BHARAT HEAVY ELECTRICALS LIMITED
CORPORATE RESEARCH & DEVELOPMENT DIVISION
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DIRECT:23882104/23882204/
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ENQUIRY

RD:DP:MPX:F-04

To

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Pin

Email :

Attn. .

Enquiry No:	Enq Date:	Due Date:	Delivery By:
990806701	27-FEB-09	02-APR-09	

PLEASE SUBMIT YOUR QUOTATION IN SEALED COVER SUPERSCRIBED WITH ENQUIRY NO, ENQUIRY DATE AND DUE DATE SUBJECT TO OUR TERMS AND CONDITIONS ENCLOSED, FOR THE FOLLOWING MATERIALS SO AS TO REACH US ON OR BEFORE THE DUE DATE BY 12 NOON. THE TENDERS WILL BE OPENED AT 2 PM ON THE SAME DAY

PLEASE GIVE REFERENCE OF ENQ NUMBER , ENQ .DATE AND DUE DATE IN ALL YOUR CORRESPONDENCE FOR PROMPT ACTION. IN CASE IF YOU ARE NOT MAKING THE OFFER PLEASE POST A REGRET LETTER AND RETURN THE DOCUMENTS.

SL NO	DESCRIPTION / SPECIFICATION	UNIT	QTY
1	SCADA BASED CONTROL SYSTEM USING PLC's FOR PECVD SYSTEM . SPECIFICATIONS: AS PER ENCLOSURE - 1	NO	1

Please submit your offer in Two parts as per enclosed "General Terms and Conditions of enquiry & Contract for the purchase of Goods/ Services" in separate sealed covers as detailed below:

1) First cover shall contain a) Technical & Commercial bid, b) Compliance Statement, c) Un-priced Price bid, i.e. a copy of the Price bid with the price(s) columns left blank.

2) Second Cover containing Price bid. If the Price bid is found to be different from the un-Priced Price bid in any way, the offer will be rejected.

Note:

1) ALL OFFERS MUST INCLUDE NAME OF CONTACT PERSON, PHONE NO, FAX NO, EMAIL ID. UNSIGNED/INCOMPLETE OFFER(S) ARE LIABLE FOR REJECTION.

2) Taxes & Duties quoted will be taken for cost evaluation & order placement and no change will be entertained later except in the case of changes made by the Government.

3) Changes in Taxes and Duties because of the changes in Turnover etc. will be to the supplier's account.

4) In case any Taxes/duties exempted, a self declaration for the same may be attached to the offer.

AS WE ARE ENGAGED IN R&D ACTIVITY "C" FORM WILL NOT BE ISSUED

PLEASE FILL UP THE ENCLOSED VENDOR REGISTRATION FORM AND SEND IT ALONG WITH YOUR QUOTATION. OTHERWISE YOUR QUOTATION WILL NOT BE CONSIDERED. (IGNORE THIS IF YOU HAVE ALREADY SUBMITTED THIS FORM)

Yours faithfully
for
BHARAT HEAVY ELECTRICALS LTD

NARSIMHA RAO N
Manager

Email: nnrao@bhelrnd.co.in

Specifications of the SCADA based control system

Functional requirement:

The SCADA based control system is required to control/operate and monitor the data from a vacuum based plasma deposition system which is used for making semiconductor devices. The system should have following features:

- Control of process,
- Logging and report generation,
- Monitoring of Alarms,
- Historical data storage.

Scope of supply & work

To design and develop **automation software/Hardware** for start up of the **vacuum based plasma deposition system** available at ASSCP and run the process sequence for deposition of the films in automatic mode. After the process is complete, carry out safe shut down steps as per pre defined sequence. Provision should be made to operate the systems in both Auto and manual modes.

Specifications:

S.No	Item Description	Specifications
1	Computer system and software	• Industrial computer, • SCADA software, • Engineering/software, • Interface card, • Profibus connectors, • Cables These items have to be provided as per control system requirement. A schematic layout is enclosed for estimating the cable lengths is given in Annexure-1
2	**PLC system**	• Programmable logic controllers (PLC) • Power supplies, • Front connectors, • Micro memory cards, • Rails, • Pushbuttons, • Relay cards, • I/O modules. These items have to be provided as per control system requirement.
3	**Control cubicle**	• To house Computer/monitor for process monitoring & control with SCADA software to run process sequence

		and safety interlocks.
4	**Design, engineering, installation and commissioning at ASSCP, BHEL Gurgaon (About 25 km from Delhi Airport)**	The system has to operate the vacuum deposition system as per the sequence specified in Annexure 2 List of number of: 12V DC operated valves, 220V AC operated valves, 12V DC motors, sensors for the movement of substrate carriers, control equipment for pressures, flow, temperature, RF power, analog and digital signals to be monitored etc are given in Annexure-3
5	**Input Power Supply**	220 ± 20 VAC, 50 Hz
6	**O & M Training**	Necessary training to be provided to BHEL personnel
7	**Operation and Maintenance manual**	1 set
9	**Warranty**	Minimum 1 year with effect from date of commissioning.

Inspection /Acceptance Criteria

A. Pre dispatch Inspection at supplier's works.

Vendor has to integrate all the hardware items and demonstrate the operation of hardware and software in a simulated mode.

B. Acceptance Criteria for the commissioning of SCADA based control system at ASSCP, Gurgaon:

- Vendor has to integrate the control system with the existing vacuum plasma deposition system including complete wiring with appropriate tags.
- Vendor has to demonstrate the complete operation of the deposition system in manual and automatic modes as described in Annexure 2.
- Vendor has to demonstrate fail-proof and fool-proof operation of various interlocks in various modes of operation as it is very critical for safety reasons due to the use of highly toxic and pyrophoric gases in the deposition process.

IMPORTANT NOTE

- Please read the pre-dispatch inspection and the acceptance criteria for the commissioning of the control system. These are very important and the commissioning of the control system will be evaluated by committee of experts from BHEL
- The pre-dispatch inspection will be carried out at supplier's works and NO parts, which are in the scope of supply of BHEL, will be supplied by BHEL.

- The supplier has to arrange the required items at his works for pre-dispatch inspection.
- The parts (as per the list) in the scope of BHEL will be made available at ASSCP Gurgaon during the final commissioning of the control system. The supplier has to ensure availability of the expert manpower for carrying out integration and commissioning of the control system at ASSCP Gurgaon.

Annexure-3

List of items in the scope of BHEL to be supplied at ASSCP, Gurgaon:

S.No	Item	Qty
1	12 V DC Solenoids	60
2	12 V DC motors to be operated in forward and reverse direction	18
3	220 V AC operated valves	30
4	Limit switches for sensing substrate carriers	30
5	Analog signals form Temperature controllers	7
6	Analog signals form pressure gauges (Ion, capacitance and Convectron gauges.	45
7	Analog signals form Throttle valve controllers	5
8	Analog signals form Mass flow controllers	15
9	Analog Signal from DC power supply (Metal)	1
10	Analog signal DC power supply (ITO)	1
11	Analog signal RF Power supply (SiN, a-Si)	4
12	Digital signal from Interlocks	15

Sequence for operation of vacuum plasma deposition system

The vacuum plasma deposition system is used for the deposition of several semiconducting thin films for solar cell applications. The deposition system available at ASSCP-BHEL is divided into the following two sections for deposition of thin films:

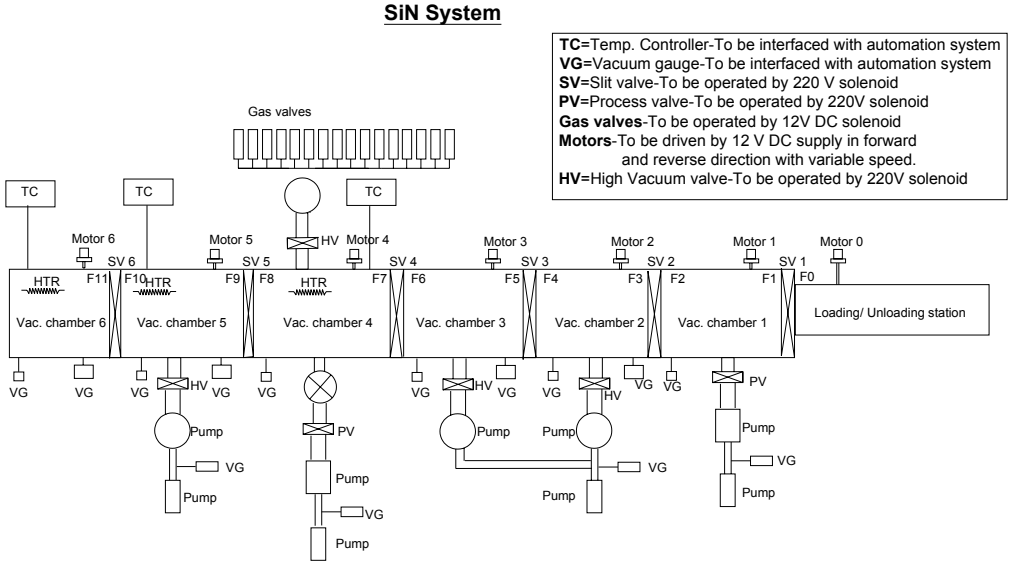
Section 1: Deposition system for SiN (Silicon Nitride) film.
Section 2: Deposition system for a-Si (Amorphous silicon) films.

At a time only one section will be operational.

Brief hardware details of the above two sections are given below:

Section 1: Deposition system for Silicon Nitride film.

The deposition system consists of 6 nos. of SS vacuum chambers connected in line. The schematic of the system is given below.

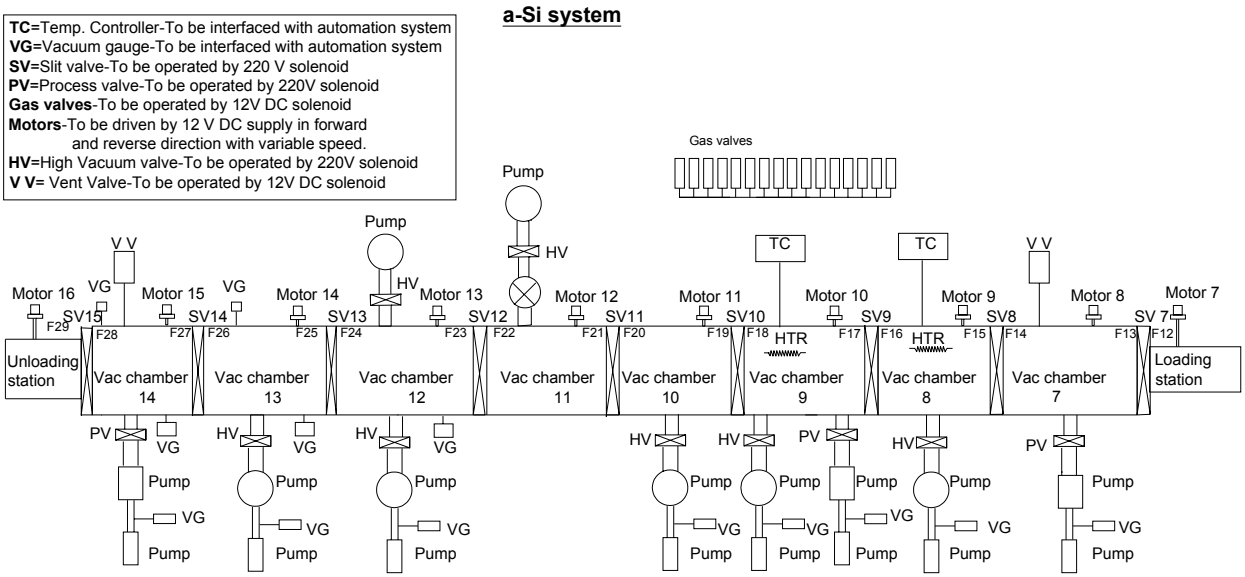


Slit valves (SV) are connected in between the chambers to isolate each other. The SVs are operated by 220 V solenoids. Each chamber is fitted with a transport assembly driven by a

12 V DC motor to move the sample carrier at a desired speed forward and reverse directions. Limit switches (F0—F11) are provided at the entry and exit of each chamber to sense the position of the sample carrier. The chambers are connected to combination of vacuum pumps to evacuate the chambers from atmospheric pressure (760 Torr) to high vacuum conditions (10^{-6} Torr). The pumps are connected to chambers through High Vacuum Valves (HV) and Process valves (PV) and are operated through 220 V solenoids. The locations of these valves are depicted in the schematic. The vacuum inside the chambers is measured with Capacitance manometer gauges (Baratron gauge) & Ion gauges which are operated through dedicated power supplies. A signal (4-20 mA/0-10V) is available from each gauge supply which can be used for computer interfacing. The process gases are allowed to flow into chambers through Electronic Mass Flow Controllers (MFC) which are connected through a Gas manifold. The gas valves are operated through 12 V DC solenoids.

Section 2: Deposition system for a-Si films.

The deposition system consist of 8 nos. of SS vacuum chambers connected in line. The schematic of the system is given below.



Slit valves (SV) are connected in between the chambers to isolate each other. The SV are operated by 220 V solenoids. Each chamber is fitted with a transport assembly driven by a 12 V dc motor to move the sample carrier at a desired speed forward and reverse directions. Limit switches (F12-F29) are provided at the entry and exit of each chamber to sense the position of the sample carrier. The chambers are connected to combination of vacuum pumps to evacuate the chambers from atmospheric pressure (760 Torr) to high vacuum conditions (10^{-6} Torr). The pumps are connected to chambers through High Vacuum Valves (HV) and Process valves (PV) and are operated through 220 V solenoids. The locations of these valves are depicted in the schematic. The vacuum inside the chambers is measured with Capacitance manometer gauges (Baratron gauge) & Ion gauges which are operated through dedicated power supplies. A signal (4-20 mA/0-10V) is available from each gauge supply which can be used for computer interfacing. The process gases are allowed to flow into chambers through Electronic Mass Flow Controllers (MFC) which are connected through a Gas manifold. The gas manifold valves are operated through 12 V DC solenoids.

Safety Interlocks common for both the sections:

Three levels of Safety interlocks are required in the system for checking of proper operation of house exhaust, Scrubber exhaust, Scrubber, Compressed Air supply, Nitrogen gas supply, Single phase UPS, three phase UPS and Toxic gas monitor. Three levels are given below as per the criticality of the process requirement.

i. **Essential Safety interlock:** Chilled water flow/pressure, House exhaust enclosure exhaust.
ii. **Critical Safety Interlock:** Scrubber exhaust, Compressed Air pressure, UPS power supply.
iii. **Super Critical Safety Interlock:** Scrubber exhaust, toxic gas monitoring system, Nitrogen gas pressure and UPS power supply.

Deposition of SiN or a-Si films process would proceed only after checking the status of these safety interlocks.

Modes of Operation:

It should be possible to operate both the systems in either manual or Auto modes

<u>Manual Mode</u>

1. In manual mode, the operator should be able to operate any carrier transport drive, slit valves, High vacuum valves independently / manually at any time for desired length of time.
2. In this mode except super critical interlocks all other interlocks can be bypassed by the user.
3. In this mode all the process parameters such as position of carrier, pressure of each chamber etc. should be displayed on the screen

Automatic Mode

1. Provision for creating a several process recipes and store in PC.
2. After selecting the process recipe it should follow pre-defined process sequence by checking all safety interlocks.
3. Provision to display and log all the process parameters like, carrier position, gas flow rates, chamber pressure, Temperature, fore line pressure etc., on the SCADA screen.
4. The Process and High vacuum valves are to be operated automatically as per process steps (All the pumps in the systems will be operated manually).
5. Control of movement of sample carrier in and out as per pre defined time cycle.
6. The system should support movement of multiple carrier plate in the process line.
7. After completion of one process cycle (i.e. when carrier is at exit lock) it should give an alarm or buzzer sound prior to shift carrier plate to unloading station.
8. It should display the parameters regarding status of interlocks and pumps during operation.

Start up of PECVD system:

Following three steps will be performed manually by the operator:

1. Turn ON Single phase UPS supply.
2. Turn ON SCADA Control system.
3. Initiate the start up screen.

The SCADA screen to display the status of Interlocks and display start up sequence.

The SCADA to ask to select the section to be operated (SiN or a-Si)

After selecting the required section:
The SCADA screen to display the status of Interlocks and display start up sequence of the selected section:

OPERATION OF SECTION-1

1. Select SiN section:

Control system to ask to select Manual/Auto

Select Manual Mode
The control system should display the sequence of equipment/services to be turned ON and their respective status:

- Three phase UPS

- Three phase power supply on power cubicles
- Power supply for Vacuum gauges
- Chilled water supply
- Compressed Air
- Scrubber exhaust
- House exhaust
- Vacuum pumps

At this stage, the SCADA system should display and log the fore line pressures, pressure in the chambers, status of slit valves, Sample Carrier status etc. In manual mode operation, provision to be made to operate all the SV's HV's transport motors etc., as per the operators requirement.

Control system to display the following instructions for further operation:

1. Check all the pressures in the vacuum chambers and fore lines of pumps
2. Reduce pressure in chamber by operating the respective valves
3. After attaining the required pressure put on heaters

After turning on the above controls, the system operation to be controlled by Automation system (SCADA based control system) as per the desired mode of operation either by AUTO or MANUAL.

Auto Mode Operation:

1.1 Loading of Sample carriers

Before turning on to auto loading of carrier, the control system to ensure the condition of the chambers as per the predetermined conditions. After satisfying all the preconditions, the operator will load a carrier on the loading station manually and turn on auto loading. The SCADA based control system should initiate carrier loading automatically as per the following sequence:

i. The SCADA based control system to sense the first carrier-A by sensing finger F0 at the entry of the Vac.chamber-1. Initiate venting of the chamber by operating the vent valve VV1 through a 220V solenoid valve.
ii. Open SV1 start transport motors of M0 and M1. After sensing finger F2, stop M0 and M1, close SV1. Carrier moves into Vac.Chamber-1 and wait for next transfer.
iii. Open SV2 and start M1 and M2. After sensing F4, stop M1 and M2, Close SV2. Carrier moves into Vac.Chamber-2 and wait for next transfer
iv. Open SV3 and start M2 and M3. After sensing F6, stop M2 and M3, Close SV3. Carrier moves into Vac.Chamber-3 and wait for next transfer
v. Open SV4 and start M3 and M4. After sensing F8, stop M3 and M4, Close SV4. Carrier moves into Vac.Chamber-4 and wait for next transfer
vi. Open SV5 and start M4 and M5. After sensing F10, stop M4 and M5, Close SV5. Carrier moves into Vac.Chamber-5 and wait for next transfer
vii. Open SV6 and start M5 and M6. After clearing F11, stop M5 and M6, Close SV6. the first carrier-A moves into Vac.Chamber-6 and parked there for heating

viii. The second carrier-B entry should be allowed into the system after Vac.Chamber-1 is free to accept the carrier. Follow the above steps (i-vi) to transport the carrier and to be parked in Vac.chaamber-5

ix. Similarly the third carrier-C entry should be allowed into the system after Vac.Chamber-1 is free to accept the carrier. And follow the above (i-v) to transport the carrier and to be parked in Vac.chamber-4

x. While transporting the multiple carriers, only one carrier to be allowed in each chamber. Carrier entry to the next chamber to be allowed only when the next chamber is free.

1.2 Process: Deposition of SiN film

Once the set temperatures in Vac.Chamber-4, Vac.Chamber-5 and Vac.Chamber-6 are attained the control system to give an audio visual signal. The control system to prompt to go to super critical interlocks, if any interlock is not ok, the control system should not allow process.

Control system to ask to Turn ON:

- MFC flow Box
- RF supply and matching network
- throttle valve controller
- Nitrogen gas supply
- Scrubber

Start Deposition Process in Auto mode:

The following sequence to be initiated by the control system:

a. System should ask to select process recipe (gas flow rates, pressure, RF power, Temperature etc., are selected as per process requirement)
b. Prompt to start the process
c. To carry out deposition process a set of valves (honey well solenoids) need to be operated to allow process gases into the Vac.Chamber-4. Stabilize the pressure at the preset value
d. Control system to wait till the chamber pressure is maintained with in ± 1% of set value for two minutes, otherwise give an audio visual alarm.
e. Control system to strike RF plasma. The film deposition will start on the substrate loaded on to the substrate carrier-C (which is already loaded in the Vac.chamber-4. Turn OFF RF supply after the pre determined time and stop gas valves (set of honey well solenoids)
f. After deposition is complete on carrier-C, it is to be transported back to unloading station. A similar sequence of operations (i-v) in reverse direction to be followed.

g. Values of gas flows, chamber pressure, fore line pressure, carrier position and safety interlock status should be displayed on SCADA system through out the process and log the data for every minute.
h. After Vac.chmber-4 is free, another carrier-B to be transported from Vac.chmber-5 to Vac.chmber-4. And initiate deposition process as per the step nos.: c to g.
i. After deposition is complete the on carrier-B, it is to be transported back to unloading station by following similar steps used in operations (i-v) in reverse direction.
j. A similar sequence to be followed to carryout for the deposition process on carrier-A and transport back to load/Unload station.

Shut down process:

i. Close/open set of valves through solenoids as per pre determined time sequence for purging of chambers.
ii. Close heater supply to all the heaters manually. The control system should confirm that the heaters supply is switched OFF.
iii. On the monitor screen Display instructions to Switch OFF:
    - Throttle valve controller.
    - MFC Flow box
    - Turbo pumps
    - Roots pump.
    - Stop rotary pumps
    - Baratron power supplies
    - Ion gauge power supplies
    - Convectron gauge power supplies
    - Control cubical power supply.
    - Scrubber
    - Nitrogen Supply
    - Compressed Air Supply
    - Scrubber Exhaust

OPERATION OF SECTION-2

2. Select a-Si Section:

Control system to ask to select Manual/Auto

Select Manual Mode

The control system should display the sequence of equipment/services to be turned ON and their respective status:

- Three phase UPS
- Three phase power supply on power cubicles
- Power supply for Vacuum gauges
- Chilled water supply
- Compressed Air
- Scrubber exhaust
- House exhaust
- Vacuum pumps

At this stage, the SCADA system should display and log the fore line pressures, pressure in the chambers, status of slit valves, Sample Carrier status etc.

1. Control system to display the following instructions for further operation:
2. Check all the pressures in the vacuum chambers and fore lines of pumps
3. Reduce pressure in chamber by operating the respective valves
4. After attaining the required pressure put on heaters

After turning on the above controls, the system operation to be controlled by Automation system (SCADA based control system) as per the desired mode of operation either by AUTO or MANUAL.

Auto Mode Operation:

2.1 Loading of Sample carriers

Before turning on to auto loading of carrier the control system to ensure the condition of the chambers as per the predetermined conditions. After satisfying all the preconditions, the operator will load a carrier on the loading station manually and turn on auto loading. The SCADA based control system should initiate carrier loading automatically as per the following sequence:

i. The SCADA based control system to sense the first carrier-A by sensing finger F12 at the entry of the Vac.chamber-7. Initiate venting of the chamber by operating the vent valve VV2 through a solenoid valve operated on 220V.
ii. Open SV7 start transport motors of M7 and M8. After sensing finger F14, stop M7 and M8, close SV7. Carrier moves into Vac.Chamber-7. Open PV2 and close PV2 after the vac.level is attained as per the set valve. Carrier is ready for next transfer.
iii. Open SV8 and start M8 and M9. After sensing F16, stop M8 and M9, Close SV8. Carrier moves into Vac.Chamber-8 and wait for next transfer
iv. Open SV9 and start M9 and M10. After sensing F18, stop M9 and M10, Close SV9. Carrier moves into Vac.Chamber-9 and is parked in this chamber till it is attained set temperature.
v. Another carrier-B to be transported up to vac.Chamber-8 by adopting similar steps: (i-iii) and is parked for heating till it is attained set temperature value.

vi. While transporting the multiple carriers, only one carrier to be allowed in each chamber. Carrier entry to the next chamber to be allowed only when the next chamber is free.

1.2 Process: Deposition of a-Si film

Once the set temperatures in Vac.Chamber-8 and Vac.Chamber-9 are attained the control system to give an audio visual signal. The control system to prompt to go to super critical interlocks, if any interlock is not ok, the control system should not allow process.
Typical Gas flow arrangement is shown in annexure 2.

Control system to ask to Turn ON:

- MFC flow Box
- RF supply and matching network
- throttle valve controller
- Nitrogen gas supply
- Scrubber

Start Deposition Process in Auto mode:

The following sequence to be initiated by the control system:

a. System should ask to select process recipe (gas flow rates, pressure, RF power, Temperature etc., are selected as per process requirement)
b. Prompt to start the process in Auto mode.
c. To carry out deposition process a set of valves (honey well solenoids) need to be operated to allow process gases into the Vac.Chamber-9. Stabilize the pressure at the preset value
d. Control system to wait till the chamber pressure is maintained with in ± 1% of set value for two minutes, otherwise give an audio visual alarm.
e. Control system to strike RF plasma and film deposition will start on the substrate loaded in carrier-A (which is already loaded in the Vac.chamber-9. Turn OFF RF supply after the pre determined time and stop gas valves (set of honey well solenoids)
f. After deposition is complete the on carrier-A, it is to be transported to Vac.chamber-10.
g. Open SV10, start M9 and M10. After sensing F20, stop M9 and M10, close SV10. Carrier moves into Vac.Chamber-10 and wait for next transfer for film deposition in Vac.chamber-11. Move the Carrier –B from vac. chamber 8 to vac.chamber-9 and deposition of a-Si layer can continue as per steps:c-e
h. Process on carrier–A to continue in subsequent chambers. Open SV11 start M10 and M11. Deposition of ITO film on carrier -A to be initiated by turning on a set of gas valves and turning on DC Power supply and strike the plasma. Continue deposition as per set time duration (and as sensed by F22). After deposition is complete switch OFF DC supply, close set of Solenoid valves, Stop M11.

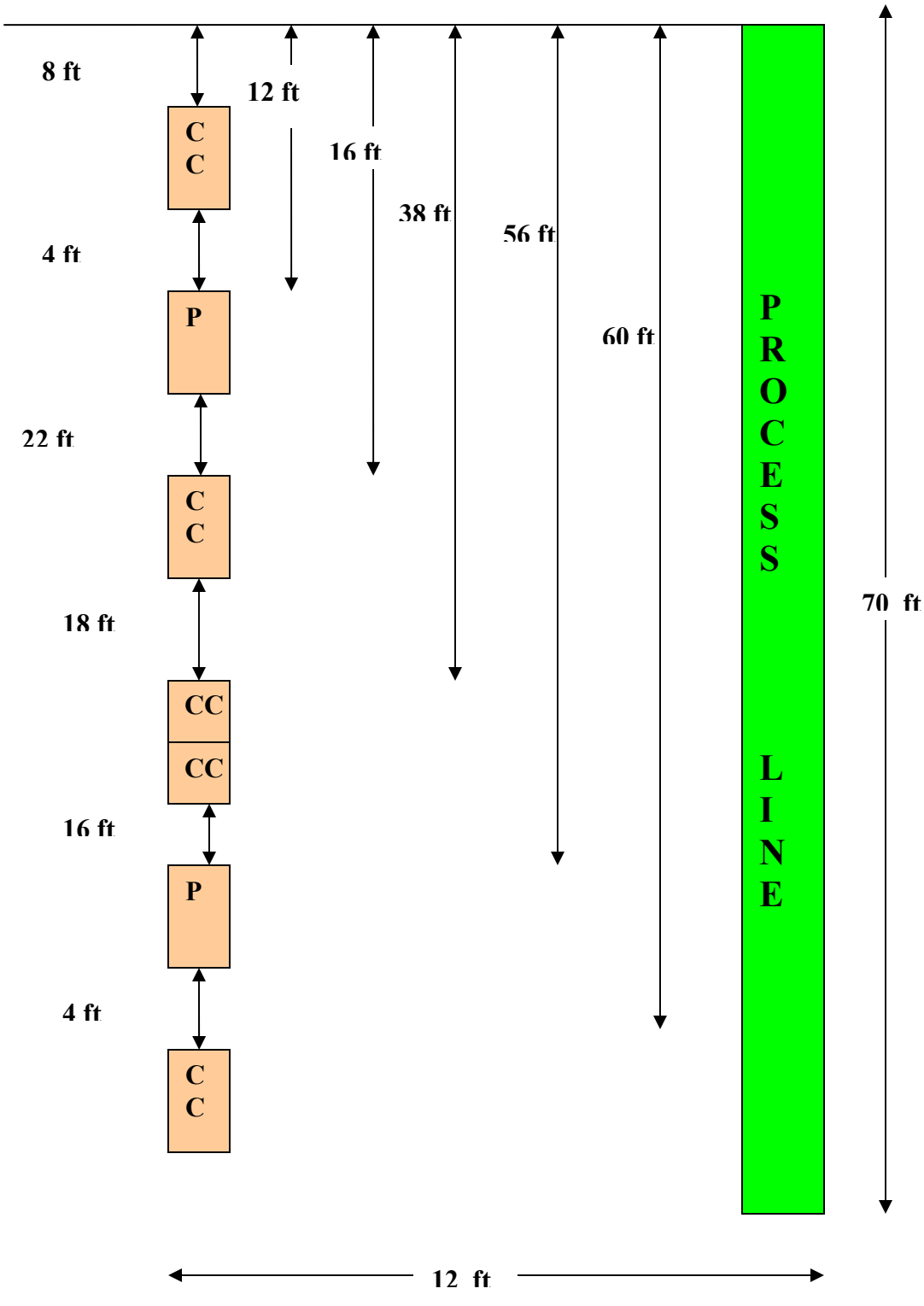
i. Open SV12, SV13 and start M11, M12 and M13. Deposition of Ag film on carrier -A to be initiated by turning on a set of gas valves and turning on DC Power supply and strike the plasma. Continue deposition as per set time duration (and as sensed by F26). After deposition is complete switch OFF DC supply, close set of solenoid valves, Stop M11, M12 and M13. Close SV12 and SV13. Carrier-A ready for transfer to next chamber
j. Open SV14, start M13 and M14. After sensing F28, stop M13 and M14, Close SV14. Carrier moves into Vac.Chamber-14 and wait for transfer to unload station.
k. Vent the chamber by opening VV3 through solenoid. Sense the pressure in the chamber at 760Torr, Open SV15, start M15 and M16. After clearing F29, stop M14 and M15, Close SV15. (Carrier moves onto unloading station to be removed manually). Close VV2, Open PV2 to evacuate the chamber. Sense the pressure ~600 mTorr, close PV2.
l. Similar steps (h-k) to be followed for carrier-B.
m. Values of gas flows, chamber pressure, fore line pressure, carrier position and safety interlock status should be displayed on SCADA system through out the process and log the data for every minute.

Shut down process:

iv. Close/open set of valves through solenoids as per pre determined time sequence for purging of chambers.
v. Close heater supply to all the heaters manually. The control system should confirm that the heaters supply is switched OFF.
vi. On the monitor screen Display instructions to Switch OFF:
    - Throttle valve controller.
    - MFC Flow box
    - Turbo pumps
    - Roots pump.
    - Stop rotary pumps
    - Baratron power supplies
    - Ion gauge power supplies
    - Convectron gauge power supplies
    - Control cubical power supply.
    - Scrubber
    - Nitrogen Supply
    - Compressed Air Supply
    - Scrubber Exhaust

Annexure-1

Dimensions of existing Process line and Control Cubicles (CC)



Total Area covered in (Sq feet) = 840 sq. feet

P - Power Supply
CC- Control cubical

AUTHORISATION LETTER FOR E-PAYMENT/ NEFT / RTGS

(PLEASE FILL UP THE FORM COMPLETELY IN CAPITAL LETTERS ONLY)

1	Type of Request (Tick One)	NEW / CHANGE
2	BHEL Vendor Code	
3	Company's Name	
4	Address	
5	City with Pin Code	
6	State	
7	PAN NUMBER	
8	Name of Contact Person	
9	Phone No with STD Code	
10	Fax No with STD Code	
11	Email Id	
12	Web Site (URL)	

BANK DETAILS FOR EFT / RTGS

1	Bank Name	
2	Branch	
3	Branch Code	
4	Address	
5	PHONE No.	
6	Account No.	
7	MICR/ IFSC Code	
8	Bank Swift Code	
8	NEFT/ RTGS enabled	Yes / No
10	Cancelled Cheque	Enclosed / Not Enclosed

1. I, as representative / owner of the above named company, hereby authorise BHEL R&D Hyderabad, to electronically make payments to the designated bank account. I hereby certify that the particulars given above are true, complete and correct.
2. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transferring Bank responsible.
3. This authority remains in full force until BHEL receives and acknowledge written notification requesting a change or cancellation.

Date:

Authorised Signatory
Designation :

COMPANY SEAL

BHARAT HEAVY ELECTRICALS LIMITED
CORPORATE R&D DIVISION, VIKAS NAGAR, HYDERABAD – 500 093, AP, India
Ph: 0091-40 – 23778474, FAX: 0091-40 – 23770698

RD:MPX:F-20 **General Terms and Conditions of Enquiry & Contract for the Purchase of Goods/ Services**

1. The quotation and any order resulting from this enquiry shall be governed by these General Terms and Conditions of enquiry and contract for the supply of goods and the supplier quoting against this enquiry shall, unless specifically stipulates any different terms or conditions, be deemed to have read and agreed to the same.
2. Sealed quotations in double cover with tenderer's distinctive seal, superscribing enquiry number, date and due date are to be submitted so as to reach on or before due date & time, addressed to **Additional General Manager(MM) and Head, Bharat Heavy Electricals Limited, Corporate Research & Development Division, Vikasnagar, Hyderabad, Andhra Pradesh, India – PIN–500 093, India.**
   In the case of **Two-part bid**, each inner cover shall clearly be labeled as a) **Technical & Commercial Bid** containing technical data/ drawings/ catalogues/ quality plans along with commercial terms and conditions & copy of the price bid with the price columns left blank (unpriced price bid), b) **Price bid** containing prices quotes. Installation and/or Commissioning charges shall be spelt out in absolutely lucid terms, taking into account total charges, rather than quoting vaguely, such as charges per man-day or charges per engineer per day etc. **If the price bid was found later to be different from the unpriced price bid in any way, the offer will be rejected summarily.**
3. **Tender/ Technical bid Opening**: Unless specified otherwise, tenders/ technical bids will be opened on appointed date and time as mentioned in the enquiry or as communicated changed date/time, if any, in the presence of such of those tenderers who may be present.
4. **Delayed/ Late Tender**: Tenders, which have been posted by registered post through the postal department in time before opening date but received after tender opening, shall be treated as regular tenders. Other tenders received after tender opening time shall be treated as late tenders and normally they may be rejected.
5. The Quotation should be free from overwriting and erasures. Corrections and additions, if any, must be attested. Supplier should indicate in the quotation dimensions (Size), weight, rate etc., in the metric system unless the enquiry calls for different unit.
6. **Validity of Quotation**: All quotations shall be kept open for acceptance for a period of ninety days from the date of opening of Tenders/ Technical bid and this shall be deemed to be an express condition of all quotations. The rate shall be quoted in both figures and in words.
7. In the case of Two-part bid, the vendor should furnish technical clarifications, if any, within stipulated time mentioned, failing which, it will be construed that the vendor is not interested in the tender and BHEL shall not consider the offer for further evaluation.
8. **Revision of Pricebid**: In the event of any bidder, after finalizing the technical specifications and scope of supply, opting to revise and submit their latest price bid, then BHEL reserves the right to open their original / previous price bid also while evaluating revised bid.
9. **Pricebid Opening**: Unless specified otherwise in the enquiry, the Price bids of technically qualified vendors shall be opened with prior intimation in the presence of such of those tenderers who may be present.
10. **Conformity to Specifications**: The material should be of the best quality and shall be conforming to our specification given in our enquiry. Unless otherwise agreed upon by BHEL, no payment shall be due by BHEL in respect of any sample. Offers without details of specifications/ applicable catalogues will not be considered and are liable to be rejected.
11. **Terms of Delivery**: All suppliers shall quote the lowest prices on ex-works and FOB/FCA basis. Foreign suppliers will also indicate their Indian agent's name and address with percentage of agency commission out of the quoted price, if any. Name and Address of the supplier's Bankers address should also be given. Indian suppliers for the indigenously manufactured/ imported stock shall quote on Ex-works /Free-on-Rail/Road /FOR-destination basis, indicating packing & forwarding charges, if any, separately.
12. **Taxes and Duties**: Unless specified otherwise in the enquiry, BHEL do not provide "C" or "D" Form as it is engaged in R&D. All Indian suppliers shall clearly mention current Sales Tax/ VAT, Excise Duty, and Service Tax etc, if any, payable in addition to the quoted price and indicate applicable rates/ percentage, item-wise clearly. It will be paid only if Registration Number under State(TIN)/ Central Sales Tax or Service Tax is specifically mentioned in the Bill/Invoice. Vendors without a Sales Tax/VAT registration and applicable Service Tax registration will not be considered.
13. **Insurance:** Insurance will be arranged by BHEL in case of Ex-Works as well as FOB basis supplies.
14. **Terms of Payment:** Full payment will be made within 30 days after receipt, inspection and acceptance of the material (and where involved, Erection and commissioning of the material/ equipment at BHEL/Destination) though Electronic Fund transfer (RTGS/NEFT/SEFT) with bank charges to the supplier's account. For foreign suppliers, the preferred payment term will be on Sight Draft basis and bank charges inside India will be to BHEL account and outside India will be to supplier's account.
15. Suppliers shall quote competitive price and best delivery for all the items mentioned in the enquiry. BHEL reserves the right to reject partial quotations and to place order on overall landed cost basis. Correct date of effecting supplies in the event of an order should be indicated in the offer. If the supplier's quoted terms are different from BHEL standard payment terms (Refer #14 above), interest @11% per annum (or as indicated in the enquiry) will be loaded to the quoted prices for difference of payment period.
16. **Packing**: The supplier shall be responsible for the goods being properly and adequately packed so as to prevent any loss, damage or deterioration during transit and indicate packing charges, if any, separately.
17. **Part/ Split Ordering**: BHEL reserves right to Order part of the item/ quantity of the enquiry and split the order among qualified vendors.
18. In case the goods enquired are on Rate Contract basis with any other unit of BHEL, such fact should be clearly indicated in the quotation giving full particulars of Rate Contract number, validity and price and also your willingness to comply with order if placed against such Rate Contract. A true copy of Rate contract signed by the supplier should be sent with the quotation.
19. **Inspection**: On receipt, the goods shall be subjected to inspection and also test, if necessary, and our decision regarding the acceptability of the goods shall be final and binding on the suppliers.
20. **Penalty for late delivery**: The time stipulated for delivery of goods shall be deemed to be the essence of the contract and delivery must be completed within the stipulated date/s. In the event of supplier's failure to supply the goods by the stipulated date/s , a penalty of ½% per week for the delayed no of weeks or part thereof for the undelivered portion of PO subject to a maximum of 10% of total order value shall be levied at the discretion of BHEL.
21. **Withdrawal from the Contract:** In case the supplier withdraws the quotation after its acceptance by BHEL or fails to supply the goods as per the terms and conditions of contract, or at any time repudiated the contract wholly or in part, BHEL shall be at liberty to cancel the Purchase Order and to recover from the supplier the extra cost and other loss, incidentals due to the breach of contract on the part of the supplier through risk purchase.
22. **Guarantee/ Warranty certificate and Manufacturer's Test report**: Invariably in all cases where it is so stipulated, the supplier should furnish Guarantee/ Warranty certificate valid for a period of 18 months from date of supply or 1 year from the date of receipt, acceptance and commissioning(or more, if provide by oem) whichever earlier and manufacturer's Test report along with the goods, failing which, BHEL shall have the right to reject the goods.
23. All ferrous/ non-ferrous items shall be colour coded as per bureau of Indian standards/ or IS standards/ BHEL Standards.
24. **Recovery of Dues**: BHEL shall recover any amount due from the supplier or any amount outstanding to the credit of the supplier with BHEL R&D unit or any other BHEL unit(s) and/or by legal action.
25. **Arbitration & Forum for Legal Proceedings**: All disputes arising in connection with indigenous/ foreign supplies shall be settled through arbitration held at Hyderabad, AP, India and arbitration shall be appointed by Arbitration Tribunal of the Federation of Andhra Pradesh Chambers of Commerce and Industry, Hyderabad, AP, India. The Courts at Secunderabad/ Hyderabad, AP, India shall have jurisdiction in respect of any suit or other legal proceeding arising from or relating to this contract

The rights and remedies of BHEL stated in these General terms and conditions shall be in addition and supplemental to its rights and remedies under law and custom or usage of trade or business and shall in no way be deemed to limit, curtail, supercede or derogate from its said rights and remedies.

RD:MPX:F-18

BHARAT HEAVY ELECTRICALS LIMITED
CORPORATE R&D Division
Vikasnagar, Hyderabad, Andhra Pradesh, India – 500093.,

IMPORTED

Suppliers' compliance statement to basic conditions of enquiry (to be submitted along with Technical & Commercial bid)

Enquiry number: **Enquiry dt:**

(In case Order to be placed on the Principal and foreign currency)

Condition	BHEL R& D's terms	Supplier's compliance (indicate Yes/No. if 'No', state terms desired)
1. Validity of offer	90 days from the tender opening date (or as per enquiry)	
2. Delivery requirements	FCA – Nearest International Airport (or as indicated in the enquiry)	
3. Warranty	Unless specifically mentioned in the enquiry, all supplied items to be provided with warrantee for one year (or more, if provided by the OEM) from the date of acceptance/ commissioning. In case of equipment involving erection and commissioning, warrantee shall be for 18 months from the date of dispatch or 12 months from the date of commissioning, whichever is earlier	
4. Terms of payment	Sight draft. All bank charges inside India will be to BHEL R&D account and outside India will be to the supplier's account. Documents through State Bank of India, Trade Finance Central processing Cell (TFCPC), Opp. Anand Theatre, Secunderabad, Andhra Pradesh, India-500003. SWIFT Code: SBININBB602, Phone: 91-40-27816795, FAX: 91-40-27720459	
5. Agency commission	Pl specify Indian agency commission charges, if any, in percentage of quotation. The same shall be paid to the agency in Indian Currency only.	
6. Erection/ Commission	As per enquiry	
7. Documentation	As per enquiry	
8. Insurance	BHEL will arrange Insurance based on intimation to our Insurance agency. Address of the agency will be mentioned in the Purchase Order.	
9. Penalty for late delivery	0.5% per week beyond the delivery date on undelivered portion subject to a maximum of 10% of the total order value.	

* BHEL R&D reserves the right to reject any offer due to non-compliance with the above conditions and/or non-receipt of this form in duly filled condition
* Any other elements of cost in addition to the above may please be specified in detail

(Signature and Stamp/ Seal of Vendor)

RD:MPX:F-17

BHARAT HEAVY ELECTRICALS LIMITED
CORPORATE R&D Division
Vikasnagar, Hyderabad – 500093, India.

Suppliers' compliance statement to basic conditions of enquiry (to be submitted along with Technical & Commercial bid)

Enquiry number:: **Enquiry date::**

(In case Order to be placed on Indian supplier in Indian currency)

Condition	BHEL R& D's terms	Supplier's compliance (indicate Yes/No. if 'No', state terms desired)
1) Validity of offer	Unless specifically mentioned in the enquiry, 90 days from the tender opening date	
2) Delivery requirements	Free delivery at our stores or FOR destination (or as indicated in the enquiry)	
3)Warranty	Unless specifically mentioned in the enquiry, all supplied items to be provided with warrantee for one year (or more, if provided by the OEM) from the date of acceptance/commissioning. In case of equipment involving erection and commissioning, warrantee shall be for 18 months from the date of despatch or 12 months from the date of commissioning, whichever is earlier	
4) Terms of payment	Unless specifically mentioned, full payment will be made within thirty days after receipt, inspection and acceptance of the material at BHEL R&D (and where involved, erection and commissioning of the material/equipment at BHEL/destination), by EFT/RTGS with bank charges, if any, to supplier's account.	
5) Taxes & Duties	Unless specifically mentioned in the enquiry, we do not provide 'C' or 'D' form. Supplier to specify rates of taxes and duties element wise and related percentages. Terms like "inclusive" or "extra" are not acceptable. Please mention "NIL" if taxes/ duties are exempted/ not applicable.	
6) Penalty for late delivery	0.5% per week beyond the delivery date on undelivered portion subject to a maximum of 10% of the total order value	

* BHEL R&D reserves the right to reject any offer due to non-compliance with the above conditions and/or non-receipt of this form in duly filled condition
* Any other elements of cost in addition to the above may please be specified in detail

(Signature and Stamp/Seal of Vendor)

RD:DP:MPX:F-14

BHARAT HEAVY ELECTRICALS LTD.
Corp. R&D DIVISION
VIKAS NAGAR,
HYDERABAD- 500 093 (INDIA)

SUPPLIER REGISTRATION FORM

(FOREIGN SUPPLIER)

ALL COLUMNS SHOULD BE PROPERLY FILLED IN THE SPACE PROVIDED FOR. WHEREVER IT IS NOT APPLICABLE PLEASE WRITE "NOT APPLICABLE". INCOMPLETE OR INCORRECT FORMS MAY NOT BE CONSIDERED.

1.0 GENERAL INFORMATION:

1.1 ….NAME OF COMPANY

1.2 ….DETAILS OF HEAD OFFICE:

ADDRESS :
TELEPHONE :
FAX :
.EMAIL :
.WEB SITE :

1.3 ….DETAILS OF FACTORY/WORKS:

ADDRESS :
TELEPHONE :
FAX :
.EMAIL :
.WEB SITE :

1.4 ….DETAILS OF MARKETING AGENT

ADDRESS :
TELEPHONE :
.FAX :
.EMAIL :
.WEB SITE :

1.5 CHIEF EXECUTIVE

1.6 CONTACT PERSON(S)
FOR PRODUCT OFFERED
NAME(S)
OFFICIAL CPACITY
ADDRESS:
TELEPHONE
FAX
E-MAIL

1.7 YEAR OF ESTABLISHMENT

1.8 PRODUCTION CAPACITY PER ANNUM

1.9 PARTICULARS OF PRODUCT INCLUDING
SPECIFICATION AND RANGE OFFERED
FOR REGISTRTION
(ATTACH BROUCHERS AND CATALOGUE)

1.10 NAME(S) OF BANKERS

1.11 BANKER'S CERTIFICATE

1.12 PORT OF LOADING

1.13 NEAREST AIRPORT

1.14 NAME OF THE INDIAN AGENT, IF ANY
WITH AUTHORISATION LETTER

2.0 FINANCIAL INFORMATION

2.1 …TOTAL CAPACITY

2.2 …ANNUAL TURN OVER FOR LAST 3 YEARS

2.3 …WHEHER CREDIT LICENSE ACCEPTABLE YES/NO

3.0 QUALITY MANAGEMENT SYSTEMS
ENCLOSED FORMAT PART-B

3.1 EXPERIENCE LIST FOR SAME/SIMILAR ITEMS
TO BE ENCLOSED

4.0 …..**FUTURE EXPANSION PLANS:**
(GIVE DETAILS)

5.0 LIST OF ENCLOSURES:
INCLUDING BROUCHERS, CATALOGUES, TECHNICAL
LITERATURE ETC.

6.0 ANY OTHER INFORMATION

SIGNATURE OF SUPPIER (AUTHORIZED SIGNATORY)

NAME
DESIGNATION
DATE
…….OFFICIAL SEAL

Note: Please attach separate sheets, if space found is inadequate

BHARAT HEAVY ELECTRICALS LTD.
Corp. R&D DIVISION
VIKAS NAGAR,
RD:DP:MPX:F-13 **HYDERABAD- 500 093 (INDIA)**
Ph: 040 – 23778474, Fax: 040 – 23770698, email: mpx@bhelrnd.co.in

VENDOR REGISTRATION FORM

(Indigenous supplier)

[FORM TO BE SUBMITTED* BY THE BIDDER ALONG WITH TECHNICAL-BID]

Before filling, please refer to instructions on page-4

1.0 VENDOR PROFILE:

1.1 Name and address of the vendor:

_____

_____

_____

Phone Nos.:
Fax No.:
Email: 1. 2.

1.2 Local representative name & address in Hyderabad/ Secunderabad:

_____

_____

_____

_____

Phone Nos.:
Fax No.:
Email:
Contact person:
Mobile No.:

2.0. TYPE OF ORGANIZATION:

PROPRIETORSHIP	COMPANY	SISTER CONCERN (mention vendor registration number of main organization)	
PARTNERSHIP	CORPORATION	Small Scale Industry	ANY OTHER (Please specify)

In case of SSI unit, copy of registration to be enclosed.

3.0 ANNUAL TURN OVER:

#	Year	Turn-Over
1	Current Year(budgeted)	
2	Previous year (200 - 0)	
3	Prior Year (200 - 0)	

4.0 NAME AND ADDRESS OF THE BANKER:

1. Bank Name
2. Branch name
3. Account number
4. Account Type
5. MICR Code:
6. IFSC Code(RTGS/NEFT):
7. Bank Phone number(s),

Blank cheque, duly cancelled, to be enclosed.

Please note that all payments shall be made through Electronic clearance services to your above account against the orders executed, if any.

5.0 REGISTRATION PARTICULARS (relevant copies to be enclosed)

5.1 IT Permanent Account No.(PAN):
5.2 State sales tax/VAT Registration No.:
5.3 Central Sales Tax Registration No.
5.4 ED Registration No.
5.5 Service Tax Registration No.:
5.6 PF Account No.:
5.7 Labour Licence No.:
5.8 **ESI Account No.:**

6.0 CONTACT PERSON: S/Sri

Designation::: Phone/ Mobile No. :

7.0 TOTAL NUMBER OF EMPLOYEES:

Graduates (Engr./Scientists/ Mgmt/Fin.)	Consultants	Workers		
		Sup./Skilled	Semiskilled	Unskilled

8.0 WISH TO REGISTER FOR SUPPLIES/SERVICES:

#	**Service/Supplies**	**Capacity**
1		
2		
3		
4		
5		
6		
7		

9.0 REFERENCE LIST :

(Only recognized public and private sector companies, attach if printed copy available)

#	Customer	Volume / Year
1		
2		
3		
4		
5		
6		
7		

10.0 INFRASTRUCTURE / FACILITIES:

#	Facility (with specifications)	Age/ Year procured
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

11.0 REGISTRATION WITH OTHER BHEL UNIT/UNITS:

#	Unit	Registration No.	Year
1			
2			
3			
4			

12.0 ANY OTHER INFORMATION :

DECLARATION:

The information furnished above is true and authentic.

(CEO / PROPRIETOR)

SEAL:

DATE:

The competent authority reserves the right to accept or reject the registration. Registered vendors will be informed by mail / email, as convenient. Contact AGM (MM) for clarification/ additional information on registration.

A separate communication will be sent to you in case of non-registration, citing reasons thereof.

Instructions

1. Answer all items; use NA for items not applicable.
2. BHEL units do not require this registration.
3. Use additional sheets for want of space if required.
4. Attach copies of latest document s in respect of items 5.0 (Registration no.s)
5. Photographs of registered office and the chief executive/proprietor shall be furnished.
6. Use A4 sheets for this document and the enclosures.

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* REGISTERED BIDDERS, HAVING BHEL (R&D) REGISTRATION NO. OR HAVE SUBMITTED THIS FORMAT FOR REGISTRATION, NEED NOT FURNISH THIS INFORMATION AGAIN