



INTERNATIONAL ADVANCED RESEARCH CENTRE  
FOR POWDER METALLURGY AND NEW MATERIALS  
(ARCI),

Balapur PO, R.R. District, Hyderabad – 500 005, India

Tel: 040-244523326 Fax: 040-24442699

Web Site: [www.arci.res.in](http://www.arci.res.in), email : stores@arci.res.in

Tender No.CF20170061/PO

Date: 09.03.2018

**TENDER DOCUMENT**

High Flux Powder X-Ray Diffraction (XRD) System with non-ambient stage - Supply, Installation, Commissioning, Demonstration and Training.

|    |  |  |
|----|--|--|
| 1. | Cost of Tender Document ( Non- Refundable)             | Rs 1000.00   |
| 2. | EMD ( Earnest Money Deposit/Bid Security)              | Rs 7,50,000.00   |
| 3. | Tender document published date                         | 09.03.2018   |
| 4. | Bid documents can be downloaded from                   | <a href="http://www.arci.res.in">www.arci.res.in</a><br><a href="http://www.eprocure.gov.in">www.eprocure.gov.in</a> |
| 5. | Clarification start date and end date                  | 12.03.2018 to 16.03.2018   |
| 5. | Bid submission start and time                          | 19.03.2018, 9:30 AM onwards  |
|    | Bid submission end date and time                       | 22.03.2018 before 3.30 PM  |
| 6. | Bids opening date and time (for technical bids covers) | <b>23.03.2018</b> at 11:00 AM (Friday)   |



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**Instructions to Bidder**

**Table of Contents**

| <b>Sl. No.</b> | <b>Description</b>                                   | <b>Page No.</b> |
|----------------|--|-----------------|
| 1.             | Tender Notice  | 3 to 5          |
| 2.             | Part – 1: Technical Bid -Terms and conditions        | 6 to 9          |
| 3.             | Part – 2: Earnest Money Deposit-Terms and Conditions | 10              |
| 4.             | Part – 3: Price Bid -Terms and Conditions            | 11 to 14        |
| 5.             | Price Schedule for foreign and domestic suppliers    | 15 to 16        |
| 6.             | Declaration by Vendor                                | 17              |
| 7.             | Scope of Supply (Annexure – I)                       | 18 to 24        |
| 8.             | Checklist  | 25              |

## **TENDER NOTICE**

International Advanced Research Centre for Powder Metallurgy and New Materials (henceforth referred to as ARCI) is an Autonomous Research and Development Centre of Department of Science and Technology (DST), Government of India with main campus at Hyderabad and with operations in Chennai and Gurgaon.

ARCI would like to procure the following equipment. The Technical Specifications, Schedule of Requirements and Allied Technical details are given in Part-1 of tender document.

**Item: High Flux Powder X-Ray Diffraction (XRD) System- Supply, Installation, Commissioning, Demonstration and Training.**

Tender Enquiry No: (Case No.) CF20170061/PO dated 09.03.2018

- Last date and time of submission of Tender (Tender fee, EMD, Technical bid, and Price bid): 22.03.2018 before 3:30 PM.
- Tender fee and EMD should be in the form of Demand Draft drawn in favour of **Director, International Advanced Research Centre, payable at Hyderabad.**
- The item to be delivered to and installed at :

**International Advanced Research Centre for Powder Metallurgy and New Materials, Balapur Post, Hyderabad – 500 005, Telangana, India**

### **The tender document should consist of the following:**

Two bid system will be followed for this tender. In this system, the bidder must submit the offer in three separate sealed envelopes i.e., one envelope for each for technical bid, EMD and commercial bid. These envelopes should be securely sealed and stamped separately for each quoted equipment and clearly marked as “**Envelope No.1- Tender Fee & EMD**”, “**Envelope No. 2- Technical Bid**” and “**Envelope No.3 – Commercial Bid**”. All the sealed envelopes should be placed in another larger envelope. The main envelope which will contain all the envelopes should be super-scribed with the tender enquiry no. CF20170061/PO date 09.03.2018 due on 22.03.2018 name of the equipment/ item and is to be submitted to the address given below so as to reach **on or before 22.03.2018 before: 3:30 PM**

**The Bidder should ensure that the Prices are mentioned only in the Financial Bid and nowhere in the Technical Bid.**

### **Validity of Bid**

Quotation should have minimum validity of **120 days** from the date of opening

**Address for submission of the Tender:**

**International Advanced Research Centre for Powder Metallurgy and New Materials, Balapur Post, Hyderabad – 500 005, Telangana, India**

**Last date for submission: 22.03.2018 before 3:30 PM**

Tender should be submitted before the last date stated above. The Tenders not accompanied by Tender Fee and EMD in the form of Demand Draft favoring Director, ARCI, payable at Hyderabad are liable for rejection.

The bid can be submitted in person or through post/courier. ARCI will not be responsible for transit delay for tenders submitted by Post / Courier etc.

**All the tenders, in which any of the prescribed conditions are not fulfilled or incomplete in any respect are liable to be rejected.**

**Clarification on bid**

Bidders can seek clarification as per the schedule start and end date through email IDs given below:

- i. For technical clarifications: sureshkoppoju ['@']arci.res.in
- ii. For commercial clarifications: stores['@']arci.res.in

**Opening of the tender**

The offer/bid will be opened by a committee duly constituted for this purpose. The bidder if interested may participate on the tender opening date and time. The bidder should produce authorization letter from their company to participate in the tender opening. Only one representative will be allowed to participate in the tender opening. The schedules of tender opening are:

Technical Bid opening date and Time: **23.03.2018 at 11:00 AM (Friday)**

**Place:-International Advanced Research Centre for Powder Metallurgy and New Materials, P.O Balapur, RCI Road, Hyderabad, Telangana, India.**

**The bidders who are technically qualified will be called separately for opening of price bids.**

**Award of Contract**

Contract will be awarded to successful bidder and a copy of the award of the contract will be uploaded in CPPP portal after finalizing the tender.

## **DISQUALIFICATION OF TENDERS:**

The tenders are liable for rejection in the following circumstances:

- If they are not in line with the terms and conditions of this tender notice.
- Conditional quotations
- Incomplete tenders
- Tenders without Tender fee and EMD
- Tenders submitted through Fax or e-mail
- If two bid system is not followed

Director, ARCI reserves the right to accept or reject any or all tenders either in part or in full or to split the order without assigning any reasons there for.

**IMPORTANT NOTE: Amendment, Corrigendum if any to this tender document, WILL BE HOSTED ONLY ON ARCI WEBSITE and CPPP portal, and no separate Press Notification will be issued. Bidders are advised to visit our website and CPPP portal regularly to know such details.**

**Director, ARCI, Hyderabad**

PART-1  
TECHNICAL BID - TERMS AND CONDITIONS

**I. Vendor qualification criteria:**

- A. Original Equipment Manufacturer (OEM) or authorized representatives of OEM only can quote for this tender. The vendor (if different from OEM) should submit authorization letter from OEM along with the quotation.
- B. The OEM should have proven expertise in manufacture and supply and service of the item.
- C. The bidder should have supplied one (1) or more similar units in India/world in the last 3 years.
- D. The manufacturer should provide the list of installations of the equipment with contact details of the person(s) in charge of each installation.
- E. OEM is required to submit a letter of commitment at the time of quotation for supply of spares and also for efficient and prompt service of the equipment after installation.
- F. Failure to meet any of the above vendor qualification criteria may lead to disqualification of tender at technical evaluation stage itself and the vendor's quotation may not be considered for procurement.

**II. Pre dispatch inspection**

- A. The manufacturer/supplier of the unit shall demonstrate, if required, the full functionality of the unit at their works during pre-dispatch inspection by ARCI personnel, and shall satisfy all the technical specifications as described in the tender document **Annexure-I (Scope of supply)**.
- B. The manufacturer/supplier of the unit shall demonstrate the features as provided in **Annexure-I (Scope of supply)**.
- C. All the consumables, raw materials, required for the above demonstration should be arranged by the tenderer.
- D. All the utilities and manpower required for the demonstration shall be arranged by the supplier only.

**III. Acceptance criteria:**

- A. The manufacturer/supplier's trained engineer(s) should carry out installation and commissioning of the unit at ARCI.
- B. The entire functionality of the equipment according to the specifications should be demonstrated at ARCI.
- C. The manufacturer /supplier of the unit shall demonstrate the features as specified in **Annexure I ( Scope of Supply)**.

#### **IV. Other aspects:**

##### **A. PATENT RIGHTS:**

The OEM shall indemnify ARCI against all third-party claims of infringement of patent, trademark or industrial design rights, copyrights, etc. arising from use of the Goods or any part thereof and an undertaking to this effect shall be provided in writing.

##### **B. Training:**

The manufacturer shall impart training and demonstration in the operation and preventive/breakdown maintenance of the complete unit including sub-parts during installation to ARCI personnel. Optional training at OEM site: (on case-to-case basis during pre-dispatch inspection or at a later date, based on mutually agreed terms and conditions.

##### **C. Utilities/Infrastructure for installation:**

- a) Supplier shall indicate all the required utilities/infrastructure such as input power (wattage), water, gas, etc including power backup requirements.
- b) Supplier shall provide overall dimensions of the Unit along with floor area/height of the site or building, including foundation details if any, for accommodating the Unit.
- c) The operating environment for the Unit including temperature and humidity control, anti-vibration, EMI, EMC etc. should be indicated.
- d) If any charges are payable for Installation and Commissioning, the same should be specified in the commercial offer (**Price Schedule**).

##### **D. Manuals, software and other drawings etc:**

The following documents (in English) shall be provided along with the Unit in both hardcopy and softcopy forms:

- a) Operation and maintenance manuals, troubleshooting procedures, calibration methods, wiring and other schematic diagrams, list of components, spares and accessories.
- b) If there are any bought-out systems and components, manuals should be provided in hardcopy and softcopy forms for the same.
- c) Calibration certificates for sensors, instruments, gauges, display units etc. as may be required must be provided.
- d) Software upgrades pertaining to the supplied Unit should be provided free of cost as and when new versions are released by the OEM.
- e) Safety and security instruction manual should be provided.

##### **E. After-sales service:**

The supplier shall guarantee efficient and prompt after-sales service including the supply of the spares for a minimum period of ten (10) years from the date of discontinuation of the quoted model.

**F. Bought-out items:**

All bought-out sub-systems and components if any should be of reputed make and conforming to international standards. Make and details of all bought-out sub-systems and components shall be specified.

**G. General Quote:**

The breakup for accessories or sub system(s)/attachments apart from the basic system, if any, should be quoted separately.

**H. Export License:** It is the responsibility of the OEM to obtain any export license(s) that may be required.

**I. Technical compliance statement:** The vendor should provide item wise details against each and every specification. Deviations if any are to be highlighted. Please refer to section 14 of Annexure-I

**J. Guarantee/warranty:**

- a) The Unit shall be guaranteed for performance **for three (3) years** from the date of final acceptance by ARCI. The manufacturer shall replace premature failure of parts during the guarantee period at their cost and risk. Please see section 9 of Annexure-I.
- b) During the warranty period, all software and hardware updates shall be provided free of cost. Items, if any, excluded from the warranty shall be explicitly mentioned by the supplier in the technical bid.

**K. Delivery/ time schedule:**

The offer shall be accompanied by a detailed delivery time schedule showing the individual time schedule required for submission of initial equipment layout drawings, foundation drawings along with load data, main equipment and sub-assembly drawings, shipment schedule of the equipment as well as the time required for installation, commissioning and performance tests.

**L. Packing:**

The Supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination (ARCI). The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit. In order to maintain safety of the equipment, we prefer to have wooden crating with adequate cushioning inside for transportation of any goods. The Material has to be dispatched with International standard packing to withstand rigors, and to avoid any transit damages.



#### **M. Packing Instructions:**

Each package will be marked on three sides with proper paint/indelible ink with the following:

- a) Purchaser Name & Address
- b) Item Nomenclature
- c) Order/Contract No.
- d) Country of Origin of Goods
- e) Packing list reference number

#### **N. Insurance:**

The Goods supplied under the Contract shall be fully insured in Indian Rupees against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery.

For delivery of goods at the purchaser's premises, the insurance shall be obtained by the Supplier in an amount equal to 110% of the value of the goods from "Warehouse to warehouse" (final destinations) on "All Risks" basis including war Risks and Strikes. The insurance shall be valid for a period of not less than 3 months after dispatch **or up to installation and commissioning of stores whichever is later**. However, in case of orders placed on FOB/FCA basis, the purchaser shall arrange insurance.

#### **O. General instructions:**

- a) The Technical Bid must be submitted in an organized and structured manner. No brochures/leaflets etc. should be submitted in loose form. Please indicate page nos. on your quotation. **The price should not be mentioned anywhere in this document.**
- b) Tenders, who are submitted without following the Two-Bid Offer System, are liable to be rejected.
- c) The technical offer should be complete to indicate that all products and services asked for are quoted. Each page of the bid and strikeout/corrections shall be duly signed and stamped by the bidder. Unsigned Tenders are liable to be rejected. Failure to comply with this requirement may result in the bid being rejected.
- d) The purpose of certain specific conditions is to get or procure best product/service etc. for ARCI. The opinion of Technical Committee shall be the guiding factor for technical short listing.
- e) Vendor should provide list of deliverables / bill of materials and services.

**PART- 2**  
**EARNEST MONEY DEPOSIT – TERMS AND CONDITIONS**

Earnest Money Deposit in the form of Indian or foreign demand draft Drawn in favour of **Director, International Advanced Research Centre, Payable at Hyderabad.**

No interest is payable on EMD. The EMD will be returned to the bidders(s)/Agents whose offer is not accepted by ARCI within one month from the date of the placing of the final order(s) on the selected bidder(s). EMD of the successful bidder shall be converted into performance guarantee and shall be released on submission of bank guarantee.

EMD in the form of BG is not acceptable.

**Amount of EMD Rs.750,000.00** in INR (0.75 million Indian rupees) or equivalent foreign currency.

**Bidder registered with Department of Micro, Small and Medium Enterprises as MSEs and having valid NSIC registration are exempted for payment of tender fee and EMD subject to submission of documentary evidences .Copies of registration certificate and other supporting documents should be submitted in Envelope no. 1.**

**PART-3**  
**PRICE BID – TERMS AND CONDITIONS**

**I. Terms and Conditions:**

- a) Envelope 3 should contain price schedule (as per the table) complete in all respects with proper seal and signature of authorized person.
- b) Tenders with any condition, including conditional rebate, are liable to be rejected.
- c) Cost of all the items should be mentioned clearly and individually in the Commercial Offer (Part- II) only.
- d) The Bidders are requested to quote for **research institutional prices** for Machine/ Equipment and, since ARCI is eligible for the same. The quoting party should ensure that the quoted prices are the minimum and that have not quoted the same item on lesser rates than those being offered to ARCI to any other customer.
- e) Printed conditions of the vendor submitted with the tender will not be binding on ARCI.
- f) The commercial bids of only the technically qualified bidders shall be considered for further processing.
- g) The price quoted shall be considered firm and no price change will be permitted during the currency of contract. The quotation should be in standard currency on Ex-works basis. **Freight, insurance, Agency commission (if any) and commissioning charges, if not included, may be quoted separately in Commercial Bid.**
- h) Commercial Bid (prices quoted) should not be enclosed in the technical bid envelope. If the price quote is submitted with technical bid, the tender is liable to be rejected.
- i) The Director ARCI reserves the right to accept the offer in full or in part or reject summarily or partly thereof.

**II. Payment terms:**

i) For import:

An irrevocable Letter of Credit [L/C] for 100% of the order value will be established by the purchaser in favour of the supplier, through purchaser's bank in India once the following conditions are met:

**Receipt of order acknowledgement and acceptance of the order.**

THE ACTUAL PAYMENT TO SUPPLIER WILL HOWEVER BE RELEASED IN TWO STAGES IN THE FOLLOWING MANNER:

Payment for 90% of the order value will be made upon shipment of the equipment and negotiation of the following shipping documents through L/C:

- a. Signed Commercial Invoice - Original + 5 Copies
- b. Airway Bill/Bill of lading - Original + 5 Copies.
- c. Packing List -Original + 5 Copies
- d. Certificate of conformity from the supplier that stores/equipment has been tested by the supplier and the same meet the technical specification - Original + 3 Copies.
- e. Supplier's Certificate to the effect that the contents in each package are not less than those entered in the Invoice and the Packing List - Original + 3 Copies.

Balance 10% of the order value will be released through L/C upon submission of the following documents:

- a. Commercial Invoice for 10% order value.
- b. Final Acceptance Certificate [FAC] issued by the purchaser/authorized representative in original against satisfactory installation and commissioning of the equipment at ARCI Site.
- c. Bank Guarantee Equivalent to 10% of total order value covering warranty period of the equipment issued or counter guaranteed by an Indian Bank clearly mentioning the relation with OEM if submitted by Indian Agent.
- d. If the above-mentioned performance bank guarantee is not provided, 10% of the order value (i.e. second stage payment) will be released only after the expiry of the warranty period from the date of FAC.

### **Domestic purchase**

#### **Payment Terms**

Subject to deduction of taxes at source, if any,

90% of the goods cost + 100% taxes will be paid after receipt of the goods at our site subject to inspection & acceptance of the goods/works/commissioning by ARCI authorities.

Balance 10% will be paid against submission of Performance Bank Guarantee (i.e. 10% of the total order value excluding taxes etc.) from a Nationalized /Scheduled Bank valid till the expiry of the warranty period OR after completion of warranty period from the date of successful commissioning of equipment at ARCI.

### **III. Final acceptance certificate (FAC)**

- a. On installation, the working of the equipment should be demonstrated so as to comply with all the technical specifications. In this connection, it is to be noted that the installation report is not to be treated as the Final acceptance certificate (FAC).
- b. Final acceptance certificate will be issued after installation at ARCI site, and successful demonstration of the high quality XRD profiles on NIST standard, and the test samples (provided by ARCI) in all standard (optimum), high flux and high angular resolution configurations. After the successful completion of the installation and demonstration of the specifications, the unit will be under observation for a period of no more than 30 days. FAC will be issued by the PURCHASER latest by this period. Warranty shall start from the date of issuing the FAC.

### **IV. Liquidated damages (LD)**

As time is the essence of the contract, delivery period mentioned in the Purchase Order should be strictly adhered to. Otherwise, LD clause will be applicable /enforced. If the supplier fails to Supply, Install and Commission the equipment as per specifications mentioned in the order within the due date, ARCI may levy a penalty for such delay by way of liquidated damages, at 0.5% per week of delay or part thereof, and in aggregate not exceeding 5% of the order value. Such LD will be deducted from any amount due or which may become due to the supplier.

## **V. Order acceptance**

The successful bidder, on award of contract/order, must send the contract/order acceptance in writing, within 15 days of award of contract / order failing which the EMD will be forfeited.

## **VI. Award of contract:**

ARCI reserves the right at the time of award of Contract to increase or decrease the quantity of items specified in the Schedule of Requirements without any change in price or other terms and conditions.

## **VII. Corrupt or Fraudulent Practices:**

ARCI requires that the bidders who wish to bid for this project have highest standards of ethics. ARCI will reject a bid if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices while competing for this contract. ARCI may declare a vendor ineligible, either indefinitely or for a stated duration, to be awarded a contract if it at any time it is determined that the vendor has engaged in corrupt and fraudulent practices during the execution of contract.

## **VIII. Interpretation of the clauses in the Tender Document/Contract Document:**

In case of any ambiguity/dispute in the interpretation of any of the clauses in this Tender Document, Director, ARCI's interpretation of the clauses shall be final and binding on all parties.

The equipment must be supported by Service personnel trained by the OEM.

The vendor will have to arrange for all the testing equipment and tools required for installation, testing and maintenance etc. If any equipment is to be provided by ARCI, the same should be clearly mentioned upfront. Installation and integration of all supplied hardware and software shall be done by the vendor. The vendor shall install and configure all required hardware and software. The bidder must install and configure user/application software, and demonstrate its running in parallel as part of the system acceptance.

## **IX. Indemnity:**

The vendor shall indemnify, protect and save ARCI against all claims, losses, costs, damages, expenses, action suits and other proceedings, resulting from infringement of any law pertaining to patent, trademarks, copyrights etc. or such other statutory infringements in respect of all the equipments supplied to ARCI.

## **X. Arbitration**

### **For Domestic Suppliers**

In case of Dispute or difference arising between the Purchaser and a domestic supplier relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Indian Arbitration & Conciliation Act, 1996, the rules there under and any statutory modifications or re-enactments thereof shall apply to the arbitration proceedings. The dispute shall be referred to arbitrator appointed by the Director, ARCI. The award of the arbitrator so appointed shall be final, conclusive and binding on all parties to this order.

The venue of the arbitration shall be the place from where the purchase order/contract is issued. Notwithstanding any reference to arbitration herein, the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree..

### **For Imports**

In the case of a dispute between the purchaser and a Foreign Supplier, the dispute shall be settled by arbitration in accordance with provision of sub-clause (a) above. But if this is not acceptable to the supplier then the dispute shall be settled in accordance with provisions of UNCITRAL (United Nations Commission on International Trade Law) Arbitration Rules.

## PRICE SCHEDULE FOR FOREIGN SUPPLIERS

Currency:

| Sl. No.                        | Name of the equipment  | Country of Origin | Quantity | Price in foreign currency |
|--------------------------------|--|-------------------|----------|---------------------------|
| 1                              | <b>Main equipment</b> (please refer to Annexure-I : scope of supply, page no's. 18-24, expect items mentioned in this table as Accessories I to IV and Spares and Consumables) |                   |          |                           |
| 2                              | <b>Accessories-I</b> : refer to Annexure-I, section 4.9, page no. 21   |                   |          |                           |
| 3                              | <b>Accessories-II</b> : refer to Annexure-I, section 4.9, page no. 21  |                   |          |                           |
| 4                              | <b>Accessories-III</b> : refer to Annexure-I, section 6.7, page no. 21   |                   |          |                           |
| 5                              | <b>Accessories-IV</b> : please refer to Annexure-I, section 8.1, page no. 22   |                   |          |                           |
| 6                              | <b>Spares and Consumables:</b> refer to Annexure-I, section 6.8, page no. 22   |                   |          |                           |
| Packing and forwarding Charges |  |                   |          |                           |
| Ex-works Price                 |  |                   |          |                           |
| Discount if any                |  |                   |          |                           |
| Net Ex-works Price             |  |                   |          |                           |
| AMOUNT IN WORDS :              |  |                   |          |                           |

*Note: The Bidder may please fill in this form or the same may be typewritten on the Letter Head of the Bidder exactly as per the above format and submit the same as per the instructions given in the tender document.*

**ARCI is entitled for concessional Customs duty as per Notification No.51/96-Custom (as notified by GST council). Hence rates to be quoted accordingly.**

**Other information:**

- a) Any installation and commission charges
- b) Optional items, if any, and their prices should be mentioned separately

[SIGNATURE OF BIDDER ]  
NAME AND ADDRESS OF BIDDER

## PRICE SCHEDULE FOR DOMESTIC SUPPLIERS

| Sl No.                                | Name of the equipment  | Quantity | Unit/Price | Total Amount(Rs) |
|---------------------------------------|------------------------|----------|------------|------------------|
| 1                                     | Main equipment         |          |            |                  |
| 2                                     | Accessories            |          |            |                  |
| 3.                                    | Spares and consumables |          |            |                  |
|                                       |                        |          |            |                  |
| Discount if any                       |                        |          |            |                  |
| Net Price                             |                        |          |            |                  |
| Taxes (GST with HSN/SAC codes) if any |                        |          |            |                  |
| Total price (FOR – ARCI)              |                        |          |            |                  |
| AMOUNT IN WORD:                       |                        |          |            |                  |

*Note: The Bidder may please fill in this form or the same may be typewritten on the Letter Head of the Bidder exactly as per the above format and submit the same as per the instructions given in the tender document.*

**ARCI is a public funded research institution, concessional GST rate may please be quoted with reference to GST Notification no. 45/2017 dated 14.11.2017. ARCI will provide certificate for the same.**

**Other information:**

- a) Any installation and commission charges
- b) Optional items, if any, and their prices should be mentioned separately

[SIGNATURE OF BIDDER ]  
NAME AND ADDRESS OF BIDDER



## **Declaration by the Vendor**

**(To be provided in the following format in their letter head)**

It is hereby declared that I/We the undersigned, have read and examined all the terms and conditions etc. of the tender document for which I/We have signed and submitted the tender under proper authorization. It is also certified that all the terms and conditions of the tender document are fully acceptable to me/us and I/We will abide by the conditions of the tender. We have not given any printed conditions beyond the scope of this tender. It is also certified that I/We/our principal manufacturing firm has no objection in signing the purchase contract if the opportunity for the supply of the items against this tender is given to me/us.

Date:

Signature:

Name:

Address:

Designation:

On behalf of:

## SCOPE OF SUPPLY

The scope of the work includes supply, installation, commissioning, training and demonstration of the multipurpose high-flux and high-resolution Powder X-ray diffraction (XRD) system with non-ambient stage at ARCI, Hyderabad, India.

The XRD unit should have the capability to measure high-quality XRD profiles of advanced materials in the form of powders, solids (uneven surface and irregular shape), thick and thin coatings, and thin films. The unit should be designed and built with optimization of various auto adjustable modules (e.g., suitable optics, sample stage, detector, etc.) to provide high-flux and high-resolution scans of various forms and shapes of the samples.

**Important to note:** The complete XRD unit, including computers and all accessories (such as chillers, power supplies, transformers, etc.) and attachments (non-ambient cell, etc.) and spares should be shipped only from original equipment manufacturer facility. The entire unit along with accessories should be delivered in a single shipment. Part shipment, either from the OEM site or multiple sites, will not be accepted. Uninterrupted power supply (UPS) units may be supplied from within India.

XRD unit should consist of the following modules:

- i. High flux  $\text{Cu}_{K\alpha}$  rotating anode X-ray source operating at a minimum power of 5 kW. Higher power is preferred.
- ii. Bragg-Brentano geometry, capable of measuring  $\theta$ - $\theta$ ,  $\theta$ - $2\theta$  scans with position accuracy (reproducibility) of  $2\theta$  better than  $\pm 0.01$  over the entire  $2\theta$  range.
- iii. Necessary integrated primary and secondary optical modules that should have mirrors, monochromators, slits, and filters. It should be possible to easily switch over from parallel beam to focused beam, and vice versa.
- iv. Advanced 0D or 1D solid-state Si detector with high count rate (more than  $10^7$  counts per seconds (CPS)) and energy discrimination capability to suppress the fluorescence from a sample.
- v. Auto-sample changing cartridge with the capability to hold 30 or more samples, and a necessary robot for the operation.
- vi. Non-ambient low and high-temperature integrated stages suitable to carry out real time measurements with X-rays ( $-196$  to  $400^\circ\text{C}$ ) with humidity control (RH: 5 to 80%).

Detailed specifications for each module in the XRD unit are listed below:

**1. X-source and generator:**

- 1.1. Fine line focus Copper (Cu) anode X-ray source operating at a minimum of 5 kW (higher power being preferred) should produce high flux with a minimum of  $1 \times 10^{10}$  CPS with stability better than 0.2% for 12 hours at a temperature of  $18.0 \pm 0.2$  °C. Documentary proof for the flux and its stability to be submitted along with the technical bid, which will be considered during evaluation of the technical bid.
- 1.2. Source voltage and current should be controlled by the computer with manual override, in increments of 1 kV and 1 mA, respectively.
- 1.3. Suitable power supply to the X-ray generator should be built with robust electronics and electrical parts that should work at ambient conditions at Hyderabad.
- 1.4. Generator should have automatic protection against voltage fluctuations and voltage spikes.
- 1.5. Water Chiller: appropriately (suitably) rated and compatible cooling system for the anode should be provided from an OEM/reputed manufacturer with temperature stability upto  $\pm 0.1$  °C at water temperature of 18 °C. External flow rate meter in the circulation line should be provided.
- 1.6. External filter traps should be provided for minimizing dust settlements from the chiller in the target area.
- 1.7. Safety: Abnormal cooling water flow, pressure and temperature detection, abnormal generator overload detection, leak current breaker, shutter malfunction detection. Options for X-ray power control through manual and auto start-up/shutdown. In the event of unexpected radiation safety circuit break, only the shutter of the X-ray generator to be closed and the power supply to the X-ray generator should continue to remain on.

**2. Goniometer:**

- 2.1. Goniometer should be of vertical type  $\theta$ - $\theta$  geometry based on optical position sensing system with independent theta source & theta detector drive based on computer controlled DC or Stepper motors.
- 2.2. Auto-alignment should be possible when mounting and demounting of accessories like sample stage, detectors, monochromators, Eucentric stage alignment pins and procedures should be given.
- 2.3. Scanning Range:  $2\theta$  from - 3 to  $160^\circ$  or better
- 2.4. Minimum Step size:  $\leq 0.0001^\circ$  (for both the  $\theta$  and  $2\theta$  motors)
- 2.5. Goniometer reproducibility:  $\leq 0.002^\circ$
- 2.6. Angular ( $\theta/2\theta$ ) accuracy :  $\leq \pm 0.0025^\circ$
- 2.7. Scan speed :  $0.002^\circ$  deg. to  $20^\circ$ / min or better.

- 2.8. Instrument alignment accuracy (linearity):  $\pm 0.01^\circ$  or better for the complete  $2\theta$  range concerning NIST reference (SRM-660c) standard. Documentary proof to be submitted along with the technical bid.

### **3. Detector:**

- 3.1. Solid state Si-based compound large active area ( $\geq 220 \text{ mm}^2$ ) detector with best available energy discriminated/dispersive/selection resolution module lower than 400 eV at Cu(K-alpha) energy should be offered.
- 3.2. The detector should work in 0D and 1D mode with minimum count rate of  $10^7$  cps and best angular resolution.
- 3.3. Detector should be able to filter fluorescence and white radiation from the diffracted beam.
- 3.4. The spatial resolution of detector per strip/pitch/pixel should be minimum of 75 micrometers or better.
- 3.5. Detection efficiency of the detector should be better than 94% for Cu energy.
- 3.6. The detector should be able to suppress low angle background (especially from  $2^\circ$ ) by variable active detector window/scatter protector.
- 3.7. Detector should work in static, scanning, and fast scan mode.
- 3.8. Detector should be operated at ambient temperature.
- 3.9. Appropriate computer controlled slits and other accessories need to be supplied.

### **4. Beam conditioning and optics (primary and secondary):**

The XRD unit should be equipped with a pre-aligned appropriate combination of primary and secondary mirrors and optics (divergence slits, antiscatter slits, Soller slits, etc.) to obtain XRD profiles with high diffracted intensity, appreciable angular resolution, minimum background, improved S/N ratio, etc.

- 4.1. Mirrors, optics and slit systems should be compatible with Cu radiation (wavelength). Needed optics for Cu radiation both towards to source and detector should to be provided.
- 4.2. Optics should include primary beta filters (used when they are needed), divergence slits, receiving slits and anti-scatter slits. All necessary slits, filters and optics systems should be included in the basic system.
- 4.3. Excellent low angle, very low (flat) background, performance (starting from  $2^\circ$  of  $2\theta$  in reflection mode).
- 4.4. Bragg-Brentano (focusing) geometry for powder, solid and coated samples.
- 4.5. Parallel beam geometry for GIXRD and samples with uneven surfaces.
- 4.6. Exchange of optics modules from Bragg-Brentano geometry to the Parallel beam and vice versa should be effortless. These modules should be computer controlled or easily exchanged with a push button or other mechanism.
- 4.7. Automatic alignment: Automatic slit exchanger system with automatic alignment and control with automatic, systematic error corrections.

4.8. Monochromatization to remove secondary fluorescence generated by transition elements, in addition to energy discriminator detector.

**4.9.** To achieve i) high intensity and ii) high angular resolution of the diffracted profiles, suitable combinations of optics should be listed. The “high intensity optics module” and the “high angular resolution optics module” should be quoted as *Accessories-I* and *Accessories-II*, respectively. Please provide relevant details on page 16, under serial no’s. 2 and 3.

## **5. Sample stage:**

5.1. Horizontal sample stage with a spinner to mount powders, solids, thin and thick film samples, which should also be compatible with mounting/un-mounting of non-ambient heating stage.

5.2. Auto-sample changer module should be provided which should consist of appropriate robot and sample holder cartridges (towers)

5.3. Robot should have the capability to handle more than 80 samples

5.4. Cartridges should have the capacity to hold a minimum 30 number of samples

5.5. Sample holders :

5.5.1. Powder sample holders: 30 numbers

5.5.2. Zero background sample holders: 10 numbers

5.5.3. Thick solids sample holders : 30 numbers to mount 15 mm thick and 25 mm diameter samples.

5.6. The sample stage should be compatible with the auto-sample changing module.

5.7. Rotation of the spinner between 0 to 120 rpm, which should be programmable.

## **6. Non-ambient stage:**

6.1. Non-ambient stage (NAS): Model CHC Plus+, cell of Anton Paar make with temperature range from -193 to 400 °C and humidity (RH of 5 to 80%) should be offered with all necessary accessories.

6.2. NAS should be able to perform in tempered humid condition (up to 80% of RH with temp. max. 90 °C). It should be possible to control the temperature and humidity independently.

6.3. The NAS should be integrated with XRD unit and should be controlled through computer.

6.4. NAS should have provision to accommodate samples with different thickness (1 to 10 mm).

6.5. The vendor should specify the limitation (if any) on sample size and geometry, intensity and resolution when NAS is used.

6.6. Required accessories (eg. LN2 Dewar, etc.,) to perform tests with NAS stage should be supplied by the vendor.

6.7. NAS module should be quoted separately as *Accessories-III*. Please provide relevant details on page 15, under serial no. 4.

- 6.8. The vendor should specify the necessary list of the spares and the consumables for the NAS, if any, and these should be quoted separately as “*Spares and Consumables*”. Please provide relevant details on page 16, under serial no. 6.

**7. Data acquisition and software:**

- 7.1. Advanced desktop 64 bit computer with Intel® i7 or better processor,  $\geq 3.0$ GHz speed, 64 GB RAM, two numbers of 1TB HDD, High-resolution HD 27” LCD colour monitor (1920x1080) and the required graphic adaptor card. The supplied PC’s operating system should be Microsoft Windows, latest release of OS should be provided.
- 7.2. As a spare: TWIN of the Data acquisition system (*exactly same as 7.1*) including all necessary communications ports and cards (only tower, and not the monitor, key board and mouse) should be quoted.
- 7.3. The XRD unit should be interfaced with the computer and dedicated software to perform operations such as remote operation, online data acquisition, diagnosis, guiding for the component/module exchange, etc. should be provided.
- 7.4. Advanced versions of software should be provided for data reduction (background subtraction, smoothing, Kalpha1 and Kalpha2 separation, peak search, multiple peak separation), phase analysis, phase quantification, Retained-Austenite analysis, Williamson-Hall analysis and Rietveld analysis. It should be possible to export the analyzed data to international standard data formats.
- 7.5. Additional computer of same configuration mentioned in 7.1 (including monitor, mouse, keyboard, etc., excluding interface cards related to the XRD unit) should be provided for the data analysis.

**8. Other Items:**

- 8.1. Uninterrupted power supply (UPS): Two UPS-es, one for XRD unit and the other one for Chiller, from reputed Indian brands (such as Emerson, Powerone, ETON, Numeric) with 4 hours of backup should be provided. UPS should be quoted as *Accessories-IV*. Please provide relevant details on page 15, under serial no. 5.
- 8.2. Vendor should supply NIST standards: LaB6 (SRM-660c), Silicon (SRM-640e), and Silicon Nitride (SRM-656).

**9. Warranty & Spares:**

- 9.1. Three (3) years comprehensive warranty from the date of issue of Final Acceptance Certificate for the entire system. Downtime during the warranty period will not be considered as warranty period. Any parts replaced during failure in the warranty period must be supplied on delivery duty paid (DDP) basis, without any cost implication to ARCI. No payment will be made for failure replacement.
- 9.2. ARCI should be intimated in writing as soon as the quoted model is discontinued.

- 9.3. Vendor must confirm the availability of the spares and service support of the entire system for a minimum period of ten years after the model has been discontinued.

#### **10. Manual, Drawings, if any, and Literature.**

Complete set of documentation in hard copy, as well as softcopy, must be supplied with the system.

#### **11. Safety:**

- 11.1. Enclosure for the XRD unit should block X-rays from the source, scattered and diffracted beams. Radiation levels should be less than 1 micro-Sievert/hour around the XRD unit.
- 11.2. Radiation levels should be measured around the XRD unit after the successful installation and demonstration, and the same should be documented.
- 11.3. Other safety features mentioned in 1.5 and 1.7.

#### **12. Installation, Commissioning and demonstration:**

- 12.1. The instrument must be installed, tested and commissioned by qualified engineers/representatives of the manufacturer. Performance must be demonstrated at the installation site by using the supplied standards, as well as the test samples supplied by the ARCI.

#### **13. General**

- 13.1. Electrical power supply: ARCI provides stable electrical power supply as per Indian standards in two phase 220 V/3-phase 440 V, and 50 Hz. Vendor should accordingly design power requirements of the XRD units.
- 13.2. All items necessary to demonstrate the specifications even if not explicitly mentioned here shall be included in the scope of the supply.

#### **14. Technical bid qualification**

Technical bids will be evaluated based on following aspects:

- 14.1. **Compliance statement:** Technical should be provided as a table (representative format given below), containing the following columns: i) ARCI's specifications, ii) the corresponding number/ value for the specification in the instrument offered by the supplier, iii) a statement whether there is compliance or not, iv) explaining deviation(s) if any, and v) offered item no/ model no/ part no. Please provide related officially published brochures, data sheets and application sheets.

**Representative tabular form:**

| Specification format number | ARCI's Specification | Corresponding number/ value for the specification in the instrument offered by the supplier | Compliance yes/no | Deviation, if any, to be explained here | Offered item/ model/part number, if any |
|-----------------------------|----------------------|---|-------------------|---|---|
| 1                           |                      |   |                   |   |   |
| 1.1                         |                      |   |                   |   |   |
| 1.2                         |                      |   |                   |   |   |
| .                           |                      |   |                   |   |   |
| etc.,                       |                      |   |                   |   |   |

14.2. Prospective vendor should measure and provide the XRD profiles of three test samples (Fe based alloy, thin film and nano-powder). The measurements should be performed on of each individual test sample in three configurations that are i) standard/ optimum, ii) high flux, and iii) high angular resolution. A total of nine XRD profiles to be recorded in a range of  $2\theta$  from 1 to  $150^\circ$  with step size of  $0.01^\circ$ , dwell time of 1 sec. The measured data should be shared along the technical bid in a printed and signed hard copy, and also soft copy (original measured file and data/text format).

**Note:** Prospective bidders should inform ARCI of their intention to submit the bid so that samples will be supplied by ARCI. The data should be submitted along with the technical bid by the due date of the tender.

15. Equipment supply, installation, commissioning, training and demonstration must be carried out at:

**International Advanced Research Centre for Powder Metallurgy and New Materials,  
Balapur Post, Hyderabad – 500 005, Telangana, India  
Telephone no. 91-40-24452326, Fax No. +91-040-24442699  
Email ID: stores@arci.res.in**



## CHECK LIST

**BIDDER HAS TO FILL IN THE CHECK LIST GIVEN BELOW**

| <b>S. No.</b> | <b>Item</b>   | <b>YES/NO</b> |
|---------------|---|---------------|
| 1             | If bidder is not an original equipment manufacturer, authorization letter attached.   |               |
| 2.            | Whether Earnest Money Deposit (EMD) and tender fee (envelope I) Submitted   |               |
| 3.            | Whether Technical Bid (envelope II) Submitted   |               |
| 4.            | Whether Commercial Bid (envelope III) Submitted   |               |
| 5.            | Whether the <b>Tender Fee &amp; EMD (envelope I), Technical Bid (envelope II)</b> and <b>Price Bid (envelope III)</b> are submitted in separate covers, and all the covers enclosed in a common envelope. |               |
| 6.            | Whether declaration form signed and Submitted   |               |
| 7.            | Validity of 120 days from the date of opening   |               |
| 8.            | Whether warranty clause mentioned   |               |
| 9.            | Does the instrument comply with all the specifications mentioned  |               |
| 10.           | Whether all pages of tender document signed and submitted   |               |

**NOTE:** i) Please ensure all the relevant boxes are marked YES/NO against each column.  
ii) Page numbers should be printed on every page of the tender document submitted.

**IMPORTANT NOTE:** Tenderers must ensure that all the required documents indicated in the Tender documents are submitted without fail. Tenders received without supporting documents for the various requirements mentioned in the tender document are liable to be rejected at the initial stage itself.