing through hot zone.

01.3.7.2 Fibre optic cable laying & termination
1) GI pipes shall be used for exposed FO cable laying in plant shops.
2) GI pipes shall be firmly supported in position by means of heavy gauges saddles either screwed in concrete/brick walls using suitable plugs or screwed to MS brackets/cleats welded on to building structures. The spacing between the supports for both horizontal and vertical runs shall not be more than one meter for straight runs. At bends or termination to junction/pull boxes, the nearest support shall be within 300 mm from such fittings.

3) Exposed pipes shall run parallel or perpendicular to column/building lines to match the existing architectural arrangement.

4) The fibre stack shall be neatly coiled within the fibre termination panel. No slack loops shall be allowed external to the fibre panels.

5) Each cable shall be individually attached to the respective termination panel by mechanical means.

6) All network cabling shall be structured, tested and certified.

7) Each fibre cable shall be stripped upon entering the termination panel and individual fibre routed in the termination panel.

8) Each cable shall be clearly labeled at the entrance to the termination point. Cables labeled within the bundled shall not be acceptable. Cables shall be properly marked and distinctively coloured for ease of identification. GI pipes housing the FO cables shall be heat insulated in areas subjected to heat.

9) Dust caps shall be provided on the connectors and couplings.

10) GI pipe shall be used for routing cables embedded through concrete foundation/floors/walls generally in plant buildings. GI pipes shall be medium gauge, hot dip galvanized electric resistance welded, screw type conforming to IS: 1239(part-I) latest revision. All pipe fittings shall conform to IS: 1239(lPart-II) latest revision.

11) Underground cable shall be laid generally about 1.0 meter below the finished ground level and shall be provided with at least 75 mm sand cushioning both at top and bottom with brick top cover and sand filling for mechanical protection. Where power and network cables run side by side, the axial spacing shall not be less than 300 mm. Identification flags/ cable marker for underground cable laying shall be provided. Inspection pit at appropriate distances shall be provided for under ground cables.

12) The excavation of trenches shall be done straight as far as possible. Width of the trench shall be in accordance with the number of cables to be laid but in any case shall not be less than 300 mm.

13) After cable laying , the trenches shall be back filled in layers with each layer being well rammed, consolidated and sufficient allowance made for settlement. In case of road crossing, the damage to the road done shall be made good to its original finish. For crossing of road, railway tracks etc the cable shall be laid in GI pipe.

14) In each cable run, some extra length shall be kept at suitable points to enable one or two straight through joints in future. When a number of cables are laid together, the extra cable length shall be adjusted to stagger the straight through joints.

15) Adequate heat insulation shall be provided for cables passing through hot zone.

01.3.8 Power Supply System

The power supply system shall comprise of following:
• Power Cables, Power distribution Board – as required.
• Circuit Breakers etc. - as required
• Local UPS - if required such as Switches, etc.

01.3.9 Earthing system
Earthing of the computer system (server and PCs) and associated peripherals at the server room, control rooms, different locations (to be finalized at detail engineering stage) including civil work (earthing pit) shall be provided as per relevant IS.

01.3.10 Furniture
Suitable furniture for the computer equipment’s shall be supplied. The furniture of reputed make shall include tables, racks and chairs (at least one table & chair for every server & client) etc. for equipment and operators, storage cupboard, book shelves, shoe racks, maintenance workbench, etc. in sufficient numbers. Necessary storage cupboard shall be provided in server rooms for storing manuals etc. Aesthetically designed consoles shall be provided for servers in server rooms, in place of tables. Servers and switches shall be housed in suitable enclosures.

1.3.11 Spares & Consumables

1.3.11.1 Commissioning spares
All commissioning spares along with list shall be provided as per requirement.

1.3.11.2 Operating Spares
Two years operating spares list shall be provided.

1.3.11.3 Consumables
The Tenderer shall provide all consumables as required for installation, successful commissioning and demonstration of plant Performance Guarantee parameters at their own cost. The consumables list along with quantity shall be provided.

1.3.12 Minor Civil Works - as required

1.3.13 Tools and Tackles

• Test equipments, tools, etc. for all relevant hardware and/or software systems.
• Test and maintenance equipment shall be provided for maintenance and troubleshooting of FO cables.

01.4 Training
The following training shall be imparted for Level-II automation system:

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operating System, utility software, debuggers, web server</td>
</tr>
<tr>
<td>Sl.No.</td>
<td>Item</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>Oracle Database</td>
</tr>
<tr>
<td>3</td>
<td>Development tool</td>
</tr>
<tr>
<td>4</td>
<td>Communication Software</td>
</tr>
</tbody>
</table>

All the Training to be conducted by OEM or its authorized training partner at a fully equipped training center with facilities where extensive hands-on exercises can be performed with system similar to one under supply. Curriculum, duration and number of participants for each program shall be finalized in consultation with purchaser at a later stage.

**01.5 OTHER OBLIGATION OF TENDERER**

01.5.1 Requisite diagnostic programs/tools, test equipment and all documentation for hardware and software shall be provided.

01.5.2 Preparation and submission of all relevant drawings and documents for information/approval.

01.5.3 Software maintenance and updates as required for successful operation of the systems.

01.5.4 Purchaser will have an option of purchasing the latest hardware/software at the time of approval of system configuration during detail engineering stage. It shall be obligatory for the tenderer to bring to the notice of the purchaser, the latest information on product available along with their recommendations.

01.5.5 The system shall be upgraded in case it does not meet the capability requirements to meet the performance guarantee of total system without any extra cost.

01.5.6 The tenderer shall be responsible in case any hardware or software supplied by them infringes patents. The tenderer shall indemnify the purchaser against any damage or penalties on this account.

01.5.7 All tools and testing equipment required for installation and commissioning of the complete system shall be supplied.

01.5.8 Application software shall have built-in features of model tuning to take care of local conditions at site. It shall allow further model tuning with on line production data after successful commissioning.

01.5.9 Test certificates and details of test procedures shall be furnished.

01.5.10 The functional responsibility, of the project includes collection and measurement of all data required for various functions.

01.5.11 The switches/gateways/bridges for 100% availability for communication with Level-I automation system shall be provided by the tenderer.

01.5.12 Software implementation methodology:
   - The following methodology shall be adopted for the implementation of the application software at basic and detail engineering stage:

01.5.12.1 Submit documents and information at both basic and detail engineering stage.

01.5.12.2 Prepare requirement specification and submit to the purchaser for approval.

01.5.12.3 Discussions with the purchaser and/or his designated consultant.

01.5.12.4 Incorporate comments, prepare revised requirement specification and submit for approval.
01.5.12.5 Obtain approval of revised requirement specification.
01.5.12.6 Prepare System design document, Submit system design for approval.
01.5.12.7 Obtain approval of system design.
01.5.12.8 Program coding, testing and installation.
01.5.12.9 Hot test including model tuning.

01.5.12 All drawings, designs, configurations, software, models etc. listed in TS and GTS are indicative and minimum only. Tenderer may suggest a better and more comprehensive solution.

01.6 WORK PLAN AND METHODOLOGY
The tenderer shall furnish the work plan methodology from the start of award of the contract to the completion of the contract, for approval by purchaser/designated representative.

01.7 ACCEPTANCE TEST PROCEDURE
Provisions shall be made for off-line testing of Level-II systems prior to actual deployment.

All tests on software, hardware, network, communication, etc. shall be carried on the basis of a pre-agreed protocol clearly listing out steps involved in testing with its responsibility and minimum expected results as per specifications, engineering and other documents.

01.7.1 Computer hardware and Network
1) The acceptance test shall be carried out by the tenderer in the presence of the purchaser / representative of purchaser. The complete hardware shall be visually inspected to ensure the completeness of the scope of supply along with agreed specifications including erection and its fitness for operation. In order to qualify for acceptance, each of the computer system and all individual equipments including network equipments shall operate up to 24 hours a day for seven (7) consecutive days at an overall average up-time efficiency of 98.5%.
2) Besides the above acceptance clause for individual equipments, the integrated operation of the full system with entire network shall be demonstrated up to 24 hours a day for seven (7) consecutive days at an overall average uptime efficiency of 98.5%. The network shall be tested for attenuation and signal loss.
3) Up-time efficiency is defined as productive and error free use of equipment. Any unutilized time during the test shall also qualify as uptime provided there are no hardware and software malfunctions.
   Uptime efficiency shall be computed as under:
   \[
   \frac{\text{Uptime} \times 100}{\text{Total available time}}
   \]
4) The tenderer’s personnel shall successfully demonstrate network operations as per mutually agreed procedure in the presence of authorized representative(s) of the Purchaser during the testing period to ensure that the network operations confirm to the specified performance.
In case the required uptime efficiency is not obtained as mentioned above, the acceptance will be repeated for same time period.
5) A total period of 30 days shall be allowed for completion of acceptance test for hardware and network after start of acceptance test.

01.7.2 System Software and Application software:
Hot test shall be carried out for fifteen (15) continuous working days of error free operation. In case of detection of bug / errors, the test shall be restarted from zero date (beginning) after fixing of the bug. In case any change in application software is required to meet the process and production requirements, the tenderer shall do the same without any extra cost. Being turnkey supplier, the tenderer shall ensure that all requirements for the tests are met before the start of acceptance test.

01.7.2.1 Hot test:
1) Hot test shall be carried out after one month of stable operation of the plant and shall be scheduled with PAC/FAC of plant.
2) During the hot test period, the application software /Level-II automation system shall be tested with all live data including communication with Level-I (from PLC/DCS/ICS/any other special controller). All the modules shall be tested and demonstrated for error-free performance as per the specification and approved documents. The functions as specified in the contract and the approved requirement book shall be demonstrated.
3) Error free functioning of operating system/ system software/ database/ utility software/ communication software/ any other special software supplied by the tenderer shall also be demonstrated for consecutive period of 15 day (24 hours a day) during the hot test period.
4) Model shall be tuned as per the site conditions before the start of hot test. The test should be completed within one month of the start of the test.
5) Acceptance certificate shall be provided by Purchaser on successful completion of hot test.

01.8 Defect Liability(Warranty)
Tenderer shall provide defect liability services for hardware, system software and application software in accordance with the clause number 30 of standard bidding documents of SAIL (project directorate).

Tuning/customization/modification/bug removal of application software shall be carried out as per plant actual operating practices during defect liability services period.

The period of defect liability services shall be governed by clause number 30 of standard bidding documents of SAIL (project directorate).

Post defect liability services shall be provided on mutually agreed terms and conditions (if required)
01.9 DOCUMENTATION

01.9.1 Documentation (Type of media and no. of copies)

Documentation shall be as follows:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>ITEM</th>
<th>For Each Serial no</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No of Hard copies</td>
</tr>
<tr>
<td>1.</td>
<td>Operating system, System Software and utilities software, database, communication software.</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Hardware manuals</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Language Compilers</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Development tool</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>Any Special Software supplied by the tenderer</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>Requirement Specification</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>System Design Document</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>User Manual of Application software including models</td>
<td>6</td>
</tr>
<tr>
<td>9.</td>
<td>Maintenance Manual for troubleshooting of all application software including process model, system software, configuration, hardware, network, etc. should be provided clearly spelling out possible causes, checks and measures for corrective action.</td>
<td>3</td>
</tr>
<tr>
<td>10.</td>
<td>Additional set of all training manuals for purchaser’s archive and not for participants</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>All other additional documents/ manuals as mentioned below under 01.9.2</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>Licenses</td>
<td>3</td>
</tr>
</tbody>
</table>

01.9.2 Documentation (List)

The following shall be submitted for approval. All documentation shall be in English language.
01.9.2.1 At Basic engineering stage:
- Layout drawing showing location of all computer equipment, furniture.
- Single line diagram for power supply to computer system / equipment.
- Computer Room Layout Drawing
- Network diagram (for equipment and cabling)
- Equipment earthing/grounding diagrams.
- Control system interface signal list.
- Computer system equipment installation layout.
- List of hardware along with the following:
  - Trade catalogs with MTBF and MTTR of each equipment and the computer systems as a whole.
  - Thermal load, running and startup power requirement, environmental condition (both storage and running) including electromagnetic interference and vibrations in the building for each equipment.
  - Dimensions, weight, area, point and distributed load on floor, etc. as applicable.
- Detailed requirement specification containing:
  - List of hardware and system software.
  - Detailed description of each module, operator dialogues, displays, reports, etc.
    Period of storage for all logs, displays and report shall be indicated.
  - Detailed procedures for operation in semi-automatic mode.
- The following shall also be complied by the tenderer as part of application software and shall be submitted during basic engineering:
  - Details of quality assurance measures for various phases of project implementation for approval.
  - Overall data flow diagram.

01.9.2.2 At Detail engineering stage:
- System configuration diagram integrated with Level-I automation system (including Network Schematic diagram).
- Cable routing.
- Final Single line diagram for power supply to computer system / other computer and network equipments.
- Final control system interface signal list.
- Final computer system equipment installation layout
- User specific application source code (including forms & reports) surrounding the process model/kernel. The information regarding maintenance shall be provided. Interfacing details of sub systems to models shall be provided.
- Source code for process models (optional)
- System design document containing:
  - Database structures for application software
  - Form/report layout
  - Details features of model tuning to suit local conditions
  - Metallurgical background of process models
The following hardware and networking manuals shall be furnished over and above the manuals mentioned above:

- Installation manual providing step-by-step procedure for installation of the whole system.
- Hardware and networking installation manuals for individual equipments.
- Hardware and networking maintenance manuals for individual equipments.
- Site preparation documents/drawings providing details of space, flooring, roofing, temperature, humidity, storage, power requirement.
- Operator's manual providing details of the procedure for operating the equipment including safety procedures.
- Training manuals in hard copies for maintenance personnel, supported CD ROM's/DVD ROM's etc.
- Detailed procedure to recover in case of failure of the CPU, hard disk drives, communication links between the servers, their clients, etc., shall be furnished.
- Logical screen shots for hardware/software configuration.

The following documentation/ manuals shall be furnished for system software and application software:

- User manuals for operating system, utilities, language compilers, RDBMS, etc.
- Reference manual for operating system, utilities, language compilers, RDBMS etc.
- Application software maintenance manual.
- Operator manuals for application software. The manual shall describe all the tasks that an operator needs to undertake while using the Level-II/III system.
- Model tuning manuals including tools & procedures.
- As built system design document updated as per implementation at site.

01.10 INFORMATION /DATA /DRAWINGS TO BE FURNISHED BY THE TENDERER ALONGWITH THE TENDER

- Configuration diagram of the Level-II automation system integrated with Level-I automation system.
- Reference list of projects where similar system including hardware, system software and application software has been implemented. The list shall include details such as name of the client, address, contact numbers, cost and duration of the project, system configuration, year of implementation, Level-II functions being performed, benefits achieved, etc.
- List of deviations from the technical specification, if any, with reasons thereof.
- The tenderer shall inform the purchaser about the latest versions of hardware and software available before finalization of order. Only latest versions shall be supplied.