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**Government of India  
BHABHA ATOMIC RESEARCH CENTRE  
Glass and Advanced Materials Division**

**S .A. Thakur  
Scientific Assistant D**

REF: GAMD/SAT/2022/I/12841

DATE : 28/01/22

**Online**

**Sub: Invitation of Quotation for Minor Fabrication of customized PLC control CNT Fiber collection system with automatic robotic handling in Annexure 1.  
Due date: 14<sup>th</sup> February 2021**

Dear Sir,

For & On behalf of the President of India, quotations are invited by the undersigned for following service work.

<b>Description of work</b>
Fabrication of customized PLC control CNT Fiber collection system with automatic robotic handling as per given in Annexure 1.

The quotation should be sent in a sealed envelope. The envelope shall *clearly be superscribed* with the reference no., due date and with the words “**Quotation: not to be opened**”. It should be addressed to following person and should reach him/her on or before the date mentioned. The quotation must be send by speed post only.

S. A. Thakur, SA/D Glass and Advanced Materials Division, Materials Group, BARC Mumbai 400085	On or before 14 <sup>th</sup> February 2021
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**Instructions to the tenderer:**

1. The supplier should contact ph. No. 022-25594946 and email: sathakur@barc.gov.in to understand the scope of work, failing to which they are not eligible for tendering process and hence their quotation will not be opened.
2. The quotations are to be in printed letter head/ quotation format which should consist of GST Registration Number, PAN number of the firm. Quotations received without signature, over-writing, summation errors etc. will be construed as invalid and thus rejected.
3. The tenderer should write in words as well as figures, the rate(s) quoted by him. All corrections must be attested by the dated initials of the tenderer.
4. Income-Tax and surcharge on income-tax as applicable shall be deducted from the bill. The payment for the work done shall be paid by our Accounts Division only on satisfactory completion of the work within one month.
5. The acceptance of the tender rests upon the undersigned with a right to reject the tender without assigning any reason.

  
सहायक वैज्ञानिक अधिकारी / Scientific Officer Assistant  
काँच एवं प्रगत पदार्थ प्रभाग  
Glass and Advanced Materials Division  
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त्रांबे, मुंबई / Trombay, Mumbai - 400 085.

**S .A. Thakur**  
SA/D, GAMD

*Annexure 1*

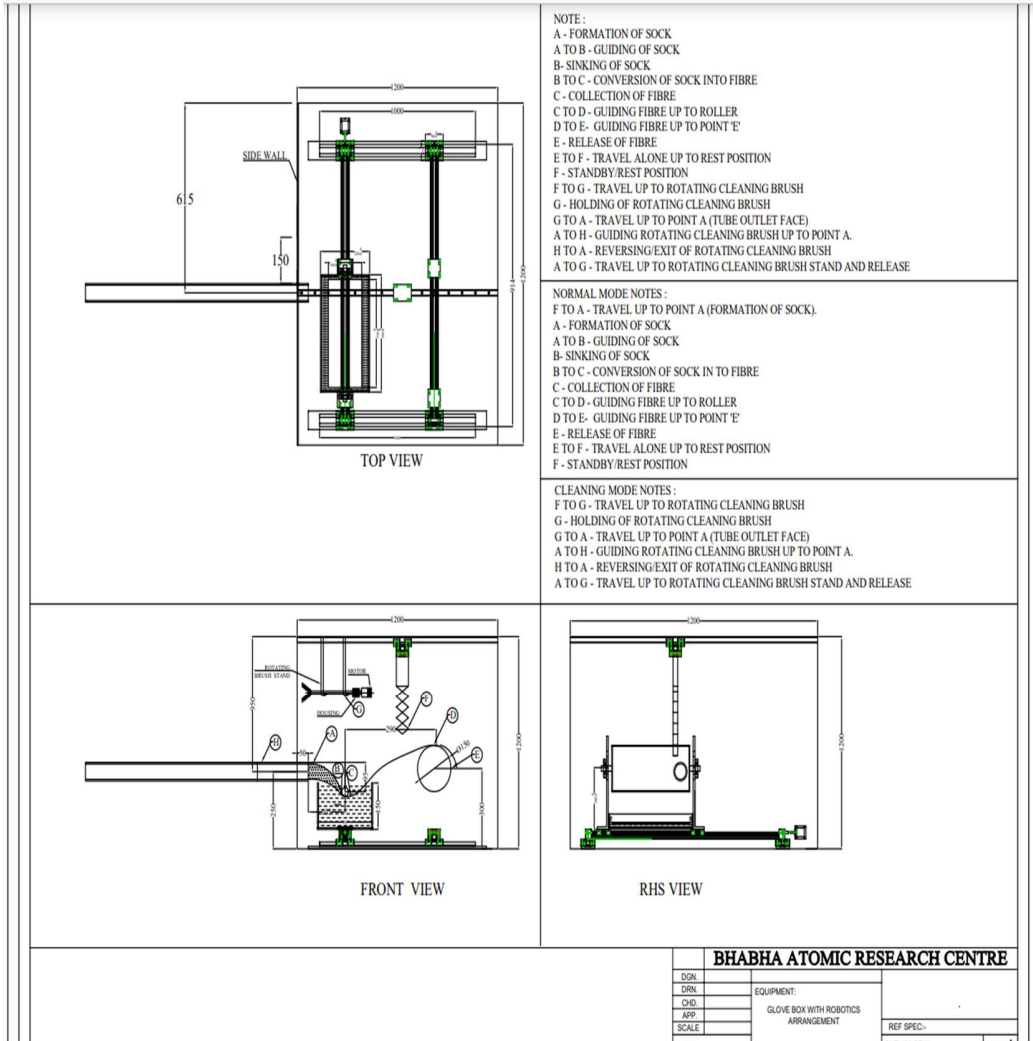
<b>TECHNICAL SPECIFICATIONS</b>		
<b>SYSTEM STRUCTURE</b>		
<b>1</b>	<b>Purpose</b>	Vacuum /Inert atmosphere tight joint between the tubular furnace tube and controlled atmosphere box to protects the sample from oxidation and application of Robotic arm in the preparation of CNT fiber winding processes.
<b>2</b>	<b>Design</b>	Horizontal loading of the tubular furnace alumina tube through the side wall of the glove box and robotic arm installation inside glove box.
<b>3</b>	<b>Automatic CNT Winding</b>	Automatic CNT Yarn Bobbin Winding Machine uses vertical path, with no inflection point, little friction and less hairiness.
<b>4</b>	<b>Tube and controlled atmosphere box sealing</b>	Alumina Tube Vacuum flange and the glove box side wall should be connected through Graphite sealing gasketed stainless steel coupling -to maintain the inert atmosphere.
<b>5</b>	<b>Hydrogen gas</b>	Safety : hydrogen leak detector will be Installed at system, if any % LEL level it should gives alarm and switched off the system
<b>Alumina Tube Vacuum seal arrangement</b>		
<b>1</b>	<b>Vacuum /Inert atmosphere arrangement</b>	Improved tube flange design should allows easy sample reload without uninstalling all parts of the flange. Tube SS 304 flange is connected with a controlled atmosphere box (electrically operated) via CF-60 adaptor. graphite O-ring sealing on the flange during high-temperature operation.
<b>Atmosphere control box</b>		
<b>1.</b>	<b>Atmosphere control box</b>	Must be capable of handling hydrogen and other explosive gases in atmospheric pressure and slightly higher level with Precision automation.
<b>2.</b>	<b>Number of Chamber</b>	<b>Single chamber</b>

3.	<b>Design</b>	<b>Two side will be Hinged type Door and Third side without hinged type door (with Polycarbonate sheet) for loading devices and sample easily. Fourth side will be SS sheet closure</b>
4.	<b>Inside dimensions</b>	<b>1200 (L)X 1200 (H) X 1200 mm(W)</b>
5.	<b>Shell Construction</b>	Internal finish : Type 304 stainless steel, #4 <b>Wall thickness : 0.105" (2.6 mm)</b>
6.	<b>Glove Port</b>	<b>Controlled atmosphere LEFT and RIGHT SIDE of door having two glove port each side Total No of glove port : 4 nos</b>
7.	<b>Exterior finish</b>	<b>Powder coated, RAL 7035</b>
8.	<b>Stand</b>	Powder coated, leveling feet & Castors
9.	<b>Feedthrough</b>	2 x DN 40 ISO-KF blank
10.	<b>Electrical Outlet</b>	Four position power strip 230V AC, 5A
11.	<b>Gas Inlet</b>	Two Gas Inlet will be provided at two sides of controlled atmosphere Box Size of gas Inlet will be 1/4" with automated solenoid valve
12.	<b>Gas Outlet</b>	Two Gas Outlet will be provided at two sides of controlled atmosphere Box 1. first gas outlet will be 1/2" with automated solenoid valve 2. Second gas outlet will be 3/4" with manual valve
13.	<b>Water Bath</b>	Water bath – SS 304 300 X 300 X 250 mm 1. water auto feeding with water level sensing 2. water auto draining system It will be controlled by PLC and HMI
14.	<b>Glove ports size</b>	220MM diameter, chemical resistant, polyoxymethylene
15.	<b>Gloves</b>	Thick butyl rubber of 0.3-0.4 mm thickness, hand size 9.75
16.	<b>Window</b>	Chemical resistant and inclined panel Polycarbonate (Abrasion Resistant) Window 9.5 mm Thick Viewing size 1050 mm Wide X 770 mm Height
17.	<b>Fiber Drying system</b>	Infrared drying (IR) uses the energy from IR radiation to directly Dry the CNT fiber. The delivered energy is applied directly to the granule with no other transfer medium. 400 watts X 2 no IR lamp will be used to Dry CNT Fiber

18.	<b>Gas Purification</b>	Gas purification panel is used to remove the vapours impurities like Moisture, CO, CO <sub>2</sub> , and Hydrocarbon from Argon. Pressure Regulators : Maximum inlet pressure 10 kg / cm <sup>2</sup>
19	<b>Pressure Control</b>	Automatic pressure control : (+/- 15 mbar) Manual pressure control : Footswitch
20.	<b>Alumina tube</b>	1 m length 50 mm OD and 45 mm ID
21	<b>Oxygen sensor</b>	High sensitivity (0-100%)
22.	<b>Vacuum System</b>	(i) Vacuum Pump: High speed rotary vacuum pump (ii) Pumping capacity :200liters/m (iii) Vacuum level : Rough Vacuum Vacuum gauge : Analogue Dial gauge
23.	<b>PLC &amp; HMI</b>	<p>Parameters Indication (Digital Display) by 10" Wide HMI</p> <ol style="list-style-type: none"> <li>1. <b>Pressure level (mbar) in the chamber</b></li> <li>2. <b>Oxygen level (%) in the chamber</b></li> <li>3. <b>Moisture level (%) in the chamber</b></li> <li>4. <b>Trending screen -Pressure, O<sub>2</sub> and H<sub>2</sub>O value is logged for 24 hours</b></li> <li>5. <b>CNT fiber winding Roller RPM</b></li> <li>6. <b>CNT fiber winding Roller X axis motor operation</b></li> <li>7. <b>CNT fiber winding Roller Z axis motor operation</b></li> </ol> <p>Parameters Control by Programmable Logic Controller The pressure level in the main chamber (0-10 mbar) is controlled by the PLC. Three electrically operated solenoid valves are controlled by the PLC to maintain the set pressure in the chamber</p> <p><b>Computer control</b> PLC and HMI will be connected to the computer, we can operate the system from computer</p>
24.	<b>HD camera with Disply</b>	<p><b>2 Nos</b>, 2.4 MP IR Camera(Full HD) 1/2.7 2.4MP PS CMOS Image Sensor, Max 25/30fps@ 2.4MP DWDR, Day/Night(ICR), 2D-DNR, AWB, AGC, BLC, HLC 3.6mm fixed lens (2.8mm, 6mm optional), IR Range of 20 Mtrs., IP67 OSD Menu, control over coaxial cable, 2D-DNR</p>

		A5-5" 4K HDMI Field Monitor (Black)
<b>25.</b>	<b>Spray Nozzle</b>	SS spray nozzle with Liquid and Aragon purge available Spray nozzle dia will be 0.5mm
<b>26.</b>	<b>Working Gas</b>	(i) Argon gas (ii) Connecting piping: 304 Stainless steel Main chamber (box) pressure control: Foot switch/ pedals for increasing and decreasing pressure.
<b>CNT Fiber winding system</b>		
<b>1</b>	<b>Winding drum</b>	Types of winding : Drum rotation Size Of the drum : 150mm Dia X 300mm length Drum speed :Up to 600 RPM Package shape : Cylindrical Traverse length : 50mm to 150mm, Way of anti-overlapping :Frequency conversion Soft edges-displacement :2-8mm Weight of each section : 50kg Power supply : 1 phased 230V±10% , 50/60HZ Drum Motor : Stepper Motor drive with PLC control
<b>2</b>	<b>Transverse movement</b>	Transverse Movement -X axis -driven By stepper Motor Traverse length : 50mm to 150mm Transverse speed : 0 to 150 RPM
<b>3</b>	<b>Rotation drum - Height adjustment Z axis</b>	Z axis Movement -Height adjustment -driven By stepper Motor Height adjustment : 0 mm to 50mm Transverse speed : 0 to 10 RPM
<b>4</b>	<b>Rotation drum - Front and back adjustment Y axis</b>	Y axis Movement -Front and back adjustment Lead Screw type manual movement

5	<b>Robotics handling</b>	Robotic system should handle delicate sock precisely with high precision (Precision system-TH) as per the different mode given in the schematic drawing (Front view) with programming notes. Controls should be enabled with PLC/SCADA system.
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*S. Thakur*

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