



INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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Ref: ELE/11-12/224/DITX/ENAK

Date: 19.04.2013

Tender No.: ELE/ENAK/012/2013

N.E. Nagaraj
Special Officer (Project Purchase)
IC&SR, I.I.T. Madras

Due Date: 13.05.2013, 3:30pm

Dear Sirs,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of **“Liquid Nitrogen based General and Purified Nitrogen Gas Distribution System”** conforming to the specifications given in Annexure.

I) Instructions to the Bidder

- (i) **Preparation of Bids:-** The tenders should be submitted under two-bid system (i.e.) Technical bid and Financial bid.
- (ii) **Delivery of the tender:-** The tender shall be sent to the below-mentioned addresses either by post or by courier so as to reach our office before the due date and time specified in our Schedule. The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule. The tender box is kept in the office of the “Special Officer, Project Purchase” IC & SR Building 2nd floor, I.I.T. Madras, Chennai – 600 036.
- (iii) **Opening of the tender:-** The offer/Bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and it will be examined by a technical committee which will decide the suitability of the bid as per our specifications and requirements. The financial offer/bid will be opened only for the offer/bids which technically meet all our requirements as per the specification.

- (iv) **Prices:-** The price should be quoted in nett per unit (after breakup) and must include all packing and delivery charges. The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However the percentage of tax & duties should be clearly indicated.

The price should be quoted without custom duty and excise duty, since I.I.T. Madras is exempt from payment of excise duty, and the custom duty will be paid at concessional rate against duty exemption certificate.

In case of import supply, the price should be quoted on CIP or CIF basis indicating the mode of shipment.

- (v) **Agency Commission:-** Agency commission, if any, will be paid to the Indian agents in Rupees on receipt of the equipment and after satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in Tender even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent.
- (vi) **Terms of Delivery:-** The item should be supplied to our destination in case of local supply. In case of import supply, the item should be shipped only to Chennai Airport. The Installation/Commissioning should be completed as specified in our important conditions.

Yours faithfully,



N.E. Nagaraj
Special Officer (Project Purchase)
IC&SR, I.I.T. Madras.

SCHEDULE

II) Important Conditions of the tender

1. The due date for the submission of the tender is **13.05.2013, 3:30pm.**
2. The offer/bids should be submitted in two bid systems (i.e.) Technical bid and Financial bid. The technical bid should consist of all technical details along with commercial terms and conditions. Financial bid should indicate item-wise price for the items mentioned in the technical bid. The Technical bid and the Financial bid should be put in separate covers and sealed. Both the sealed covers should be put into a bigger cover. The limited tender for supply of **“Liquid Nitrogen based General and Purified Nitrogen Gas Distribution System”** should be written on the left side of the outer cover.
3. (i) EMD:- Two percent (2%) of the tender value quoted by the company. The EMD should be included in the Financial bid which will not be opened for Technical evaluation. **Enclosing the EMD in the Technical bid will automatically disqualify the tenderer.** EMD should be in the form of DD in favour of “The Registrar, Indian Institute of Technology Madras” and payable at Chennai. The tender without EMD would be considered as UNRESPONSIVE and REJECTED. Photo/FAX copies of the Demand Draft/Banker’s pay orders will not be accepted. The EMD will not be paid any interest and EMD shall be converted as a security deposit of the successful bidder and the same will be returned after the completion of the warranty period.

(ii) **The Successful bidder should submit Performance Security an amount of 5% of the value of the contract. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from commercial bank will be an acceptable.**

(iii) The Performance Security should be valid for the period of 12 months from the date of Installation.

(iv) The EMD (Bid Security) will be refunded to the Successful bidder on receipt of Performance Security.

4. If an Indian agent is involved, the following documents must be enclosed:
- i) Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.
 - ii) Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
 - iii) The enlistment of the Indian agent with Director General of Supplies & Disposals under the Compulsory Registration Scheme of Ministry of Finance.
5. The offer/bids should be sent only for a machine that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.
6. Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid.
7. Documentary proof for the claimed position and repetition accuracies must be obtained from the principals and submitted along with the relevant pages of the standards.
8. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.
9. **Delivery Schedule:-** The tenderer should indicate clearly the time required for delivery of the item. In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.
10. **Risk Purchase Clause:-** In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.

11. **Payment:-** No Advance payment will be made for Indigenous purchase. However 90% Payment against Delivery and 10% after installation is agreed to wherever the installation is involved. In case of import supplies the payment will be made only through Letter of Credit and 90% payment will be released against delivery and 10% after installation wherever the installation is being done.
12. **On-site Installation:-** The equipment or machinery has to be installed or commissioned by the successful bidder within 15 to 20 days from the date of receipt of the item at Institution of IIT Madras.
13. **Warranty/Guarantee:-** The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately.
14. **Late offer:-** The offers received after the due date and time will not be considered.
15. **Acceptance and Rejection:-** I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.
16. **Disputes and Jurisdiction:-** Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.
17. **Acknowledgement:-** It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

**SIGNATURE OF TENDERER
ALONG WITH SEAL OF THE
COMPANY WITH DATE.**

Technical Specifications for Design, Supply and Installation of LN2 based Nitrogen Distribution System

It is proposed to Design, Supply and Install a High Value General Nitrogen (GN2) and Purified Nitrogen (PN2, purity $\geq 99.9999\%$) Distribution System, generated from Liquid Nitrogen (LN2), for various research equipments across multiple labs and cleanrooms. LN2 Dewars including all accessories, N2 Purifier, Changeover Panel, EP and BA SS 316L tubing with appropriate Tees, Elbows, Supports and Clamps etc. are required for the same. Following installation, the lines need to be Tested and Validated for Pressure, Helium Leak and Particles.

General Specifications

S.No	Description	Requirements	Quantity*
1	N2 Dewars - 450ltrs +/- 10% including accessories		3 Nos.
2	N2 Purifier without CH4 Removal		1 No.
3	Changeover System for Dewars		1 No.
4	2" Tube	SS316L BA	30Mtrs.
5	1" Tube	SS316L BA	200Mtrs.
6	1/2" Tube	SS316L BA	200Mtrs.
7	1/4" Tube	SS316L BA	350Mtrs.
8	2" Elbow	SS316L BA	5 Nos.
9	1" Elbow	SS316L BA	25 Nos.
10	2" Tee	SS316L BA	5 Nos.
11	1" Tee	SS316L BA	15 Nos.
12	1/2" Tee	SS316L BA	100 Nos.
13	1" Tube	SS316L EP	20Mtrs.
14	1/2" tube	SS316L EP	325Mtrs.
15	1/4" Tube	SS316L EP	250Mtrs.
16	1" Elbow	SS316L EP	10 Nos.
17	1" Tee	SS316L EP	5 Nos.
18	1/2" Tee	SS316L EP	50 Nos.
19	Filter 2"	0.25 micron	1 No.
20	2" Ball Valve	SS316L BA	5 Nos.
21	1" Ball Valve	SS316L BA	5 Nos.
22	1/2" Ball Valve	SS316L BA	15 Nos.
23	1/4" Ball Valve	SS316L BA	100 Nos.
24	1" Ball Valve	SS316L EP	5 Nos.
25	1/2" Ball valve	SS316L EP	10 Nos.
26	1/2" Diaphragm Valve	SS316L EP	5 Nos.
27	1/4" diaphragm Valve	SS316L EP	25 Nos.
28	NPT End Regulators	SS316L BA	20Nos.
29	VCR End regulators with Gauge	SS316L EP	15Nos.
30	VCR Connectors	SS316L EP	100 Sets
31	Tube Supports		175 Nos.
32	Tube Clamps		1500 Nos.
33	Pressure Test for GN2 and PN2 lines after Installation		

34	He Leak Test for PN2 lines after Installation		
35	Particle Count Test for PN2 lines after Installation		30 Nos.
36	<p><u>Flow requirement:</u></p> <ul style="list-style-type: none"> Estimated GN2 requirement of 1200SLPM Estimated PN2 requirement of 300SLPM The output from the LN2 Dewar and its accessories should be able to satisfy the required total N2 flow rate of 1500SLPM on continuous basis. Specify how this will be achieved. Necessary design data and technical validation including drawings and design calculations for delivering such flow rate of gas using dewars shall be submitted in the technical bid. Two LN2 dewars will be connected to an automatic changeover panel and the third dewar will be on standby. Changeover Panel for Dewar - Mechanism philosophy for changeover using dewars must be adequately qualified with design explanation and drawing. 		

**** Quantity mentioned is to be used for the purpose of submitting an exploratory quote only. The total cost will be based on Item Unit Rate and Installation Unit Rate only and can differ by $\pm 20\%$ of the above value.***

Specifications of Major Items:

S. No	Details
1	<p><u>Automatically Regenerable Nitrogen GAS Purifier – 300SLPM, 99.9999% purity</u></p> <ul style="list-style-type: none"> The following Impurities shall be removed - O₂, CO, CO₂, H₂, H₂O, Non-Methanated Hydro carbons to < 1 ppb. Particle Filtration at the outlet of the Purifier will be 0.003 micron @ 99.9999999% efficiency. Pressure Drop across the Purifier shall not exceed ~15 psig. Purifier shall have internal arrangement for Twin adsorption towers such that they will alternate between purification and regeneration modes, thus ensuring continuous purification. Regeneration of Adsorber is achieved by reverse flushing using purified Nitrogen blend with Hydrogen at an elevated temperature. The Entire Assembly shall be Safe for installation inside the building or Clean Room conditions. There shall be Safety Relief valve for blocked gases inside the Purifier heater zone to avoid over Pressure inside the purifier. The Purifier will have interlocks for trip / shutdown in eventuality of Temperature rise beyond set point. The design standards adopted for fabrication of the Purifier internal vessels shall comply with ASME Pressure Vessel Standards Section VIII and entire Purifier would have CE Marking. The Purifier skid must be compatible to use 230V AC Power. <p>Following features are must:</p> <ul style="list-style-type: none"> There will be Gas Moisture Sensor to provide continuous confirmation of outlet moisture content. Auto or Manual Bypass allows process gas flow to bypass the purifier vessels. Particle Filter with removal efficiency rating of 0.003 Micron shall be provided at the outlet of purifier.

	<ul style="list-style-type: none"> • There will be MODBUS Data communication port for capturing performance data output. • The Purifier will be equipped with Inlet/Outlet Pressure sensors to provide process gas pressure indication. • Purifier is preinstalled with Inlet Mass Flow Meter provides process gas flow rate and total flow indication • The Purifier will be pre-engineered with Internal bypass Column • Inlet and Outlet Isolation Valves for manual purifier isolation • Suitable rating Electric Gas Preheaters will be provided to meet the objective of purification. • The Purifier Assembly will come with Hydrogen Blending Station which provides hydrogen regeneration gas mixture for the purifier. • Electrical Fault protection shall be provided. • The Purifier Cabinet will have external emergency shutdown switch • The Controller for Purifier will be a Microprocessor PLC with Color Touch Screen Human Machine Interface (HMI). • The Foot Print of the Purifier shall not exceed 1400mm(Height) X 450mm(Depth) X 850mm(Width) • The End Connections of Purifier shall match with the following: <ul style="list-style-type: none"> • Feed Inlet: ½" FVCR • Purified Outlet: ½" FVCR • Regeneration: ½" FVCR • Relief Vent: ½" FVCR • H2 Inlet: ¼" Tube • Cabinet Extraction Vent: 4" duct • Pneumatic Air Inlet: 3/8" FNPT
2	<p><u>Liquid Nitrogen Dewars:</u></p> <p>The Dewar shall be of capacity to hold 450 liters of Liquid Nitrogen. It shall be built with Tough and durable Stainless Steel. It is encompassed with High Performance Insulation for maintaining the liquid N2 temperature for longer durations in idle conditions. It will come with following hardware for operations:</p> <ul style="list-style-type: none"> • Liquid Vaporiser • Safety Relief Valve • Rupture Disc • Differential Pressure Gauge • Liquid Filling Valve • Economiser Pressure Regulator • Pressure Building Regulator • Pressure Building Valve • Manual vent Valve • Gas Draw off Valve • Pressure Building Loop • Pressure Gauge <p>Additionally Castor wheel trolley for easy movement of Liquid Dewar and Vacuum Insulated Hose for Liquid filling.</p>
3	<p><u>Valves:</u></p> <p>The Isolation & Diaphragm Valves will have following specifications :</p> <p>Wetted Parts:</p> <ul style="list-style-type: none"> • Body: SS316

- Surface Finish: 0.25 micron EP
- Diaphragm: Hastelloy
- Seat Material: PVDF

Non-wetted Parts:

- Backup Diaphragms: Nickel Alloy
- All others: Stainless Steel
- Actuation:
- Upper Spindle: Brass
- Handle: Plastic

All others:

- Stainless Steel

Technical Data –

- Fluid Media: Standard, HP, UHP, corrosive and non-corrosive gases.
- Max Working pressure: 290 psi (20 Bar)
- Temperature Range: -20°C to +65°C
- Burst Pressure: 500 psi
- Flow Capacity: Cv=0.2
- Certified Max. Helium Board leak Rate: $< 1 \times 10^{-9}$ mbar.l/sec
- Certified max.helium outboard leak rate (at max pressure): $< 1 \times 10^{-9}$ mbar.l/sec
- Certified max.helium across the seat leak rate (at max pressure): $< 1 \times 10^{-9}$ mbar.l/sec
- Wetted volume: < 1.2 cc
- Mounting: Back Mounting
- Nominal Seat Diameter: 4mm

4 **SS 316 L Seamless Tube & Fittings:**

1. For High Purity (99.9999%) Nitrogen Gas –

- Material Type – 316L Stainless steel tube seamless
- 6M nominal lengths, Hardness – 90 Rb maximum
- Material Types – Shall meet ASTM standards A269 - Single Melt Seamless
- I.D. Surface Roughness – Interior surface electro polished 10 micro-inch Ra
- Weld Ends – Suitable for orbital welding
- Testing and Inspection – Visual inspection, Surface roughness measurement, Dimensional inspection
- Each component is traceable to its producing mill and heat by an identification number etched within 24" (610mm) of one end.
- Each component's bag is affixed with a label identifying the component's part number, date and lot number.
- A raw material Certified Test Report is furnished with each shipment. The report contains the following information –
 - ASTM or JIS Material composition and applicable specification designation.
 - Nominal outside diameter size and wall thickness.
 - Chemical composition.
 - Statement of material condition.
 - Manufacture nature, e.g. "Seamless".
- All tube and fittings are purged with UHP nitrogen, capped, bagged and packaged for shipment in such a manner which prevents damage to product and primary- product packaging.
- Maximum Working Pressure – 216 bar (3136 psi), calculated as per ASME B31.3-2002, 304.1.2 (304L/316L, -20°F to 300°F)

	<p>2. For general purity N2 Gas –</p> <ul style="list-style-type: none"> • Material Type – TP316L Stainless steel Seamless Tube • Lengths – 6M nominal lengths. • Hardness – 90 Rb maximum • Material Types – Shall meet ASTM standards A269 - Single Melt Seamless • I.D. Surface Roughness – Interior surface electro polished 25 micro-inch Ra • Weld Ends – Suitable for orbital welding • Testing and Inspection – Visual inspection, Surface roughness measurement, Dimensional inspection • Each component is traceable to its producing mill and heat by an identification number etched within 24" (610mm) of one end. • Each component's bag is affixed with a label identifying the component's part number, date and lot number. • A raw material Certified Test Report is furnished with each shipment. The report contains the following information – <ul style="list-style-type: none"> • Material composition and applicable specification designation. • Nominal outside diameter size and wall thickness. • Chemical composition. • Statement of material condition. • Manufacture nature, e.g. "Seamless". • All tube and fittings are purged with UHP nitrogen, capped, bagged and packaged for shipment in such a manner, which prevents damage to product and primary- product packaging. • Maximum Working Pressure – 317 bar (4598 psi), calculated as per ASME B31.3-2002, 304.1.2 • Temperature Range – -20°F to +300°F, -28.8°C to +148.9°C
5	<p><u>Tube Clamps:</u></p> <p>SS clamps with PP inserts fixed firmly on Unistrut type support.</p>
6	<p><u>Installation:</u></p> <p>The entire installation will be carried out using Good Engineering Practice. All the tubes will be orbital weld with 100% traceability of Weld quality, Weld Map and practice of weld coupon for every size change, operator change must be followed. The welding gas shall be Ar-99.999% purity with inline purifier to ensure less than 100 ppb impurities. Bidder to provide evidence of use of purifiers to ensure Argon gas for welding has impurities less than 100ppb.</p> <p>In case of PN2 distribution network – all bends must be pre- fabricated in Factory and electro-polished before supply or approved Bending method as per Semi Standards for bending electro-polished tubes shall be used.</p>
7	<p><u>Testing and Validation:</u></p> <p>It is required to do the complete testing and validation of the installed system. The system should be tested and validated for the following.</p> <ul style="list-style-type: none"> • Pressure – 24hrs hold test. The entire installation shall be validated for Pressure Decay test as per ASME standards. • Helium Leak – minimum 1×10^{-9} mbar He Lit/sec. Helium leak testing shall be carried out with dry vacuum pump having leak detection capability up to 1×10^{-11} mbar He Lit/sec. • Particles – 0.1micron and above. All the Gas lines will be tested for particle contamination before charging the Process Gas. Particle counter shall have capability of measuring particle size as low as 0.1 micron using High Pressure Diffusion Device. Bidder to provide evidence of having done these tests in the previous installations. Test certificates and data sheet of analytical instruments used for the same should be provided along with latest calibration certificate.

Bidder must have own or rented Analyzers to carry out the above tests and validations. A third party can be used for the testing and validation of the system at the bidder's expense, provided they satisfy the above criterion.

Bid Evaluation Criteria:

S.No	Details
1	A minimum of 5 Gas Distribution System projects for Nitrogen or other gases should have been completed in the last 5 years, of which at least 2 projects should have involved Nitrogen purification using Liquid Nitrogen. Purchase Orders of such works should be provided for verification. At least 2 such projects should have been above Rs. 1Cr.
2	All items should be quoted per Item Unit Rate and Installation Unit Rate.
3	A quote should be attached with the Financial Bid based on the Items and Item Quantities indicated in the "General Specifications" table.
4	Must have SS clean room tools for handling all components in the project.
5	Vendor should submit copy of test reports such as pressure hold, He leak, particle analysis done for other projects.
6	Customer feedback letters indicating the quality of work from at least 3 customers.
7	List of customers, projects done with contact address, phone number, email etc.
8	The vendor shall have understanding of JSA (Job Safety Analysis), MAPP (Major Accident Prevention Plan) and PSR (Pre Start up safety review) for effective project implementation.
9	Necessary site visit to any of the projects mentioned in your reference may be conducted at our discretion and technical capability rating will be accordingly given to bidders.

List of approved OEM's for various components, equipments required in the Project

S. No	Description of Components / Equipment	Makes
1	Diaphragm Valve with VCR end or Tube ends	1. Swagelok, USA 2. TKSCT, Korea 3. Parker, USA 4. Fujikin, Japan
2	Ball Valve with OD ends or Double compression ends	1. Swagelok, USA 2. TKSCT, Korea 3. Parker, USA 4. Fujikin, Japan
3	Tubes SS316L EP & BA	1. Valex, USA 2. Sandvik, Sweden 3. Dockweiler, Germany
4	Pressure Regulators	1. Swagelok, USA 2. TKSCT, Korea 3. Parker, USA 4. Fujikin, Japan 5. TESCO, USA
5	1. Gas Supply Panels 2. Changeover Panels	1. Ceres Technologies Inc. 2. KAS Technologies 3. Matheson Gas 4. Rotarex – SMT

6	Liquid Nitrogen Dewar	<ol style="list-style-type: none"> 1. ShellnTube 2. CHART 3. INOXINDIA 4. Taylor Wharton 5. Wessington Cryogenics 6. Cryolor 7. VRV
7	Nitrogen Purifier (online regenerable)	<ol style="list-style-type: none"> 1. Johnson Mathey 2. SAES Getter 3. Entegris 4. Matheson
8	Face Seal / VCR Fiitings / Compression Fittings	<ol style="list-style-type: none"> 1. TKSCT Korea 2. Swagelok 3. Parker