दूरभाष :
TELEPHONE :
तार : बार्क-मुंबई, चेम्बूर.
TELEGRAMS : BARC-MUMBAI, CHEMBUR.
फेक्स संख्या : ९१-२२-२५५० ५१५१
FAX NUMBER : 91-22-2550 5151

ट्रॉम्बे,
मुंबई-४०० ०८५.
TROMBAY,
MUMBAI-400 085.

सत्यमेव जयते

भारत सरकार
GOVERNMENT OF INDIA

भाभा परमाणु अनुसंधान केन्द्र
BHABHA ATOMIC RESEARCH CENTRE

URANIUM EXTRACTION DIVISION
(Utility and Maintenance Section)

Ref: - UED/Pl.13/21/12202 Date : 1.11.2021

Tender No. : BARC/ UED/ MLS/21097
Due on : 15/11/2021

Sub. : Design, manufacture, supply, erection, commissioning, testing and documentation of various component /accessories for upgradation of electrically heated muffle furnace.

Dear Sir,

Quotations are invited in two parts (Part **A** : Technical Bid and Part **B** : financial Bid) Director, Materials Group, in sealed envelope for and On behalf of President of India for the above subject as per following terms and conditions.

1. **Scope of work** :

Design, manufacture, supply, erection, commissioning, testing and documentation of various component /accessories for upgradation of electrically heated muffle furnace for rotary retort tube for carrying out drying of fluoride powder with maximum operating temperature of about 600°C and with associated accessories as per attached Drawing no. : BARC/UED/U&MS/RUMP/ HFF /001 and attached annexure I.

2. **QUANTITY :-**

1.	Box type Muffle with Heating Mechanism, associated accessories, structural support and working platform.	01 set
2.	Gas Control Panel.	01 set
3.	Instrumentation and Electrical control panel.	01 set

3. **PRICE:** Offered should be including the entire scope of work (Fabrication, supply, testing, taxes, packing and forwarding, transportation). Max possible break up price should be givenin the offer. **PRICE (Including all applicable Taxes)**

4. **TENDERING PROCEDURE**: The tender will be opened in two parts 1) PART A – Technical bid (should not include the quoted price), 2) PART B – Price bid. Hence, the vendor has to submit the quotations against this tender in two separate envelopes clearly mentioning PART A and PART B on the envelope. Both the envelopes

should be posted insingle bigger envelope. Tender no. and due date should be written on the top of the main envelope.

PART A will be opened as per due date PART B will be opened only after scrutinizing the technical part by appropriate committee or authority only the PART B of technically suitable offer will be opened for further processing

5. **WARRANTY:** 12 months from the date of commissioning.
6. **VALIDITY:** Price should be valid throughout the contract period.
7. **COMPLETION PERIOD:** The job is to be completed within **3 months** from the date of receipt of the order any delay which is liable to the contractor is liable for penalty @ 0.5% perweek (5% maximum) to be imposed on the contractor.
8. **INCOME TAX:** Income Tax @2% and surcharge on tax as applicable shall be deducted from vendor's bill.
9. **SAFETY:** Party should follow all the safety procedure while working inside BARC. During the execution of the work order party will be responsible for all safety precautions to be maintained in the work area. The party should arrange all the safety appliances. As per BARC security norms, the contractor shall have to obtain in the police verification Certificate (PVC) to work inside BARC for all the persons to be employed for this work and be comply with all security regulations strictly. Any injury/damage caused to the contractor's work force during execution of the job for any reason whatsoever shall be the liability of the contractor only. The vendor will be only responsible for any labor related dispute.

10. **PAYMENT:** 100% including taxes after receipt of the unit at our site, final acceptance of thetotal job and submission of the following documents:

1. Delivery Challan.
2. Advance Stamped Receipt.
3. Original Bill.
4. Guarantee certificate
5. Job completion certificate.

11. TERMS AND CONDITIONS:

Note: [***Reference:*** **(2/Misc-9/Lgl/2001/92** dated April 30, 2001, **BARC]**

1) Confidentiality: No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as "Propriety" in nature by the disclosing party shall be kept strictly

confidential by the receiving party and shall not be disclosed to any third partywithout the prior written consent of the original disclosing party.

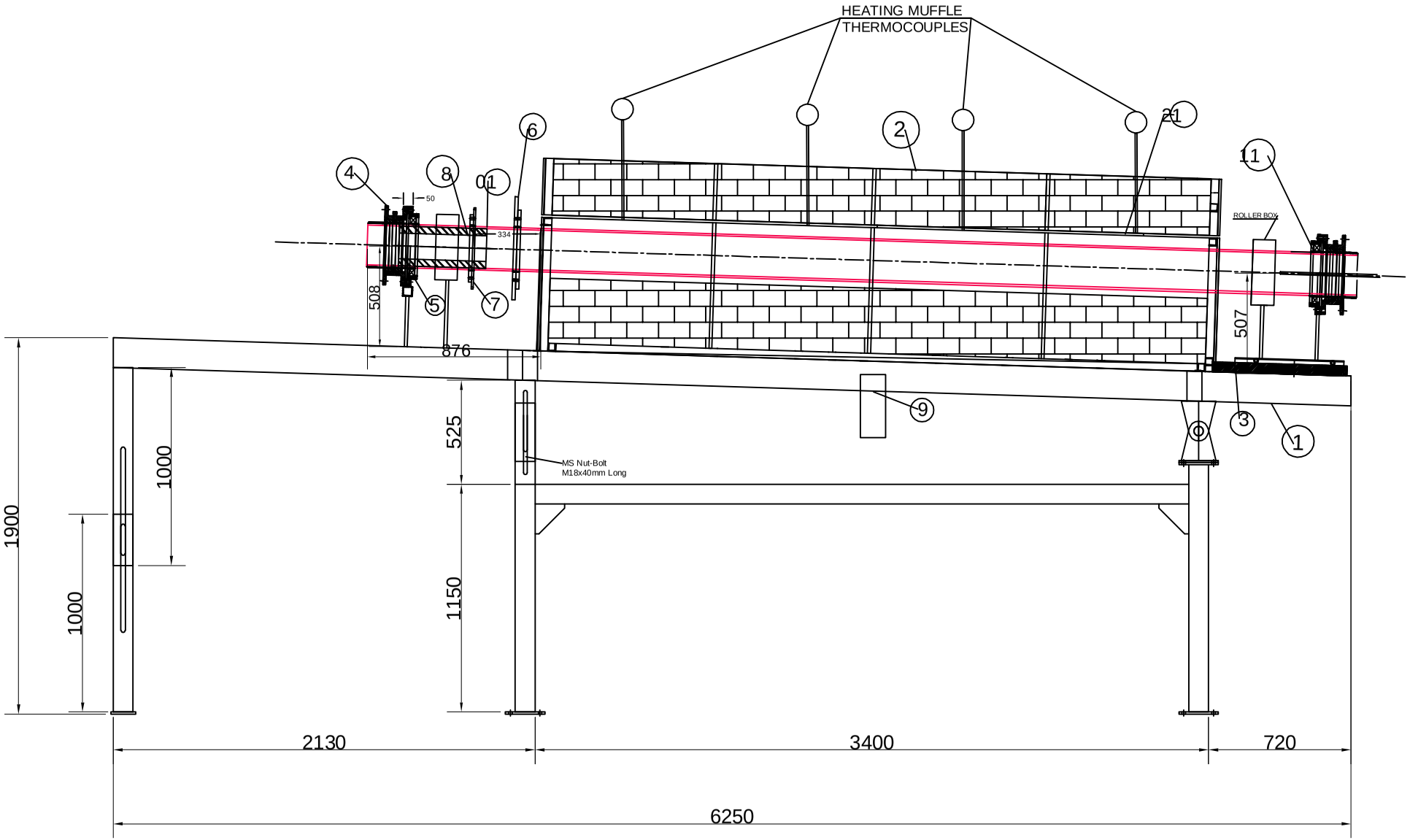
2) "Restricted information" categories under Section 18 of the Atomic Energy Act, 1962and "Official Secrets" under Section 5 of the Official Secrets Act, 1923:

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

3) Prohibition against use of BARC's name without permission for publicity purposes: The contractor or sub-contractor, consultant, adviser or the employees engaged by the contractor shallnot use BARC's name for any publicity purpose through any public media like Press, Radio, TV orInternet without the prior written approval of BARC.

Party should write clearly the Tender No., and due date on the top of envelope. Quotation should be submitted on **printed letter head** and to be addressed to Head, Uranium Extraction Division, Bhabha Atomic Research Centre, Trombay, Mumbai 400085. Party should mention their own **PAN/GST No.** on top of quotation. Party should send the Quotation using Indian postal service only i.e. speed post, registered post or ordinary post only and should not send the Quotation by private courier service. The quotations sent by private courier service will be treated as invalid.
Thanking you,

(M L Sahu)
Head UED,
(For and On Behalf of President of India)



DRG. NO.:BARC/UED/U&MS/RUMP/HFF/001

SR	DESCRIPTION	QTY		SR	DESCRIPTION	QTY	
8	INTERNAL SPIRAL	1					
7	SPROCKET WITH SPACER RING	1					
6	CAM WITH SPACER RING	1					
5	BEARING HOUSING ASSEMBLY DOSING & DISCHARGE SIDE	1					
4	SEAL HOUSING ASSEMBLY	2		12	ROTARY TUBE (Not in Party Scope)	1	
3	FLOATING CARRIAGE	1		11	BEARING PAD	2	
2	HF FARNACE BODY	1		10	SLEEVE FOR CAM & HAMMER	1	
1	HF FARNACE STRUCTURE	1		9	BUBBLER UNIT	1	

Annexure I.

TENDER NO. : BARC/UED/MLS/21097

TENDER SPECIFICATION

A. Technical specification :

1. Process Parameters for design:-

The furnace shall be suitable for carrying out solid gas reaction between Brown powder and Anhydrous Hydrofluoric Acid (AHF) to yield the required product. Powder and gas /vapour flow counter currently. Powder feed and exhaust gas will be at one end (feeding end) and the final product (powder) and feed gas will be at other end (discharge end).

1.1	Process Medium	HF gas, cracked ammonia (75% Hydrogen + 25% Nitrogen and brown powder
1.2	Operating Pressure	100 to 300 mm water column (gauge)
1.3	Design Pressure	1000 mm water column
1.4	Operating temp.	300-600^{o}C (At four different Zones)
1.5	Design temp.	1000^{o}C
1.6	Powder feed rate	15-20 kg/hr
1.7	Design powder feed rate	25 kg/hr
1.8	Total gas feed rate	150-200 slpm
1.9	Particle size	Range of 5 to 70 microns (Mean particle size= 25 micron)
1.10	Powder bulk density	1.70 – 2.5 g/cc
1.11	Angle of repose	45^{o} for the powder
1.12	Off gases	20-25% water vapours 25-30% cracked ammonia 45-50% HF (Hydrofluoric acid gas)
1.13	Resided time	30 minute for 3.5 meter length tube
1.14	Tube rotation	3 to 10 rpm

Since solid gas reaction involve explosive gas and pyrophoric powder at high temperature, utmost care shall be taken for safety with respect to seal leak tightness.

2. Furnace System Details

The furnace system consists of following main component

2.1	Box type Muffle with Heating Mechanism, associated accessories, structural support and working platform
2.2	Gas Control Panel
2.3	Instrumentation and Electrical control panel

2.1 Box type Muffle with Heating Mechanism, associated accessories, structural support and working platform

2.1.1. **Tube size** **:** 220mm O.D.X 10 mm Thick (Inconel 600 tube Seamless tube) X 5.0 meter length – ***supply is not in the scope of party .***

2.1.2. **Helical screw** : About 300 mm to 350mm length of inconel 600 at powder feeding end for conveying powder at designed powder feed rate.

2.1.3. **Tube Drive arrangement** : Chain sprocket/ geared arrangement with reduction gear box and 3- phase electric motor of suitable capacity and ratio.

2.1.4. **Screw Feeder for powder** : Brass screw of suitable pitch & depth with monel 400 Casing. (The approximate size may be 80 mm NB Sch 10). It should be equipped with reduction gear box and 3- phase electric motor of suitable capacity and ratio.

2.1.5. **Gas Sealing Arrangement:**

Both the end of rotary tube shall be provided with double lip seals (2X2) of Viton with lantern ring for distribution of sealing gas, housing and mounting system between the inboard and outboard seals there shall be a provision for blanket gas, which will be at least 150mmWC. higher pressure that the furnace pressure. No leakage is permissible in static and dynamic condition.

MOC :-

a) Seal housing – Cast carbon steel
b) Lip seals - Viton
c) Lantern Ring - Brass Commercial grade

2.1.6. **Furnace Heads** : **supply is not in the scope of party**

Sealing gasket shall be Teflon/viton suitable for operating contact temperature.

2.1.7. **Mounting arrangement** :

Both the ends of the rotary tube shall be mounted on Standard Bearings supported by M.S. Structural frame with proper inclination, tapping / hammering arrangement and rotation system.

a) **Stationary carriage** : Powder dosing end which will not be allowed to move axially. It should be fixed type.

b) **Floating carriage** : Powder (final product) discharge end shall be floating type to take care of thermal expansion and contraction of retort tube during heating and cooling cycles respectively. Design shall be such that there is min. area of contract to minimize friction with minimum acceptable play. Contractor shall submit their design for approval before execution of fabrication work)

c) **Bearings**: SKF make heavy duty single row deep groove ball bearing of suitable size to support the tube on both ends. (No slippage is allowed during rotation and thermal expansion or contraction).
   i. The C.S. bearing housing shall be connected to the respective carriages. Bearing stoppers to be provided to arrest the relative movement between the tube and bearing during tube contraction in cooling.

d) **Tapping/Hammering arrangement**: M.S. hammer with suitable leverage, cam & brass bush shall be provided after tube drive arrangement at the powder feed end to avoid sticking of powder inside the tube.

e) **Tube rotation arrangement**: Gear / chain-sprocket arrangement with suitable reduction box of reputed manufacturer shall be provided. No slippage will be allowed between gear /sprocket and tube. Suitable rating of A.C. Variable frequency speed drive (**VFD**) controller shall be used to control the speed of motor from 0 to 20 rpm tube rotation. It shall have auto re-start facility, if power fails and comes within 20 seconds.

f) **Pressure relief device (Bubbler)** : suitable device is to be made to relief furnace pressure. Range : 200 – 300 mmWC

g) **General instruction for design**.:

- Cooling zones at feeding end and discharge end will be exposed to the atmosphere and middle four heating zones will be inside the muffle. Hence the length of end zones shall be designed in such a way that the tube temperature at seal housing ends will be below 120^{o}C. The overall tube length depends on this design and the end zones will have the facility of bearing support, tube drive mechanism, furnace head with main flange assembled with seal housing.

- Complete internal arrangements of tube shall be made and fitted such that it can be removed, maintained and inserted back easily.

- Bearing shall not be mounted directly on the tube. It shall be mounted on a sleeve with insitu back up stopper. The sleeve shall be stitch welded on the tube such that there is no distortion of tube. After this welding, matching of the sleeve surfaces shall be taken up in single setting.

- Bearing housing shall be split type but fully enclosed .
  - The bearing housing of **dosing side** should be mounted on the main supporting structure of the furnace.
  - The bearing housing of the **discharge end** should be mounted on floating carriages. Suitable arrangement shall be provided to shift the carriages laterally during assembly for adjusting the gap uniformally between the tube and the main flanges. Lateral shifting arrangement must have locking arrangement to avoid any shift during operation.

2.2. MUFFLE (BOX Type)

Heating shall be done from 3 sides. Arrangement of heating elements, end connections etc. shall be suitably designed to facilitate easy replacement of coils. Heating coils terminals shall be housed in separate terminal boxes below/side of the muffle for each zone. Top of the muffle shall have covers and cut-outs to mount temperature sensing instruments i.e. thermocouples. Muffle Covers shall be provided with hinges for their opening & closing to replace heating coils.
The brief specification of muffle is :
a. *Muffle Box with top covers* : **M.S.**
Dimensions (including sheet thickness)to be specified by the vendor in their offer
b. *Muffle Box Length*: To be specified by the vendor in their offer
c. *Muffle Box painting*: Heat resistant aluminum painting after primer coating.
d. i) Length and Diameter of Rotary tube (which is not in the vender's scope of supply) - 220mm O.D. x 5000 mm Length Approx.)

ii) Heating Length (Effective) - 3.0 m with 4 Nos heating zones.

e. *Heat rating* - 48 KW in four zones (Approximate)

Max operating temperature - 600˚C
Design Temp. - 1000 ˚C
Temperature distribution at various Zones
HC1 (Heating Circuit No. 1) - 320˚C
HC2 (Heating Circuit No. 2) - 350 ˚C
HC3 (Heating Circuit No. 3) - 370˚C
HC4 (Heating Circuit No. 4) - 450˚C

f. *M.S Supports for furnace*: To be designed by the supplier with adjustable arrangement for tube inclination such that tube bottom elevation (**minimum 2.8 metres**) from the ground floor to be maintained.

g) *Furnace inclinatio*n : Adjustable from 0 to 10° (at present operating Condition is 3°)

h) *MOC of heating element* : 80/20 Nichrome or superior for all four zones

i) *Watt density of Heating Element* : To be specified by vendors in their offer.

J) *Heating Load for each zone :* To be designed ;specified by vendors along with offer.

k) *Insulation :* Ceramic fiber type- light weight, non peelable type.

l) *Insulation thickness* : To be specified by tenderer along with their offer.

m) *Muffle skin temperature* : Not more than 50°C

n) Terminal *Boxes, Junction box:* - 4 No & 1 No respectively.

o) Temperature control of the furnace: ON /OFF controller

p) Heat insulated power cables to be provided from terminal boxes to junction box.

Control & electrical panel is to be provided by the vendor. All switches, indicators and alarming system should be mounted on a PLC panel so that all electrical switches can be operated from that panel. Electrical supply to panel is under scope of BARC but electrical connection from panel to system is under scope of vendor. Approximate length of cable to be provided by the vendor from panel to the junction box is 15 Metres

2.3. GAS FEEDING PANEL

The vendor has to supply the gas feeding panel. Gas panel board consists of control valves, Rotameters, Pressure gauges, Pressure reducer Valve. The gas feeding panel will have the cracked gas feeding line, CO_2 gas feeding line & N_2 gas feeding line. The cracked gas and the CO_2 /N_2 gas will be measured with Rotameters. The reading for the flow meters will be available at the control panel and need to be controlled from the panel.

2.4. ELECTRICAL & INSTRUMENTATION CONTROL

Control & electrical panel is to be provided by the vendor. All switches, indicators and alarming system should be mounted on a PLC panel so that all electrical switches can be operated from that panel. **MIMIC Diagram** should also be displayed on the Panel. Control circuit with interlocking of operations to be designed by the vendor based on the philosophy provided by BARC. Following parameters will be indicated and controlled from the panel:

2.4.1 Incomer & Metering: 1 Set.

i) Indications : Supply Voltage
Phase Indications

Digital Energy Meter

ii) Switchgear : SDF, Front operable, Fuses, etc.

2.4.2 Furnace Heating : 4 Zones.

i)	Indications:	Current (A) in all phases
		Temperature
		Heating ON/ OFF status
ii)	Switchgear/ Devices:	Contactors, Relays, ON/OFF switches etc.
		Temperature controllers, back-up/ safety controllers etc.
iii)	Remote Indications:	Analog Output for Temperature
		Digital (Contact) Output for Heating ON/ OFF status
iv)	Local Alarm:	High Temperature alarm
v)	Instrumentation:	Thermocouple, K- type, duplex

2.4.3 Drive Control:

A. **Input Bunker Drive** : 0**1 Set.**

i)	Indications:	Drive Speed (RPM) ON/ TRIP/ FAULT Indications
ii)	Switchgear:	VFD (in close loop with RPM indicator cum controller)
iii)	Remote Indications:	Analog Output for RPM
		Digital (Contact) Output for drive ON/ FAULT indications.
iv)	Local Alarm:	TRIP/ FAULT alarm.
v)	Instrumentation:	RPM sensor.

B. **Screw Conveyer Drive** : 0**1 Set**.

i)	Indications:	ON/ TRIP Indications
ii)	Switchgear:	Contactor, Overload relay
iii)	Remote Indications:	Digital (Contact) Output for drive ON/ TRIP indications.
iv)	Local Alarm:	TRIP alarm.
v)	Instrumentation:	None

C. **Main Tube Drive** : **01 Set.**

i)	Indications:	Drive Speed (RPM)
		ON/ TRIP/ FAULT Indications
ii)	Switchgear:	VFD (in close loop with RPM indicator cum controller)
iii)	Remote Indications:	Analog Output for RPM
		Digital (Contact) Output for drive ON/ FAULT indications.
iv)	Local Alarm:	TRIP/ FAULT alarm.
v)	Instrumentation:	RPM sensor.

2.4.4 Additional Instrumentation:

i)	Indications:	Seal Leak Indications
		Pressure (dial)- 4 nos.
iii)	Remote Indications:	Digital (Contact) Output for Seal Leak
iv)	Local Alarm:	Seal Leak alarm.
v)	Instrumentation:	RTD for measurement of main tube skin temperature
		Pressure gauge, 0- 1000 mmWC, Compact capsule SS, 4" dial - 4 nos.

2.4.5 External (Emergency) Supply:

Following circuits shall be powered from separate (emergency) supply, coming from emergency (class III) supply panel:

a) Control supply (single phase) to all panel instruments, e.g. temperature controllers, RPM indicator cum controllers, etc.

b) Power supply (3- phase) to Main Tube Drive circuit.

B. FABRICATION:

1. All materials like Inconel-600, Monel-400, etc to be used for fabrication shall be purchased from reputed source along with original test certificates for chemical and mechanical properties. Source of supply should be indicated in the offer. The supplier shall inform the purchaser after the purchase of these materials for their identification & sampling which will be sent to the government approved laboratory far the required tests as per ASTM standards.
2. Fabrication of Inconel-600, Monel-400, MS & other materials should be done by only qualified welders and as per qualified welding procedures as per appropriate standards for ASTM for materials & ASME for procedures and testing.
3. The supplier shall proceed for fabrication of the furnace only after obtaining the approval of drawing, QAP from the purchaser.
4. Pickling and passivation of the materials should be carried out as per the procedures given by the purchaser after placement of order.
5. The welding procedure & performance qualification specifications shall be in accordance with ASME code section IX and the same shall be submitted to the purchaser for approval. After this, the same shall be witnessed & approved by the purchaser.
6. all the welding joints shall be subjected to liquid penetrate test for each root pass of all weld joints in accordance with ASME code Sec.5 article 6 and examination shall be performed in accordance with ASME code Sec. VIII Div.I.
7. Welding filler metal shall confirm to AWS standard .
8. Monel-60 & Inconle-82 filler wires shall be used for welding Monel-400 & Inconel-600 materials respectively.

C. INSPECTION & TESTING:

1. All materials shall be identified & sample will be taken in the presence of purchaser's representative for chemical and physical analysis.

2. Approval of welding procedure & performance qualification as mentioned earlier.
3. Submission of all test certificates.
4. After Completion of job the furnace components shall be inspected for dimensional check-up, finish, welds, Furnace leak testing, testing of seals.

5. Installation, commissioning & testing of the system at BARC site shall be carried out by the supplier in the presence of purchaser representative.

NOTE:

1. Entire system is required for solid-gas reactions of powder and gas having toxic, corrosive, explosive/pyrophoric nature. Hence care shall be taken in the material of construction.
2. The furnace shall have maximum flexibility to alter the system parameters.
3. All the above points given are mainly guidelines. If the vender feel that there can be a better design/ monitoring/ control techniques, they can intimate the same and take the approval from the purchaser before execution of fabrication. .
4. Design of the system shall be proved in terms of heat loss, higher flexibility, optimum sizing, distance between heated portion of tube to the ends, better control facility etc. also, suitable sizing of helical screw for conveying 25 kg/hr of powder of given specifications shall be worked out considering normal inclination of tube is three degrees to the floor and speed of rotation is three rpm. Theoretical hold-up should be worked out by the vender.
5. All the materials to be used for fabrication shall be purchased from the manufacturers only along with original test certificates for chemical & mechanical properties.
6. After placement of order the vender should submit design and fabrication drawings for all the components and a general assembly drawing of system for purchaser approval.

D. FREE ISSUE MATERIALS

1. BARC will provide a dummy tube of Inconel 600 of size 220mm O.D. X 10 mm Thick X 5000mm length on the returnable basis for testing of furnace and its accessories. It is vendor's responsibility to collect the tube and return the same and also submit the necessary insurance policy equivalent to the cost of tube as a security for safe transportation and storing. BARC will not pay additional charge for the the same.
2. No other free issue material (FIM) shall be supplied by BARC except tube .

QUALITY ASSURANCE PLAN FOR FABRICATION OF METALLIC ITEMS :

Quality control should be mainly done in four stages:

1. During Procurement of raw materials:

All raw materials should be purchased from reputed and approved dealers only (Mill product with heat nos. and not re-melted material). The mill certificate should also be provided for checking of the mechanical and chemical property. The following checks should normally be done during procurement of raw materials

a. The chemical composition of the material should be done in site for all relevant elements from Govt. approved laboratory.
b. Visual inspection should be done to identify defects like
c. Dimensional irregularity
d. Surface irregularity
e. Corrosion
f. Physical deformation dents
g. Sizes are accommodated to reduce the number of welding joints
h. D.P. tests for surface cracks
i. Mechanical testing to check that physical properties confirm to specification.

Vendor List for Bought out items:

The following brought out items shall be from the below mentioned reputed vendors:

Sr no	Item	Vendor
1.	Gear Box	Bonfigliloli

2	Bearing	SKF
3	Motor	Siemens, Kirloskar, Crompton
4	PLC	Allen Bradley
5	Pressure gauges / Rotameters etc	Reputed make like Guru, Feibig, Manometers
6.	VFD	Delta/Siemens/ Allen Bradley

2. During Fabrication and processing of material

a. Party should prepare the fabrication drawing based on the GA drawing and submit for approval. Dimensional and geometrical checks should be done before marking for cutting off.

b. The pressure and flow of gas, cutting speed should be monitored continuously during cutting operation.

c. Qualified operators to ensure smooth cutting edges and good dimensional tolerance should do the gas cutting and plasma cutting.

d. The gas cut and plasma cut surfaces should be ground off before further processing (Edge preparation).

e. Machining tolerance and surface finish should be checked for machined components as per ASME /IS standards.

f. Tools for SS/ monel, inconel fabrication should be separately maintained.

g. All welding should be done as per ASME code. The welding should be done as per approved WPS strictly as per the fabrication drawing.

h. The procedure for inspection should be as per the article 6 of ASME code, section V.

i. Root pass and final pass weld should be tested with liquid dye penetration test for any surface defects / cracks etc.

j. SS , monel, inconel plates / parts should be cleaned by suitable detergent to remove all dirt and greasy substances. SS wire brushes should only be used wherever necessary.

k. After fabrication SS plates , monel ,inconel parts should be cleaned by acid pickling. Subsequently these should be cleaned / washed with clear water and dried. Washed surface should be checked by litmus test to ascertain total removal of acid.

l. Welder qualification and approval 5G/6G position is a must. The welder shall have certification for welding of Monel 400 also.

3. During Welding:

Welding procedure for Monel, SS welds should be GTAW (TIG Welding) process for all passes. All joints should be full penetration welds. The root passes for weld joints, accessible from only outside should be continuously back purged with Argon during welding. The argon gas used should be of 99.95% purity.

Welding procedures and qualifications tests

Qualification of the welding, procedure and performance test for welders should be carried out in accordance with the requirements of ASME code

Filler wires should be used as per the ASME code for the TIG welding.

The welders / operators proposed to be employed on the job should also pass the welder performance qualification test prescribed by the above code.

Surface to be welded should be made free from paint, oil, grease, dust or any other contamination. Cleaning of surfaces / weld edge preparations/ completed weldments should be done by use of approved solvents.

Wire brushes used should be of SS/ monel to avoid contamination of weld surfaces.

Tack welds should be examined for cracks before continuing with further welding and qualified and approved welders should repair any defects observed.

4. During Assembly :

Quality assurance plan details with all aspects of quality so as to ensure conformity of the product to tender specifications should be made and submitted to BARC for approval.

Inspection facility should be offered to the representative appointed by BARC to enable him to carry out inspection (if required).

Following inspection and testing should be carried out

i) Visual inspection

ii) Pressure testing

iii) Cold trail

iv) Control panel testing

v) Gas feeding panel

5. Acceptance Criteria :-

The following requirement should be fulfill for the acceptance of the System during the cold trial in addition to the above QAP.

At Vender's Premises after assembly the furnace :-

6.1 .The rotation of furnace should be checked . There should not be any vibration / unusual noise during the rotation.

6.2 Functioning of all the control system except the heating of furnace should be checked. It should work smoothly as per our technical specification.

6.3. The Sealing system should be leak tested with N_2 gas at a seal pressure of 300mm of WC . There should be no any leakage for a period of 2 Hr.

6.4 The complete assembly should be leak tested with N_2 gas at a pressure of 250 mm of WC . There should be no any leakage for a period of 2 Hr.

At Purchaser Site after installation

a). The rotation of furnace should be checked . There should not be any vibration / unusual noise during the rotation.

b). The Sealing system should be leak tested with N_2 gas at a seal pressure of 300mm of WC . There should be no any leakage for a period of 2 Hr.

c). The complete assembly should be leak tested with N_2 gas at a pressure of 250 mm of WC . There should be no any leakage for a period of 2 Hr.

d). Functioning of all the control system along with the heating of furnace and inert material should be checked .It should perform satisfactory as per our technical specification.

6. General Notes

- **Records / Documentation:**

● Party should maintain records for all inspection and tests.

● Fabrication drawing for each item should be submitted for approval & records of drawing revision wise should be maintained accordingly.

● Documents for all the material testing, weld joint testing & hydro / pneumatic testing should be submitted in bound volume.

● Three sets of as built mechanical, electrical & instrumentation (wherever applicable) drawing should be submitted after completion of project. All drawing shall be prepared in AutoCAD 2013 or latest available and electronic files shall be provided as part of final drawing. Text document should be in Microsoft Word 2013 or higher.

● The contractor shall arrange for final documentation in bounded hard copy in 3 sets as part of final documentation. Electronic files (soft copy, preferred in CD) of all drawing and documents should also be submitted along with three copies of operation manual (wherever applicable) & drawing for all the bought out items after completion of works.

7. TERMS AND CONDITION : For erection and commissioning

a) Party should have valid security vetting certificate.

b) All the person to be deputed for erection and commissioning have valid PVC and fully vaccinated for COVID 19.

c) Party should have experience of carrying out similar worksupply and erection of muffle furnace for rotary tube in DAE / BARC. (The proof should be attached along with technical offer.)

d) The party should submit medical certificate for the person to be carried out the erection work as the system is for Radio chemical plant.

(M L Sahu)
Head, UED.