Bhabha Atomic Research Centre

Atomic Fuels Division

Engineering Services & Automation Section

Ref.AFD/TSS/BP/21/I/5105 **Date: 09/11/2021**

Sub: Tender enquiry for "Fabrication, supply, wiring & installation, testing and commissioning of Centralized Control System for Utility Services of AFD".

Sealed offers are invited for and on behalf of the President of India, for "Fabrication, supply, wiring & installation, testing and commissioning of Centralized Control System for Utility Services of AFD". This work includes installation and testing of centralized control unit for operation, control and monitoring of various utility services, remote I/O modules for sending and receiving data from field and from centralized control unit, wiring from field points to remote station and from remote station to centralized control unit, programming of PLC and SCADA as per standard operating procedure.

Scope of Work:

S.No.	Description	Specification and Qty.
1.	**Fabrication, supply, wiring & installation, testing and commissioning of Centralized Control System for Utility Services of AFD.**	As per Annexure –A,B, C and D

Terms and conditions:

1. Offer should be valid for minimum 90 days otherwise it will be rejected.
2. Only Lump sum price to be quoted.
3. The completion period of this job should be within 6 months from the date of issue of work order.
4. Persons having valid Police Verification Certificate willonly be allowed to enter BARC to execute the job.
5. Warranty period should be 12 months (Minimum) after completion of work.
6. The payment will be made after the satisfactory completion of the work.
7. Income Tax and S.C. as applicable will be deducted from the bill.

8. Any delay which is attributed to the contractor is liable for penalty @0.5 % Per Week (Max 5%).
9. Quotations are to be printed on letter head / quotation format which should consist of GST registration number registered with local authority, PAN of the firm. Computer generated quotation shall be considered as invalid & rejected.
10. Sealed offer with tender no. and due date legibly written on the sealed envelope should reach **through speed/registered post** on or before 24/11/2021**.**

    To,

    Shri Bhupendra Patidar,

    Scientific Officer (F)

    Atomic Fuels Division

    Bhabha Atomic Research Centre

    Trombay,Mumbai 400 085.

b) The contractor shall have to visit the site to comprehend the scope of work. The same will be arranged by the undersigned. The site can be visited on any working days between 10:30am to 4:00 pm before tender due date. however prior intimation of at least three working days is necessary.(Tel: 02225597410/6112,email: bpatidar@barc.gov.in)

c) Supplier shall have valid electrical license and previous experience of installation & commissioning of similar work with documentary evidence. Without documents for above type of work execution, site visit shall not be considered.

The quotation submitted without site visit will be rejected.

Details and Confidentially & Publicity Clause

I. No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as“proprietary” in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party.

This clause shall apply to the sub-contractor, consultant, adviser or employees engaged by a party with equal force

II. “Restricted information” categories under section 18n of the Atomic Energy Act, 1962 and “Official Secret under Section 5 of the Official Secret Act, 1923: -

Any contravention of the above-mentioned provisions by any contractor, sub-contractor, consultant, adviser or the employees of a contractor will invite penal consequence under the aforesaid legislation.

III. Prohibition against use of BARC's name without permission for the publicity purpose:

The contractor, sub-contractor, consultant, adviser or the employees engaged by the contractor,shall not use BARC's name for any publicity purpose through any public media like press, Radio, T.V. or Internet without the prior written of BARC. Contractor shall obtain Police verification certificate for all his employees including his supervisors and workers engaged in the work.

(B. Patidar)

SO/F, ES&AS, AFD

For & On behalf of President of India

Annexure-A

I. Fabrication, supply, wiring & installation, testing and commissioning of Centralized Control System for Utility Services of AFD.

Sr. no.	Description	Quantity
1.	**Centralized Control Unit consisting of following** i. Main control panel (Maximum Size: 1800 mm (H) x 800 mm (W) x 400 mm (D)): 1 No. ii. Master Programmable logic controller with Ethernet port and MODBUS RTU port: 1 No. iii. PLC programming software with single license: 1 No. iv. PLC add-on modules, ➢ Digital Input: 56 Nos. (16 ch. x 3 Nos. +8 ch. x 1 No.) ➢ Digital Output: 24 nos. (16 ch. x 1 No.+8 ch. x 1 No.) v. Standard AC power supply: 1 No. ➢ 32 Amp, 2 P MCB vi. 8 Slot back plane for expansion module: 1 No. vii. Switch Mode Power Supply: 1 No. ➢ 24 V, 15 A viii. Push buttons with indicators for remote operation of utility services in manual mode : 42 Nos. ix. ON/OFF switch with indicators : 7 Nos. x. Annunciator for 20 alarms indication: 1 No. xi. Door switch: 1 No. ➢ 230 V, 10 A xii. LED Panel light**:**1 No. ➢ 10 W,230 V xiii. 19 inch.Fanless Industrial PC with touch screen smart display and standard box: 1 No. ➢ Intel atom E3845quad core or better ➢ RAM : 8 GB or more ➢ Hard disk : 1 TB or more	**1 Set**

	➢ Operating system : Microsoft Windows 10 ➢ One expansion slot (PCI) ➢ Mic. in/Line out ➢ 2 x Intel gigabyte Ethernet ➢ 1 x HDMI ➢ 2 x RS-232 port ➢ 1 x RS-485 Port ➢ 1 x VGA port ➢ 1 x USB 3.0 , 3 x USB 2.0	
2.	**Remote Input/output unit for Exhaust Blowers of Main Hall and Overhead Tank consisting of following** i. Wall mounted I/O panel (Size:500 mm (H) x 500 mm (W) x 300 mm (D) or less: 1 No. ii. Main MCB: 1 No. ➢ 32 Amp, 2 P iii. Switch Mode Power Supply: 1 No. ➢ 24 V, 15 A iv. 16 channel Digital input modules – 24 V DC: 1 No. v. 16 channel Digital output modules – 24 V DC: 1 No. vi. 8 Channel relay card: 2 Nos. vii. 8 channel universal Analog input modules: 2 Nos. viii. Communication module with MODBUS RTU protocol: 1 No.	**1 Set**
3.	**Remote Input/output unit for Supply Blowersof Main Hall and Cooling Tower consisting of following** i. Wall mounted I/O panel (Size:500 mm (H) x 500 mm (W) x 300 mm (D) or less: 1 No. ii. Main MCB: 1 No. ➢ 32 Amp, 2 P iii. Switch Mode Power Supply: 1 No. ➢ 24 V, 15 A iv. 16 channel Digital input modules – 24 V DC: 2 Nos. v. 16 channel Digital output modules – 24 V DC: 1 No. vi. 8 Channel relay card : 2 Nos.	**1 Set**

	vii. 8 channel universal Analog input modules: 2 Nos. viii. Communication module with MODBUS RTU protocol : 1 No.	
4.	**Remote Input/output unit for Ventilation System of Extrusion PressArea consisting of following** i. Wall mounted I/O panel (Size:500 mm (H) x 300 mm (W) x 300 mm (D) or less: 1 No. ii. Main MCB: 1 No. ➢ 32 Amp, 2 P iii. Switch Mode Power Supply: 1 No. ➢ 24 V, 15 A iv. 8 channel Digital input modules – 24 V DC: 1 No. v. 8 channel Digital output modules – 24 V DC: 1 No. vi. 8 Channel relay card : 1 No. vii. 4 channel universal Analog input modules: 1 No. viii. Standard Ethernet communication module : 1 No.	**1 Set**
5.	**Remote Input/output unit for Ventilation System of Expansion Area consisting of following** i. Wall mounted I/O panel (Size:500 mm (H) x 300 mm (W) x 300 mm (D) or less: 1 No. ii. Main MCB: 1 No. ➢ 32 Amp, 2 P iii. Switch Mode Power Supply: 1 No. ➢ 24 V, 15 A iv. 8 channel Digital input modules – 24 V DC: 1 No. v. 8 channel Digital output modules – 24 V DC: 1 No. vi. 8 Channel relay card: 1 No. vii. 4 channel universal Analog input modules: 1 No. viii. Communication module with MODBUS RTU protocol : 1 No.	**1 Set**
6.	**Remote Input/output unit for Effluent Disposal Plant consisting of following** i. Wall mounted I/O panel (Size:500 mm (H) x 500 mm (W) x 300 mm (D) or less: 1 No. ii. Main MCB: 1 No.	**1 set**

	➢ 32 Amp, 2 P iii. Switch Mode Power Supply: 1 No. ➢ 24 V, 15 A iv. 16 channel Digital input modules – 24 V DC: 2 Nos. v. 16 channel Digital output modules – 24 V DC: 2 Nos. vi. 8 Channel relay card: 3 Nos. vii. 8 channel universal Analog input modules: 1 No. viii. Communication module with MODBUS RTU protocol : 1 No.	
7.	**Starter for Supply Blower Motorsof Main Hall Ventilation System** ➢ Type : soft starter ➢ Motor : Induction motor ➢ Voltage : 415 V ± 10% ➢ Frequency : 50 Hz ± 3% ➢ Motor HP/kW: 50/37.5 ➢ Maximum Current : 150 Amp ➢ Utilization category : AC-53A ➢ Assembly style : With heat sink ➢ Communication protocol : MODBUS RTU ➢ Connector type : RJ45 ➢ Physical interface :RS485 multidrop ➢ Transmission rate :4800, 9600 or 19200 bps ➢ Protection type :Phase failure: line Thermal protection: motor& starter ➢ Function available :Internal bypass ➢ Type of cooling :Forced convection ➢ Marking : CE ➢ Operating position : Vertical ➢ Noise level: 56 dB ➢ Ingress protection : IP-20 ➢ Relative humidity :0-95 % without condensation or dripping water conforming to EN/IEC 60068-2-3 ➢ Ambient air temperature for operation :-40-60 °C	**2 Nos.**

8.	**Starter for Spray Pump Motorsof Main Hall Ventilation System** ➢ Type : soft starter ➢ Motor : Induction motor ➢ Voltage : 415 V ± 10% ➢ Frequency : 50 Hz ± 3% ➢ Motor HP/kW: 25/18.64 ➢ Maximum current : 65 Amp ➢ Utilization category : AC-53A ➢ Assembly style : With heat sink ➢ Communication protocol : MODBUS RTU ➢ Connector type : RJ45 ➢ Physical interface :RS485 multidrop ➢ Transmission rate :4800, 9600 or 19200 bps ➢ Protection type :Phase failure: line Thermal protection: motor& starter ➢ Function available :Internal bypass ➢ Type of cooling :Forced convection ➢ Operating position : Vertical ➢ Noise level: 56 dB ➢ Ingress protection : IP-20 ➢ Relative humidity :0-95 % without condensation or dripping water conforming to EN/IEC 60068-2-3 ➢ Ambient air temperature for operation :-40-60 °C	**2 Nos.**
9.	**Accessories required for interface of Motors of VentilationSystem of Extrusion Press Area to remote I/O unit,** • Push button with NO/NC Auxiliary contact and indicator ➢ Start ➢ Stop • Trip Indicator • Auxiliary contact for status feedback	 **4 Nos.** **4 Nos.** **4 Nos.** **8 Nos.**
10.	**Accessories required for interface of Motors of Ventilation System of Expansion Area to remote I/O unit,** • Push button with NO/NC Auxiliary contact and indicator	

	➢ Start	**4 Nos.**
	➢ Stop	**4 Nos.**
	• Trip Indicator	**4 Nos.**
	• Auxiliary contact for status feedback	**8 Nos.**
11.	**Accessories required for interface of Motors &Sensorsof Cooling Tower to remote I/O unit,**	
	• Water temperature sensor	**2 Nos.**
	➢ Range: 0 to 50°C	
	➢ Output: 4-20 mA	
	➢ Accuracy: ±0.1°C	
	➢ Maximum Pressure (Open Water): 10 Bar	
	➢ Operating Voltage: 10-36 VDC	
	• Float type Water level sensor	**1 No.**
	➢ Output: NO/NC contact	
	➢ Operating Voltage: 24 VDC or 230 VAC	
	➢ Current : 5 A	
	• Push button with NO/NC Auxiliary contact and indicator	
	➢ Start	**4 Nos.**
	➢ Stop	**4 Nos.**
	• Trip Indicator	**4 Nos.**
	• Auxiliary contact for status feedback	**8 Nos.**
12.	**Accessories required for interface of Motors of OverheadTank to remote I/O unit,**	
	• Push button with NO/NC Auxiliary contact and indicator	
	➢ Start	**2 Nos.**
	➢ Stop	**2 Nos.**
	• Trip Indicator	**2 Nos.**
	• Auxiliary contact for status feedback	**4 Nos.**
13.	**Accessories required for interface of Motors & Motorized Valves of Effluent Disposal Plant to remote I/O unit,**	
	• Push button with NO/NC Auxiliary contact and indicator	
	➢ Start	**2 Nos.**
	➢ Stop	**2 Nos.**

	• Trip Indicator • Auxiliary contact for status feedback	**2 Nos.** **18 Nos.**

II. General Condition

1. PLC inputs/outputs must be isolated in accordance with standard IEC 61131-2.
2. Local modules in centralized control unit (except processor and power supply modules) shall be hot-swappable, i.e. they can be inserted and removed while powered up.
3. The processor should have a connection to the programming terminal (TCP/IP) on the front panel. This link should be possible without the need for a special card at the PC end. The possibilities of connecting peripherals such as human-machine interfaces or printers must also be indicated.
4. Central processing unitmust have a saveable real-time clock which manages:
   - 4.1. The current date and time
   - 4.2. The date and time of the last application shut-down
   - 4.3. The date and time should be managed even when the processor is switched off for more than 20 days.
5. Software shall be backward compatible.
6. It must be possible to perform a functional update of the processor by simply downloading the firmware through the dedicated software or the programming software platform. However, it must also be possible to use a more recent version of the programming software without having to update the firmware of the processor.
7. The memory shall be non-volatile.
8. AC power supplies must have an integrated power supply capable of delivering 24 VDC to the sensors.
9. The power supply module must have an alarm relay to indicate any partial stop of the application or occurrence of faults.
10. The communication functions of remote I/O modules must be independent of the input and output interface functions. It will therefore be possible to connect any module to the main field bus standards (multi-bus openness) including, amongst others:

10.1. Modbus RTU

10.2. Ethernet 10/100Mbps

11. The supplier must include a complete pre-wired and interfacing system between the PLC and the detectors and actuators. The system must combine the functions of a terminal block with simplified wiring and the adaptation, protection and distribution of signals.
12. Interface with existing level sensors to PLC will be in scope of supplier.
13. Configuration of VFD and soft starter will be in scope of supplier.
14. Low voltage switch gear shall complied IEC 60947.
15. All wire and cable used in electric panel shall be FRLS type.
16. All wires and cables used in panels shall be of suitable colour code.
17. Wiring from field sensors to remote input/output panels and remote panels to centralized control unit will be in scope of supplier.
18. Spacing between electrical components in panel shall be as per the IEC standard (60439).
19. Two earthing points shall be provided on electrical panel.
20. Electrical components used in the panel shall be of reputed make.
21. Panel shall be coated in Siemens gray/ standard with seven tank processing.
22. Proper cooling arrangement shall be made inside the panel to limit temperature with in 40^0C.
23. The panel shall be designed for continuous operation (24 hrs X 7 Days).
24. All unwanted, removed fittings, parts, panels are to be disposed as per the instruction of departmental engineer.
25. All panelling and other installation works include earthing as per I.S standard with bare copper conductor.
26. Submit all catalogues, brochures and datasheet of the offered products along with quotation.

27. <u>Interlocks</u>

27.1. In all the 3 Ventilation Systems, there should be interlock between supply and exhaust blower in such a way that supply blower is switched on only after exhaust blower attains full speed.

27.2. In Cooling Tower, circulation pump shall be switched on only when hot water sump has maximum water level.

27.3. For Overhead Tank, makeup water pump should be automatically switched off oncethe overhead tank water level is attained. If underground water storage tank has water level below prescribed limit then makeup water pump should not switched on.

27.4. For Effluent Disposal Plant, Discharge Pump shall be automatically switched off once liquid effluent level is reached below prescribedlimit.

28. <u>Event Logging/alarm</u>

28.1. Ventilation System,

28.1.1. Switching on and off time of supply and exhaust blowers shall be recorded.

28.1.2. Motor current and speed shall be recorded at sampling rate of at least 1 sample per minute.

28.1.3. Alarm shall come when exhaust blower is off/tripped and supply blower is on.

28.2. Cooling Tower,

28.2.1. Switching on and off time of circulation pump and spray pump shall be recorded.

28.2.2. Inlet and outlet water temperature and hot water sump level shall be recordedat sampling rate of at least 1 sample per minute.

28.2.3. Alarm should come for tripping of circulation pump and spray pump.

28.3. Overhead Tank,

28.3.1. Switching on and off time of makeupwater pump shall be recorded.

28.3.2. Overhead tank and underground tank water level shall be recordedat sampling rate of at least 1 sample per minute.

28.4. Effluent Disposal Plant,

28.4.1. Switching on and off time of discharge effluent pump shall be recorded.

28.4.2. Water level of effluent storage tank shall be monitored and recordedat sampling rate of at least 1 sample per minute.

28.4.3. In case of higher effluent level (> 90%), alarm shall come to avoid effluent overflow.

29. Supervisory Control and Data Acquisition System (SCADA)

29.1. SCADA shall have following screens,

29.1.1. Main menu screen

29.1.2. Operation screen

29.1.3. Monitoring screen

29.1.4. Parameter setting screen

29.1.5. Alarm screen

29.1.6. Diagnostic screen

29.1.7. Data Logging screen

III. Inspection and test

1. Before leaving the manufacturing work, all equipments shall have been inspected and tested and the results recorded in test report.
2. The manufacturer shall provide test report of each and every electrical component of centralized control unit, remote I/O unit's & sensors and submit at the time of inspection / execution.

IV. Following test shall be carried out at supplier's site:

1. Visual and functional check.
2. Continuity test
3. Insulation test
4. Interlock test

After installation of system at purchaser premises, the above tests shall be again conducted for checking of smooth functioning of the system.

V. Documentation and training

1. The manufacturer shall supply at least following drawing /documents in the quantities indicated.
   1.1. Bill of material
   1.2. Transport, installation, commissioning, operation, maintenance instruction and fault finding procedure.
   1.3. Single line diagram
   1.4. As built control and power wiring diagram
   1.5. Manual of Programmable logic controller, sensors and SCADA
   1.6. List of recommended spare parts
   1.7. Test certificate of each components
2. Supplier shall provide training to three persons that will covers all aspect of PLC, soft starter, industrial PC and sensors such as feature, operation & maintenance procedures and safety criteria.

VI. Warranty and support services

1. Supplier shall provide minimum one year of warranty of PLC, soft starter, industrial PC, sensors and other accessories of centralized control system.
2. The supplier shall indicate the organization, manpower and other resources of customer support division.
3. The supplier shall have support from the principal for a period of 5 years. The address of the principal may also bementioned.
4. Supplier shall provide list of customers along with the name, address and contact details to whom similar or higher capacity system supplied.
5. The supplier shall further ensure the availability of all spares for at least 5 years from the date of acceptance of the system.

VII.Services available

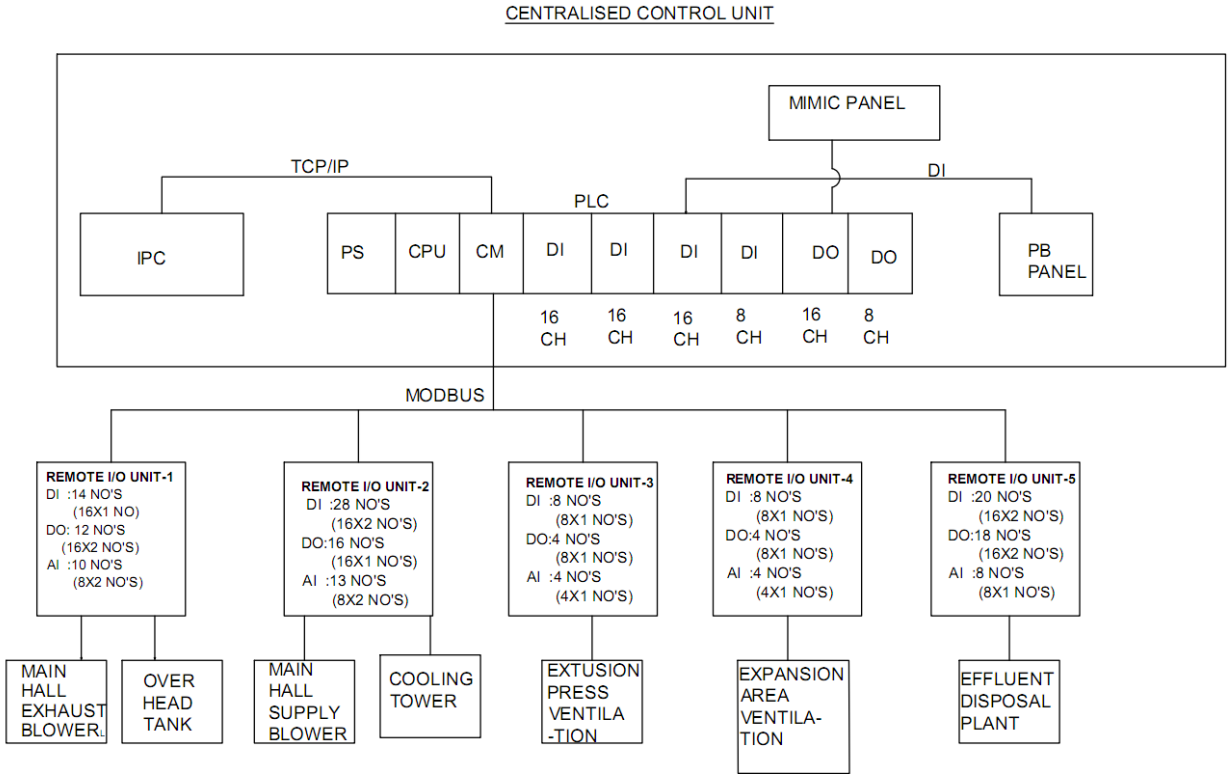
1. Electrical: 415V, 3-phase, 50Hz & 230V, 1-phase, 50Hz are available.
2. Compressed air at 6 kg/cm^2 is available.
3. Cooling water at 2 kg/cm^2 is available.
4. Vendor shall mention the Electrical power requirement, voltage, current,connection method, line size etc.
5. Vendor shall also mention the other services required for the operation of press like compressed air requirement, cooling water requirement etc.
6. Vendor shall inform the services requirements in advanced for appropriatearrangement to be made by purchaser.

VIII. Packing and forwarding

All the items shall be divided into several shipping sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship or rail or trailer. Electrical items shall be wrapped in polyethylene sheet before being placed in the wooden crates or cases to prevent damage to the finish. This side up, centre of gravity, weight, owner particulars, purchase number, shall be clearly marked on the package together with other detail as per purchase order.

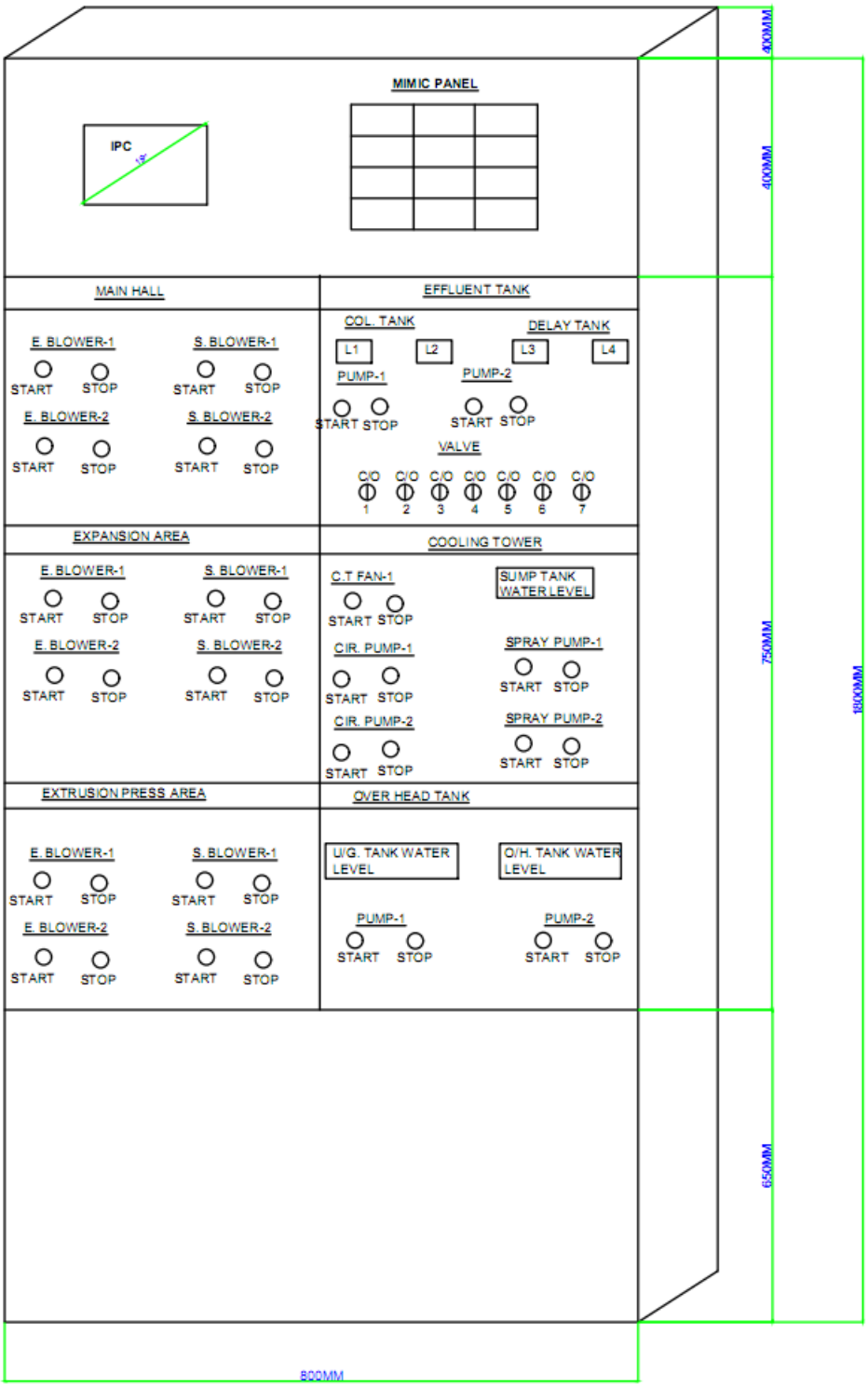
Annexure –B

PLC Architecture Diagram



Annexure –C

Schematic Diagram of Centralized Control Panel



NOTE:- 1. DIA. OF P.B. IS 22.5MM