CSIR-NML

सीएसआईआर - राष्ट्रीय धातुकर्म प्रयोगशाला
(सीएसआईआर की एक संघटक प्रयोगशाला, विज्ञान एवं प्रौद्योगिकी मंत्रालय)
भारत सरकार, बर्मामाइंस, जमशेदपुर - 831007, झारखंड (भारत)

CSIR-National Metallurgical Laboratory
(A Constituent Laboratory of CSIR, Ministry of Science & Technology)
Govt. of India, Burmamines, Jamshedpur - 831 007, Jharkhand (India)

PURCHASE ORDER

To,	P.O. No.	P/NC/712/KK/DB/OTE/24-25 (RE)
THERELEK ENGINEERS PRIVATE LIMITED, **70-71, III Phase, Peenya Industrial Area,** **Bengaluru – 560 058, Karnataka, India** **Email – info@therelek.com** **GST – 29AAACT5414A1ZR**	Date	**25-09-2026**
	Subject	**Award of Contract**
	Ref.:-	i. GEM Bid No. GEM/2026/B/7591101 ii. Quotation Ref. No. TEPL/NML/DCLR/26-27/111 Dt: 27.06.2026 iii. Clarification reply Letter No: TEPL264/NML/CLE01/26-27/1176 dt. 05-08-26 iv. Cost offered after Price Negotiation Meeting vide Letter No. TEPL264/NML/NG/Price/26-27/963 dt. 02.09.26.

Dear Sir,

I am directed to inform you that after evaluating the bid documents submitted by you as referred above, The Director, CSIR-NML, Jamshedpur has been pleased to inform you that you have been selected as the successful bidder for the **SUPPLY, INSTALLATION, COMMISSIONING ETC. OF DESIGN AND FABRICATION OF RETORT BASED VACUUM REDUCTION PILOT PLANT**. The total purchase price including cost of the equipment [covering Two (02) Years onsite Comprehensive Warranty] and Non-Comprehensive AMC period for One (01) Year shall be **₹ 3,70,00,000.00**, as indicated in your revised and final financial offer submitted on the GeM Portal after Price Negotiation indicated through Letter No. TEPL264/NML/NG/Price/26-27/963 dt. 02.09.26, in accordance with the procedures intimated in the relevant bid documents.

Accordingly, you are requested to kindly arrange for execution of the Contract for **DESIGN AND FABRICATION OF RETORT BASED VACUUM REDUCTION PILOT PLANT** within the delivery period. Please apply for refund of EMD if deposited by you with proper documentary evidence.

COST OF EQUIPMENT

Sl. No.	Description	Quantity	Total Price/ INR
1.	Basic Price of Design and Fabrication of Retort based Vacuum Reduction Pilot Plant **(Technical Specifications are attached at Annexure-A)**	One (01) Unit	3,04,42,653.00
2.	GST on Basic Price	@ 18%	54,79,677.00
3.	**Total cost on FOR CSIR-NML basis after Price Negotiation meeting vide bidder's email dt: 02.09.2026 including charges towards Packing, Forwarding, Installation & Commissioning**		**3,59,22,330.00**

CHARGES OF NON-COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT FOR 1 YEAR

Sl. No.	Description	Total Price/ INR
1.	Basic charges towards Non-Comprehensive AMC for One (01) Year covering Two (02) nos. of Preventive Maintenance (PM) and One (01) Failure/Breakdown Maintenance	9,13,279.58
2.	GST @ 18% on basic charges towards Non-Comprehensive AMC for 1st Year	1,64,390.32
Total charges of Non-Comprehensive Annual Maintenance Contract for One (01) Year [covering Two (02) nos. of Preventive Maintenance + One (01) failure/Breakdown Maintenance per AMC Year].		**10,77,669.90**
	Rounded off	**10,77,670.00**

TOTAL CONTRACT VALUE

Sl. No.	Description	Quantity	Total Price/ INR
1.	Total cost on FOR CSIR-NML basis after Price Negotiation meeting vide bidder's email dt: 02.09.2026 including charges towards Packing, forwarding, Installation & Commissioning	One (01) Unit	**3,59,22,330.00**
2.	Total Non-Comprehensive AMC Charges for One (01) Year including GST [covering Two (02) nos. of Preventive Maintenance per Year + One (01) Breakdown/Failure Visit when required].	1 Year	**10,77,670.00**
*** On-site Comprehensive Warranty for Two (02) years from the date of completion of successful installation & commissioning and completion of all contractual obligation to the entire satisfaction of buyer. All consumable and non-consumable items/components should be covered under warranty without any exclusion whatsoever.**	**TOTAL CONTRACT VALUE***		**3,70,00,000.00**

act/Purchase Order shall be governed by:-

(1) General Conditions of Contract and Special Conditions of Contract as detailed in the **BID NO. /2026/B/7591101 floated on GEM Portal** and

(2) Special Conditions of Contract enclosed with this Purchase Order.

The Technical Specifications and other allied features of the ordered goods shall strictly conform to e specified in the aforesaid CSIR-NML Tender Document and complied by the Bidder / Supplier in their tation submitted on GeM Portal and all communications exchanged between CSIR-NML and the Bidder / olier.

The Order Acknowledgement must be submitted immediately and in any case, **within 07 days** from the date of ment of this Purchase Order. **The Order Acknowledgement shall be made on letterhead of the firm mentioning led technical specifications as per the Purchase Order and shall also contains declaration towards ptance of all the terms & conditions of the Purchase Order.**

25/09/26

Stores & Purchase Officer
For & on behalf of the Council of Scientific & Industrial Research

hnical Specifications (Annexure-A, Page No. 13-35)

Explanations
The following words and expressions used in this Award of Contract shall have the meanings hereby assigned to them:

Purchaser	Means CSIR-NATIONAL METALLURGICAL LABORATORY, BURMA MINES, JAMSHEDPUR, JHARKHAND - 831007
Manufacturer/Supplier	Means Therelek Engineers Private Limited, Bengaluru
Indian Agent	Means Therelek Engineers Private Limited, Bengaluru

1.	Delivery Term	FOR CSIR-NML Jamshedpur **(Door delivery at LSTF, Magnesium Plant, Nildih Campus, CSIR-NML, Jamshedpur)**
2.	Purchase Order Value / Contract Price	**₹ 3,70,00,000.00 (INR THREE CRORES SEVENTY LAKHS ONLY).**
3.	Transportation / Dispatch	The ordered goods shall be delivered by Supplier at **LSTF, Magnesium Plant, Nildih Campus, CSIR-NML, Jamshedpur** and duly insured by Supplier from your warehouse to final destination basis covering all the risks including SRCC and unloading at destination site.
4.	Payment	**Payment shall be made in currency of the Contract in the following manner:** **Hundred percent (100%) of the Contract Price of Goods received excluding AMC Charges shall be paid within thirty (30) days of successful installation, commissioning, training and all incidental / related services of the items and acceptance certificate issued by user and submission of Performance Security within 21 days of receipt of the notification of award / PO.** **Payment terms of AMC for One (01) Year (Non-Comprehensive):-** **AMC Charges shall be paid on Yearly basis** through RTGS within 30 days **after completion of each AMC year** subject to satisfactory service certificate given by the concerned user and against submission of bills.
5.	Delivery, Installation, Commissioning and Testing	**07 MONTHS 10 DAYS** from date of issue of Purchase Order. Denial Clause (over and above levy of Liquidated Damage): any increase in statutory duties and / or upward rise in prices due to the PVC (Price Variation Clause) clause and / or any adverse fluctuation in foreign exchange are to be borne by the supplier / seller during the extended delivery period, while the purchaser reserves the right to get any benefit of a downward revisions in statutory duties, PVC and foreign exchange rate.

6.	Performance Security	The Supplier shall furnish Performance Security for 3% of the contract price excluding AMC Charges, i.e. **₹ 10,77,670.00** within 21 days of receipt of the notification of award/PO. The Performance security shall be in one of the following forms: (a) A Bank guarantee or stand-by Letter of Credit issued by a Nationalized/Scheduled bank located in India or a bank located abroad in the form provided in the bidding documents. OR (b) A Banker's cheque or Account Payee demand draft in favour of the purchaser. The performance security will be discharged by the Purchaser and returned to the Supplier not later than 60 days following the date of completion of the Supplier's performance obligations, including any warranty obligations, unless specified otherwise in SCC, without levy of any interest. In the event of any contract amendment, the supplier shall, within 21 days of receipt of such amendment, furnish the amendment to the performance security, rendering the same valid for the duration of the contract, as amended for further period of 60 days thereafter. The order confirmation must be received within 7 days. However, the Purchaser has the powers to extend the time frame for submission of order confirmation and submission of Performance Security (PS). Even after extension of time, if the order confirmation /PS are not received, the contract shall be cancelled provided that the purchaser, on being satisfied that it is not a case of cartelization and the integrity of the procurement process has been maintained, may, for cogent reasons, offer the next successful bidder an opportunity to match the financial bid of the first successful bidder, and if the offer is accepted, award the contract to the next successful bidder at the price bid of the first successful bidder. **Whenever, the bidder chooses to submit the Performance Security in the form of Bank Guarantee, then he should advise the banker issuing the Bank Guarantee to immediately send by Registered Post (A.D.) an unstamped duplicate copy of the Guarantee directly to the Purchaser with a covering letter to compare with the original BG for the correctness, genuineness, etc.**
7.	Country of Origin	INDIA
	~~Port of Shipment~~	~~By Road.~~
8.	Road Permit / eWaybill	Will not be provided.
9.	Scope of Work	Design, Fabrication, Supply, Installation, Commissioning, Testing and Training.

10.	Pre-Dispatch Inspection (PDI)	a) Vendor should submit Layout drawings within 20 days from the issue of P.O. before taking up the fabrication/assembly work. b) The submitted drawings should be approved by CSIR-NML and shall be used for all fabrication / assembly work. c) Pre-Dispatch Inspection will be done by CSIR-NML at Supplier's site. Prior notice of 7 working days shall be given by Supplier for PDI. d) The Vendor should intimate minimum one week in advance for the inspection call. e) PDI will also be a part of the acceptance criteria mentioned. If any discrepancy or deviation is identified with respect to above mentioned Technical Specifications and approved Drawings during PDI, the bidder has to take up corrective actions upto the satisfaction of the tenderer, followed by re-inspection by CSIR-NML. All necessary PDI should be completed by the delivery time mentioned. Non–compliance during PDI may lead to cancellation of the order. f) The cost of travel, hospitality for the PDI will be borne by NML, Jamshedpur. However, all costs related to demonstration of equipment will have to be borne by the supplier.
11.	Design Vetting conditions and submission of Final Approved Drawings	Equipment with parts and accessories as per technical specification and designs checked by CSIR NML Jamshedpur. Vetting of all mechanical, electrical and electronic circuit-control panel designs shall be done by CSIR NML before start of actual fabrication. Space requirements along with any specific requirements shall be provided with drawings for approval before fabrication. Single line diagram, CAD drawings (soft and hard copy), Detailed engineering drawings (3 hard copies and soft copy in adequate storage). All engineering Drawings must be vetted by both participating vendor and by CSIR NML team before actual fabrications.
12.	ICT (Onsite) (Installation, Commissioning and Testing)	Installation, Commissioning and Testing will be the sole responsibility of the Supplier. Installation, Commissioning and Testing will have to be done by the supplier. The Supplier will complete the Installation & Commissioning including Training and acceptance test at site within **07 MONTHS 10 DAYS** from the date of issuance of Purchase Order. Installation, Commissioning, Training (ICT) for vacuum system and its parameters defined, tests, and training of the equipment with operation shall be provided by vendor to NML personnel. Vacuum system shall be tested for continuous running of 10 hrs atleast for cold runs. Atleast two (02) nos. hot trials of furnaces will be tested during commissioning. Successful ICT by CSIR NML team/s will lead to acceptance of system supplied. **Supplier must submit copy of Installation Certificate on their letterhead duly signed & stamped by both the firm's engineer and user of CSIR-NML indicating specific start date and completion date of Installation. The firm must also submit Acceptance Certificate Form (Attached) on completion of commissioning of the items.**
13.	Warranty	**Two (02) Years** on-site Comprehensive Warranty from the date of completion of successful installation & commissioning and completion of all contractual obligation to the entire satisfaction of buyer. **All consumable and non-consumable items/components should be covered under warranty without any exclusion whatsoever.**

14.	AMC	Consecutive One (01) year Non-comprehensive AMC [minimum Two (02) preventive + One (01) breakdown visit annually] for equipment to be started immediately after expiry of warranty period of Two (02) Years. The services towards Preventive Maintenance will be carried out in equal spaced interval during an AMC Year and the Breakdown Maintenance visit will be carried out as and when requested during AMC Period. In the event of any breakdown, the Supplier shall attend to the complaint notice and depute its service personnel within five (05) working days from the date of notification by the Purchaser.
15.	Pre-installation visit	Supplier's engineer will make the inspection for site readiness prior to shipment/dispatch to expedite the installation.
16.	Training	It should be imparted to Ten (10) persons for Five (05) days to the purchaser at purchaser's premises. It should be completed as per schedule mentioned under installation and commissioning.
17.	Acceptance Criteria	i. Successful Installation, Commissioning, Demonstration and trouble-free operation of the equipment. ii. Inspection of all dimensional details as PO, Compliance Documents (including drawings and BOM) submitted by bidder during tendering and final approved drawings. iii. Installation, commissioning and testing of equipment with all utilities, alongwith performances of individual subunits till the specified limit of all operational parameters. iv. Atleast Two (02) nos. hot trials will be conducted in presence of vendor's representatives after commissioning of item. Successful ICT by CSIR NML team/s will lead to acceptance of system supplied. **On successful completion of acceptability test, receipt of deliverables, etc. and after the Buyer is satisfied with the working of the equipment, the acceptance certificate signed by the supplier and the representative of the buyer will be issued. The date on which such certificate is signed shall be deemed to be the date of successful commissioning of the equipment.**
18.	LD Clause	The penalty shall be zero point five percent (0.5%) per week or part of a week; maximum amount of penalty shall be ten (10%). It will be applicable for delay in delivery / ~~shipment~~, installation, testing, commissioning and completion of all contractual obligations beyond deadlines as mentioned above.
19.	Certificate for effecting payment	Supplier will submit the installation and acceptance certificate indicating the completion of Installation, Commissioning & Training as well as duly signed by the user of CSIR-NML alongwith Invoice for effecting the payment.

NON-DISCLOSURE AGREEMENT (NDA)

The supplier must abide with the confidentiality and non-disclosure of any information pertaining to this Purchase Order / item under this Project.

The designs and details is strictly confidential and shall not be shared to anyone without permission of CSIR NML, Jamshedpur. An NDA for design and specs shall be provided by M/s. Therelek Engineers Private Limited, Bengaluru to NML before actual fabrication. Final equipment and its designs will be property of CSIR NML and hence vendor will be abiding with non-disclosure terms of CSIR National Metallurgical Laboratory (NML). All designs (mechanical/electrical/ electronic) and integrated pilot plant will be intellectual property of CSIR NML and permissions must be sought before disclosing information to parties other than CSIR NML Jamshedpur.

All designs and drawings originating from this tender shall be copyright and IP of CSIR-NML.

BIDDER MUST NEED TO PROVIDE A DECLARATION CERTIFICATE ON COMPANY LETTERHEAD FOR MAINTAINING CONFIDENTIALITY AND ACCEPTANCE OF NON-DISCLOSURE AGREEMENT DULY SIGNED & SEALED BY AUTHORIZED SIGNATORY.

25/09/24

Stores & Purchase Officer
For & on behalf of the Council of Scientific & Industrial Research

SPECIAL CONDITIONS OF CONTRACT (SCC)

The following Special Conditions of Contract (SCC) shall supplement and / or amend the General Conditions of Contract (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

SCC 1.	The Purchaser is: Director, CSIR-NATIONAL METALLURGICAL LABORATORY, BURMA MINES, JAMSHEDPUR, JHARKHAND - 831007
SCC 2.	The Supplier is: M/s. Therelek Engineers Private Limited, Bengaluru
SCC 3.	**Final Destination:** **LSTF, Magnesium Plant, Nildih Campus, CSIR-NML, Jamshedpur**
SCC 4.	**Order Acknowledgement/Confirmation:** The Order Acknowledgement must be submitted immediately and in any case, within 07 days from the date of placement of this Purchase Order. The Order Acknowledgement shall be made on letterhead of the firm mentioning detailed technical specifications as per Quotation and shall also contains declaration towards acceptance of all the terms & conditions of the Purchase Order.
SCC 5.	**Performance Security:** The Supplier shall furnish Performance Security for **3% of the contract price excluding AMC Charges,** i.e. **₹ 10,77,670.00** within 21 days of receipt of the notification of award/PO.
SCC 6.	**Delivery / Shipment :** **07 MONTHS 10 DAYS from date of issue of Purchase Order.** Denial Clause (over and above levy of Liquidated Damage): any increase in statutory duties and / or upward rise in prices due to the PVC (Price Variation Clause) clause and / or any adverse fluctuation in foreign exchange are to be borne by the seller during the extended delivery period, while the purchaser reserves the right to get any benefit of a downward revisions in statutory duties, PVC and foreign exchange rate. Except as provided under the Force Majeure clause, a delay by the Supplier in the performance of its delivery obligations shall render the Supplier liable to the imposition of penalty pursuant to Penalty Clause unless an extension of time is agreed upon pursuant to above clause without the application of penalty clause.
SCC 7.	**Part supply will not be accepted.**
SCC 8.	The **country of origin** of the Goods is INDIA
	~~The **port of shipment** of the Goods is .....~~
SCC 9.	The **mode of shipment / dispatch:** By Road.
SCC 10.	**Pre-installation visit** Supplier's engineer will make the inspection for site readiness prior to shipment / dispatch to expedite the installation. **Installation & Commissioning:** Installation, Commissioning and Testing will be the sole responsibility of the Supplier. Installation, Commissioning and Testing will have to be done by the supplier. The Supplier will complete the Installation & Commissioning including Training and acceptance test at site within **07 MONTHS 10 DAYS from the date of issuance of Purchase Order.** Installation, commissioning, Training (ICT) for vacuum system and its parameters defined, tests, and training of the equipment with operation shall be provided by vendor to NML personnel. Vacuum system shall be tested for continuous running of 10 hrs atleast for cold runs. Atleast two (02) nos. hot trials of furnaces will be tested during commissioning. Successful ICT by CSIR NML team/s will lead to acceptance of system supplied.

Firm must submit copy of Installation Certificate on Supplier's letterhead duly signed & stamped by both the firm's engineer and user of CSIR-NML indicating specific start date and completion date of Installation. The firm must also submit Acceptance Certificate Form (Attached) on completion of commissioning of the items.

Delay beyond the prescribed period in completion of contractual obligations will attract the imposition of Liquidated Damage Clause as mentioned in this tender document.

SCC 11 **Training:-**

It should be imparted for Ten (10) persons for Five (05) days to the purchaser at purchaser's premises. It should be completed as per schedule mentioned under installation and commissioning.

SCC 12. **Acceptance Criteria :**

i. Successful Installation, Commissioning, Demonstration and trouble-free operation of the equipment.

ii. Inspection of all dimensional details as PO, Compliance Documents (including drawings and ROM) submitted by bidder during tendering and final approved drawings.

iii. Installation, commissioning and testing of equipment with all utilities, alongwith performances of individual subunits till the specified limit of all operational parameters

iv Atleast Two (02) nos. hot trials will be conducted in presence of vendor's representatives after commissioning of item. Successful ICT by CSIR NML teams will lead to acceptance of system supplied

On successful completion of acceptability test, receipt of deliverables, etc. and after the Buyer is satisfied with the working of the equipment, the acceptance certificate signed by the supplier and the representative of the buyer will be issued. The date on which such certificate is signed shall be deemed to be the date of successful commissioning of the equipment.

SCC 13. **Pre-Dispatch Inspection and Acceptance Tests:-**

The Inspection tests prior to shipment of goods and at final acceptance at buyer's site.

a) Vendor should submit Layout drawings within 20 days from the issue of P.O. before taking up the fabrication/assembly work

b) The submitted drawings should be approved by CSIR-NML and shall be used for all fabrication / assembly work

c) Pre-Dispatch Inspection will be done by CSIR-NML at Supplier's site. Prior notice of 7 working days shall be given by Supplier for PDI

d) The Vendor should intimate minimum one week in advance for the inspection call

e) PDI will also be a part of the acceptance criteria mentioned. If any discrepancy or deviation is identified with respect to above mentioned Technical Specifications and approved Drawings during PDI, the bidder has to take up corrective actions upto the satisfaction of the tenderer, followed by re-inspection by CSIR-NML. All necessary PDI should be completed by the delivery time mentioned. Non - compliance during PDI may lead to cancellation of the order

f) The cost of travel, hospitality for the PDI will be borne by NML Jamshedpur. However, all costs related to demonstration of equipment will have to be borne by the supplier

After the goods are manufactured and assembled, inspection and testing of the goods shall be carried out at the Supplier's plant by the Supplier prior to shipment to check whether the goods are in conformity with the technical specifications.

Manufacturers Test Certificate with data sheet shall be issued to the effect and submit alongwith delivery documents

The acceptance test will be conducted by the Purchaser, their consultant or other such person nominated by the Purchaser at its option after the equipment is installed at Purchaser's site in the presence of supplier's representatives. The acceptance will involve trouble free operation. There shall not be any additional charges for carrying out acceptance test. No malfunction, partial or complete failure of any part of the equipment is expected to occur. The Supplier shall maintain necessary log in respect of the result

	of the test to establish to the entire satisfaction of the Purchaser, the successful completion of the test specified. In the event of the ordered item failing to pass the acceptance test, a period not exceeding two weeks will be given to rectify the defects and clear the acceptance test, failing which, the Purchaser reserve the right to get the equipment replaced by the Supplier at no extra cost to the Purchaser. Successful conduct and conclusion of the acceptance test for the installed goods and equipment shall also be the responsibility and at the cost of the Supplier. Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance Manuals together with Drawings of the goods and equipment built. These shall be in such details as will enable the Purchase to operate, maintain, adjust and repair all parts of the works as stated in the specifications. The Manuals and Drawings shall be in the ruling language (English) and in such form and numbers as stated in the Contract. Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purposes of taking over until such Manuals and Drawing have been supplied to the Purchaser. On successful completion of acceptability test, receipt of deliverables, etc. and after the Purchaser is satisfied with the working of the equipment, the acceptance certificate signed by the Supplier and the representative of the Purchaser will be issued. The date on which such certificate is signed shall be deemed to be the date of successful commissioning of the equipment.
SCC 14.	**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. 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.
SCC 15.	**Shipping and other Documents** : For goods manufactured within India Within 24 hours of dispatch, the supplier shall notify the purchaser the complete details of dispatch and also supply following documents by registered post / speed post and copies thereof by Email. (a) Two copies of Supplier's Invoice indicating, *inter-alia* description and specification of the goods, quantity, unit price, total value, HSN Code, Gross & Net Weight, Volume of goods; (b) Packing list; (c) Insurance certificate, if required under the contract; (d) Manufacturer's warranty certificate and in-house inspection certificate; (e) Any other document(s) as and when required in terms of the contract.
SCC 16.	**Mode of dispatch:** In case of supplies from within India, the mode of transportation shall be by Road. ~~In case of supplies from abroad, the mode of transportation shall be by Sea.~~
SCC 17.	**Insurance:** The Insurance in respect of goods to cover all risks including SRCC and unloading at destination site shall be borne by Supplier at its own costs.
SCC 18.	**Warranty:** **Two (02) Years on-site Comprehensive Warranty** from the date of completion of successful installation & commissioning and completion of all contractual obligation to the entire satisfaction of buyer. **All consumable and non-consumable items/components should be covered under warranty without any exclusion whatsoever.**
SCC 19.	**Payment:** **Payment shall be made in currency of the Contract in the following manner:** **Hundred percent (100%) of the Contract Price of Goods received excluding AMC Charges shall be paid within thirty (30) days of successful installation, commissioning, training and all incidental / related services of the items and acceptance certificate issued by user and submission of Performance Security within 21 days of receipt of the notification of award / PO.**

	Payment terms of AMC for 01 Year (Non-Comprehensive in nature):- **AMC Charges shall be paid on Yearly basis through RTGS within 30 days after completion of each AMC year subject to satisfactory service certificate given by the concerned user and against submission of bills.**
SCC 20.	**Liquidated Damages** : The penalty shall be zero point five percent (0.5%) per week or part of a week; maximum amount of penalty shall be ten percent (10%). It will be applicable for delay in delivery / shipment, installation, testing, commissioning and completion of all contractual obligations beyond deadlines as mentioned above.

NON-DISCLOSURE AGREEMENT (NDA)

The supplier must abide with the confidentiality and non-disclosure of any information pertaining to this Purchase Order / item under this Project.

The designs and details is strictly confidential and shall not be shared to anyone without permission of CSIR NML, Jamshedpur. An NDA for design and specs shall be provided by M/s. Therelek Engineers Private Limited, Bengaluru to NML before actual fabrication. Final equipment and its designs will be property of CSIR NML and hence vendor will be abiding with non-disclosure terms of CSIR National Metallurgical Laboratory (NML). All designs (mechanical/electrical/ electronic) and integrated pilot plant will be intellectual property of CSIR NML and permissions must be sought before disclosing information to parties other than CSIR NML Jamshedpur.

All designs and drawings originating from this tender shall be copyright and IP of CSIR-NML.

BIDDER MUST NEED TO PROVIDE A DECLARATION CERTIFICATE ON COMPANY LETTERHEAD FOR MAINTAINING CONFIDENTIALITY AND ACCEPTANCE OF NON-DISCLOSURE AGREEMENT DULY SIGNED & SEALED BY AUTHORIZED SIGNATORY.

25/09/26

Stores & Purchase Officer
For & on behalf of the Council of Scientific & Industrial Research

Annexure-A

RETORT BASED VACUUM REDUCTION PILOT PLANT

FOR SILICO-THERMIC REDUCTION OF CALCINED DOLOMITE

End Use: CSPS-Mg Pilot Plant for Silicothermic Reduction of Calcined Dolomite under Vacuum to extract Magnesium.

Scope of Supply and incidental works:

Retort based Vacuum Reduction Pilot Plant for Silico-thermic Reduction of calcined dolomite

Vacuum Retort Reduction system for conducting silicothermic reduction of calcined oxide of magnesium of other metals at capacity upto 120 kg/day. Majorly three parts i.e. Retorts, central vacuum system and furnaces are to be integrated for setting up the required system. This system comprises of 3 lines of dual retort-electrical heating furnaces (each of 120-140 Kw load), each consisting of two Ni-Cr special alloy retorts of volume 170-200 liters integrated with central vacuum system capable to create atleast 0.0005 mbar ultimate vacuum in cold condition and able to maintain higher than 0.005 mbar vacuum in hot/working conditions. Two retorts will be placed on the hearth of the furnace horizontally side by side. Hearth shall be bogey-hearth kind of arrangement and user shall be able to pull the hearth loaded with retorts out of the furnace chamber for maintenance requirements. Similarly, the user shall be able to push the furnace hearth back inside the chamber. Adequate thermal insulation shall be provided to minimize heat losses, but the thickness of the refractories shall be kept within 600 mm by using high quality refractories and ceramic insulation boards. One trolley based chain pulley arrangement capable to lift and hold 2-3 tonns load shall be provided for retort handling. Each line of furnace shall be equipped with individual controls with electrical and instrumentations. Centrifugal cast Retorts of 22H/Ni-Cr or equivalent grade alloy material (suitable to specified temperatures) shall be 3200 mm long, 260-270 mm ID and 330-350 mm OD. One end of the retort shall be cap welded and Other end shall contain a water cooled jacket, water cooled flanges with suitable O-rings and water cooled lid with a vacuum port of 60-80 mm diameter with KF 75 fittings. All weldings of retorts shall leak proof through TIG or suitably welding technologies for defect free –vacuum proof sound welds. Retorts shall be reinforced across length. Retorts shall be able to hold stated vacuum 0.005-0.0005 mbar in hot and cold conditions respectively for prolonged furnace-heating exposures. Each Retort shall be connected with a vacuum line connected with central vacuum header. Vacuum connections shall be with suitable SS grade vacuum pipelines/bellows and KF fittings wherever required in assembly. There should be throttle valve in each line controlled with feedback control. For control of throttle operations, pirani gauges shall be used for in all vacuum lines for all retorts to measure vacuum during operations. There will be dust trap in each line with manual valves, pressure/vacuum display and utilities to maintain, measure and monitor the vacuum of each retort separately and for continuous campaigns. All controls of vacuum system and furnaces shall be placed at central control room (CCR) at 10-15 m distance from furnace lines (refer-pilot plant layout drawings) and vacuum system. Control panels shall be equipped with adequate instrumentations i.e. LED based indicators, HMI systems, PID, safety interlocks, PF&ID diagrams and all essential items to run the system for 72-120 hrs prolonged campaigns. The cable trays, furnace outer bodies, vacuum pipelines shall be colored as per industrial colour standards. Detailed requirements and technical specifications of each parts are tabled and described in appended sections for reference. Schematics are also provided to present the requirements and for reference.

A. Atleast 06 (six) no of centrifugal cast Ni-Cr alloy/suitable grade HRCS/22H material retorts for 1100-1150 ^{0}C applications capable to withstand inside vacuum 0.001 to 0.005 mbar, fabricated as per given dimensional specifications.
B. Three lines of Dual Retort –atmospheric Electrical Heating Furnace (120-140 kW load)

C. Central integrated vacuum system for at least 0.0005 mbar ultimate vacuum (cold) and at least 0.005 mbar (hot working conditions) for 6 retorts having volume 180-200 liters each.
D. Centralized Controls with display, Provision of utilities as per actual requirements cooling water system and compressed air utilities and Material handling for briquettes, hot slag and Mg sponge.

Technical specifications of respective items under pilot plant is as follows:

A. Centrifugal Cast Ni-Cr alloy/ 22H/ HRCS suitable grade or equivalent material retorts for 1100-1150 °C applications.

	Requirements and technical specifications
1	06 (six) nos. of centrifugal cast retorts (Ni-Cr alloy steel or better material) of ID 260-280 mm, OD 330-350 mm, length ~3200 mm, with one end cap welded, (as cast retorts) for 1100-1150^{0}C heating operations and at least 0.005 mbar vacuum process, including water jacket, flanges and lids fabricated with suitable stainless steel (SS) grade material properly welded shall be provided. Retort material shall be selected preferably from 22H, Super 22H, HRCS-35/25 Nb-HP Modified, HRCS 39/19 Grade 13, HRCS 24/30 NbW, HRCS 66/17 grade 14 or material suitable to withstand 1100-1150^{0}C for given conditions.
2	Volume of retort is 170-200 liters. In cold conditions retort shall hold minimum 0.0005 mbar (ultimate vacuum), whereas in hot (1100-1150 ^{0}C) and full load conditions (material charged, under heating) retort shall hold upto minimum 0.005 mbar vacuum. For vacuum measurements tolerances is ±10%.
3	Cylindrical retort, of which 2100-2200 mm would be in Hot zone (1100-1150^{0}C), One end in hot zone is cap closed (minimum 150 mm), minimum 400 mm would be in non-heating refractory zone, minimum 450 mm water jacket-condenser (MoC- SS) externally fabricated as cold zone , atleast 100 mm air cooled zone for lid-fittings. Retort ID is 260- 280 mm. Vacuum port mounted on lid to be 60 to 80 mm length of SS material, atleast 4 mm thickness and fitted with KF 75 fittings. Annexured schematics, drawings shall be referred for details and fabrications. Suitable grade (preferably Viton) O-rings shall be used for vacuum sealing, wherever required/fittings are provided with water cooling provision.
4.	With reference to drawings and schematics, for 100 mm and higher dimensions allowed tolerances is ± 10 mm, for less than 100 mm dimensions' tolerance of ± 5 mm is allowed. All dimensions depicted are in mm except the exclusively mentioned dimensions.
5	Fabrication of retort essentially needs to follow procedures given as per ASME pressure vessels codes/IS/BIS standards for fabrications and constructions. Tolerances as per standard protocols shall be followed and mentioned wherever applicable in designs/fabrications. All the weld quality of the retort has to be ensured through NDT testing involving X ray or gamma ray testing as per the Codes prescribed by ASME. All test reports has to be essentially furnished with items for inspection and clearances.
6	All Original Test Certificates for material, fabrications, vacuum, NDT, re-test certificates, fabrication history including the various test reports generated during fabrications, 100% of the radiography films (including digitized record of radiography), repair history, shall be provided for all retorts. Cold tests for ultimate vacuum will be carried by CSIR NML also.
7	Drawings and schematics provided in annexures shall be referred. Final Drawing shall be approved by CSIR NML before fabrications and all drawings shall be provided to CSIR NML in soft copy (CAD) and hard copies. Provisional drawings shall be submitted along with bid for evaluation. Indicative Bill of Materials (BOM) shall be referred and listed in technical offers/bid for technical comparisons; detailed BOM may be prepared after PO for necessary approvals. Bids without provisional drawings (component as well as integrated) and BOM with technical bids shall be considered disqualified. Direct Copy of tendered drawings shall lead to disqualification. Offers must include own drawings/schematics referring specifications.

8	The tendered design and details is strictly confidential and shall not be shared to anyone without permission of CSIR NML, Jamshedpur. An NDA (Non-Disclosure Agreement) for design and specs shall be provided by selected vendor to NML before actual fabrication. All drawings pertinent to this specified project is property of CSIR NML. Final equipment and its designs will be intellectual property (IP) of CSIR NML and hence vendor will be abiding with non-disclosure terms of CSIR National Metallurgical Laboratory (NML).

B. Three lines of Dual Retort –Atmospheric Electrical Heating Furnace (120-140 kW load) with all accessories/utilities and control system

Electrically- resistance heated atmospheric furnaces capable to hold two Ni-Cr/22H/equivalent alloy retorts of OD upto 350 mm and length upto minimum 3200 mm each, placed adjacent with a gap of 7-10 mm. This Furnace will be used to heat the retorts holding ~120 kg feed charge mix for reduction and extraction of magnesium metal. Each furnace shall be designed for at least 120-140 kW load with utilities and controls. Each Furnace is required to conduct vacuum reduction campaigns for Mg metal production with two retorts. Three nos. of furnaces are required to put six retorts of described dimensions (refer drawings for arrangements/schematics). Furnaces are atmospheric in nature and suitable Silicon Carbide (SiC) heating elements for achieving and maintaining 1350-1400 ^{0} C temperature continuously for prolonged operations, at least 72-120 hrs. shall be used for heating the chambers and retorts. Hearth of the furnaces shall be detachable and movable i.e. bogie hearth mechanism. For maintenance and retort replacements/inspections the hearths shall be able to come out and enter inside the chamber (horizontally) using suitable motorized arrangements. Rails of adequate length and strengths are to be used for horizontal-hearth-trolley movement. All Furnaces shall be able to run for continuous prolonged times and make shall be as per industrial standards for prolonged services. Each furnace shall have individual temperature monitoring and control with data recording provision integrated to panels. Additionally, a 2 ton motorised crane (ghantry/chain pulley system) should be provided to cover the three furnaces with rails, it will be used across 3 furnaces and rail-mounted hearths for retort handling and material lifting. The detailed technical specifications of various parts are as follows:

Sl. No.	Description	General Specifications and requirements
A.	**Furnace chamber and heating**	
1.	Furnace	Furnace shall be long tunnel type with internal hot zone to be 2500-2800 mm depth (horizontal), 900 -1000 mm width and 420-450 mm height. Both walls shall have electrical heating elements to raise temperature of furnace in hot zone and load of 120-140 kW. Maximum furnace width to be ~2000 mm. Furnace load calculations shall be mandatorily submitted with tender and it will be a technical qualification criteria.
2.	Heating Chamber with heating elements	Resistance Heating furnace system shall be constructed with suitable heating element, preferable Silicon carbide (SiC) elements of reputed standard make (Kanthal/ Silicarb) in adequate numbers to raise temperature to atleast 1350 ^{0}C in 6-8 hrs.
3.	Temperature requirements, measurements and logging	Furnace design temperature shall be atleast 1350^{0}C and working temperature shall be 1200 ^{0}C or higher in continuous mode. Adequate no of suitable thermocouples (04 or higher) shall be places across hot zone to measure the temperatures of hot zone at various points from end to gate of furnace to measure and record thermal profile of hot zone.

4.	Skin temperature	Skin temperature of furnaces shall be less than 80 °C at any time during operations with minimal heat loss
5.	Overall cavity/ Chamber size	3000-3500 mm (Depth, L) x 1400-1500 mm (W) x 1200-1300 mm (Height from ground level including hearth)
6.	Inner chamber Hot zone working size	2500-2800 mm (length) x 900-1000 mm (width)x 420-450 mm (height)
7.	Thermal insulation	Suitable grade, reputed make refractory of 150 mm – 300 mm thickness shall be provided
8.	Furnace Max designed Temperature	1350° C or higher
9.	Working Temperature	1200 °C or higher
10.	Heating rate	8 °C per minute or higher rates upto 600°C and atleast 4 °C per minute beyond 600 °C to maximum temperature, through adequate and reputed make certified PID controls (Segment wise, programmable/PID controlled). Programmable PIDs of make Eurotherm® or Schneider ®, Seimens® or equivalent standard suitable to industrial applciations shall be provided in control system.
		Rail mounted-Moving Trolley hearth
11.	Retort Support ceramic	Arch shape saddles to hold retort of OD 310-330 mm and length across hot zone i.e. 2500 mm. These saddle support bricks shall be removable. Siliminite or better grade refractory with strength shall be used to hold the retorts with load.
12.	MoC (Material of Construction)	Mild Steel/suitable steel to withstand high temperature and prolonged working conditions without failure or deformations. Outer surface shall be powder coated. Outer sheath material shall be Mild steel (powder coated MS) sheet of atleast 4 mm thickness. Inside structures shall be able to withstand the temperature and loads without fail.
13.	Rail mounted Moving type Hearth	Made of suitable strength refractory material and shall be able to hold two nos. of retorts approx1300-1500 kg each with feed material. Hot face lining will be of silmanite and or suitable grade material, saddles shall be provided with structural support and casings. Hearth should be equipped with wheels, rails and horizontal travelling-motorized mechanism. Limit switch placed both ends to restrict movement of trolley/hearth. Bogie hearth/trolley Constructed using heavy duty mild steel channels and angles.
14.	Hearth lining	High Temp-High Alumina/silico Bricks to hold the retorts (each upto 1300 kg) without damage.
15.	Furnace Door	Half Arc, with atleast 150 mm thick door insulation , Vertical movement with the use of chains, pulley and rope/ motorized gear. Furnace door limit switch , cut off supply when the door isopen and resume operation when closed.
16.	Furnace Connection Cable	All electrical and electronic connections shall of industry standard and BIS conformed. Heat proof Fibre Glass braided or better cables shall be uses for electrical connections.
17.	Reading Cable	Thermocouple K type compensating cable SS braided shall be provided with suitable length and connections shall be upto central control room located at 13-15 m distance from furnace.
18.	SIC Heating element connector	Stainless steel clamps or suitable material clamp-fittings shall be used for continuous operations and as per industrial standards. Spares shall be provided in adequate quantity for breakdown maintenances during operations.
19.	Structure with 2 ton	• Suitable MS/SS grade materials shall be used for structural and supports

	electrical operated crane	with adequate thickness and gauges. Suitable-Structure and charging stand/platform shall be provided with system. • A 2 Ton crane (Ghantry/chain pulley)-electric operated with remote operations) shall be provided for handling retorts, for height at least 6 m and covering span of crane should be at least 10 m, such that all furnaces could be covered by moving to and fro across length of furnace and front area with rails. Refer layout drawings for crane span and positioning
	Electrical and Electronic Controls with sensors and displays	
20.	Total Power Load of furnace	As per actual heating requirements for 1350 ^{0}C, (3000 kg Ni-Cr/22H alloy tubes and 200 kg feed mix), preferably to ≥130 Kw /415 VAC. Final design of load should be able to heat the loaded retorts to atleast 1200 ^{0}C or higher.
21.	Heating element	Silicon carbide (SiC) heating elements or better grade. of reputed make i.e. Silicarb®, Kanthal® or equivalent and if required additional Fe-Cr-Al wire heating elements of suitable thickness and make, preferably Kanthal® APM , Silicarb®, equivalent or better grade, to withstand operations upto 72 hrs.
22.	Thermocouple Sensor	Type K thermocouples for monitoring/measurements and type R for controls wherever used for safety cut offs/over temperature controller.
23.	Electrical control panel	Indoor type, floor mounted, Separate for each furnace and integrated in central control room of pilot plant. (ref drawings)
24.	Control Panel	Adequate size control panel equipped with individual energy meter, electrical components, ammeters, volmeters, programmable PID controllers, analog/digital displays, reputed male HMI, Data recorders with additional empty channel, temperature indicators, LED indicators, dummy ports for thermocouple connections, suitable ports to connect computer modules for data processing, etc. shall be provided with system. All essential utilities required to operate the furnaces shall be provided. All items integrated shall be certified as per prevailing ratings/ standards for electronics and instrumentations.
25.	Electrical components	As per requirement to run the furnaces safely for heavy duty applications items. i.e. Phase protection Fuse, Relay Contractor, Thyristor based Power Voltage regulator Earth leakage, Earth leakage protection, Heater switches, MCCB, Main Power MCCB, Digital VAF meter, CT Coil, Heavy Duty Ceramic Bus Bar connector as per requirement of electrical load and connections, etc. shall be provided as per industry standards and of reputed make. Suitable capacity panel cooling fans shall be provided in panels to cool down the electronic components to avoid failures and breakdowns due to excessive heating in long operations.
26.	Marking Ferule	Wire indicator ferules shall be provided as per electrical diagram and connections at all places in the control and connections.
27.	Limit/safety Switches	Trolley movement limit switches as per design and operations, forward and Reverse Movement. For doors also close and open shall be limit switch operated movements for safe handling of system. On furnaces and control panels, wherever required to cut off the furnaces in case of emergency. Over temperature alarms/cut offs and indications shall be provided
28.	Control room panels connections	Central control room (CCR) is to be placed at 8-10 m distance from furnaces hence all cables of adequate lengths shall be considered for controls
29.	Step down transformer	For operations adequate rating (As per load including safety parameters) shall be provided
30.	cables	Heat resistance/industrial grade cables and switches with shielding shall be used. Instrumentation and control cables as well as power cables shall be underground with tranches and covers. Only certified cables shall be used with safety and other electrical protections.

31.	MIMIC Display	HMI Based MIMIC display (computer system, latest version OS/RAM/Memory with 15-18" screens) shall be provided to visualize the heating and temperature of various zones. Provisions /ports shall be provided to extract recorded data, to connect external system (i.e. windows PC) and transmit data /control to other devices if required.
32.	Single line diagrams/ Circuit diagrams	SLDs and electrical circuit diagrams for all connections with marked ferules shall be provided with furnaces and control in triplicate hard copies and soft copy in adequate storage system.
33.	Standard Construction of furnace and controls	Fabrication of furnaces shall be of industrial standard and components used shall be BIS/ equivalent International standards conformed.
34.	Drawings and schematics	Drawings and schematics provided in annexures shall be referred. Layout shall be followed strictly. In case of any change, it shall be approved by CSIR NML. CSIR NML would provide a space as per layout attached.

C. Integrated vacuum system, accessories and controls

Vacuum system is essential in Pidgeon process as thermodynamic requirement of 0.1 mbar or low shall be made towards feasibility of silico-thermic reduction of calcined dolomite at 1150 ^{0}C or higher for extraction of Magnesium metal. The vacuum system in the plant is the most important unit and without adequate vacuum, production of magnesium is not feasible. A portable vacuum leak test equipment of reputed make shall be provided to test vacuum and leaks of the specified system. The Vacuum system will be comprised for following specifications:

Sl No	Technical Specifications/requirements
	Vacuum System (Pumps and Gauges)
1	Ultimate Vacuum is required to be maintained at least 0.0005 mbar in empty conditions in 4-6 no of vacuum retorts of capacity 170-180 litres each. Pumping capacity shall be adequate to vacuum the 1200-1500 litres air to at least 0.0005 mbar mbar level in less than 2 hours. Operational vacuum is required to be less than 0.005 mbar or better vacuum.
2	The pumping system consists of water/ oil-sealed mechanical pumps along with sensors (pirani/pressure transmitters/ recorders and indicators), vacuum lines and fittings, flanges, valves and required accessories to create and maintain vacuum. Central header vacuum level shall be tested for ultimate vacuum and holding capacities. Digital gauges in duplicate shall be provided on central vacuum header to display vacuum.
3	It would be a throttle valve operated feedback controlled system.
4	It is envisaged that, in the first stage, the pressure will be brought down to atleast 30 mbar or lower by a roughing pump. Adequate rotary two-stage vacuum pump with a displacement of 1300-1500 cm^3/hr equipped with suitable rating/capacity motor and drive, preferably 50 HP shall be provided for this purpose.
5	Schematic given shall be referred for design of vacuum system development and supply.
6	After the pressure of the system has been brought down to lower than 30 mbar, the evacuation will be carried out by high vacuum pumps. Further vacuum is to be lowered to at least 0.0005 mbar using suitable two-stage vacuum pump/rotary pumps/root pumps of adequate throughput to create and maintain vacuum in 1200-1500 litters (ref. volume of retort system/equivalent vacuum chamber) space. Rotary vane pumps- double stage, 3 phase with dual pumping system with manual change over option along with indicating lights on control panel shall be provided. All pumps shall be equipped manual vacuum valves .
7	The vacuum pumps shall have always a standby pump option to maintain vacuum in breakdown/maintenance conditions. Standby pumps will also be used in case of overheating, with manual/automatic valve changeover options. Provisions shall be given to use the pumps as per requirement/breakdown conditions.
8	Vacuum pumps shall be able to run and operate continuously for 8-10 hrs. Since the process will be continuous for 3-4 days, the vacuum system shall be able to serve the requirements. Standby pumps shall be offered and provided with manual/automatic changeovers facilities wherever required to run the vacuum system in continuous operations.

9	The vacuum line-piping provided will be of 75-100 mm diameter with separate pipe-lines for roughing and high vacuum lines. All interconnections for joining various components shall be 50-80 mm diameter stainless steel seamless pipes.
	Vacuum valves, Pipelines, manifolds and fitting accessories
10	Electro- pneumatic safety vacuum valves will be provided in the vacuum lines. Tube-nest type air coolers cum dust filters shall be provided in the vacuum piping to cool the gases issuing from the retorts and will be located just after the manifold connecting group of 6 retorts. At retort connecting ports adequate size dummy plugs/caps shall be provided with KF fittings.
11	Flexible bellows of diameter equivalent to pipe diameters, length 50-100 mm shall be provided in the vacuum lines at all terminal connections of the pumps and retorts, to avoid any vibrations and misalignments. Suitable KF Fittings shall be provided at all connections.
12	Manifolds to retorts, shall have provision of vacuum valves, dummy ports (with plugs) to break vacuum using air or argon. Exhaust valve to release the gas shall be provided in header/vacuum line
13	Absolute vacuum measuring gauges preferably pressure transmitters with digital display will be installed in each of the vacuum lines for direct reading of the pressure in the system. Pirani gauge-heads for the above instruments will be located in the vacuum line of each retort, which will be used for feedback control of throttle valves to control the vacuum inside each individual retort.
14	Pirani vacuum gauges with display and an electronic recording of vacuum in each retorts/lines instrument will be provided for indicating and recording the vacuum in the System and will be located on an instrument panel.
15	The schematic/s provided for reference of assembly and operations shall be followed in design and fabrication.
16	Main vacuum Line (central vacuum header) of diameter 250-300 mm and length 10000-11000 mm with end port-dummy connection, welded and connected to vacuum pumps in the system shall be provided as central Vacuum header. Seven (07) manifolds of 75-100 mm diameter will come down the central vacuum header by using vacuum welded ports and valves. Construction materials shall be stainless steel or better grade with adequate thickness, preferably 3 mm or more.
17	SS sub- vacuum lines approx. diameter ~40 mm with KF 40 end connection (07 Nos) with manual valves and dummy with clamps and O-rings shall be adequately provided
18	Stainless Steel (SS) bellows of adequate length and diameters (suitable for ease and maintenance) with KF flanges and O-rings duly connected to vacuum pump and vacuum lines shall be provided.
19	KF 16-SS gas line ports with dummy plugs/caps and vacuum fittings for cooling and Helium leak testing.
	Vacuum Control Panel and system
20	A HMIPLC/SCADA based control panel will also be provided to centrally control the operation of different pumps and electrically/pneumatic controlled valves and overall vacuum of each retort lines.

21	HMI display with mimic (vacuum line and indications for 7 retort, manifold and valve positions, with paperless recorder of reputed make with control system for easy access shall be provided. The installed licensed software shall be provided for HMI and data recorders.
22	Control panel is to be located at atleast 10 m distance from equipment, hence cable and connections shall be provided for adequate length by supplier
23.	One reputed make portable-vacuum and leak test system shall be provided with equipment to test vacuum/leaks in various vacuum components in pilot plant. All documentations for SOP, maintenance, precautions etc, OEM details shall be provided. If required software support shall also be provided.
24.	Drawings and schematics provided in annexures shall be referred.

D. Miscellaneous pilot plant requirement

Sl. No	specifications	description
1	Centralized Controls with display,	CCR based central controls for furnace, vacuum operations equipped with computer systems, control panels, safety items etc shall be provided. Refer layout drawing for location of CCR. This will have all controls of furnace and vacuum system operation.
2.	Air, water and other Utilities as per requirement,	Supplier shall provide utilities as per their design and supplied items. i.e. compressed line with compressors, cooling water circuits if used in system supplied. Cooling water circuit includes suitable capacity forced draft water cooling unit, hot and water lines, hose-pipe and fittings to retorts. Pumps, Pressure gauges, valves shall be used as per requirements. Individual hot and cold lines have to be fitted for each retort for adequate cooling in retort condensers. Single point water line will be provided from main sump for connections.
3	Material handling trolleys,	Trolleys, cast iron wheel-barrows -05 nos shall be provided along with tonges for material, hot slag cleaning from retorts. Safety items, i.e. helmets -10 sets, high temperature –working jackets 10 nos., gloves for high temperature workings, etc. shall be supplied. Greases, oils for lubrications shall be supplied in adequate quantity to be used for at least 6 months.
4	Vacuum-bins (MoC: SS) for briquettes.	Vacuum bins for upto 0.01 mbar shall be provided, with flanges and detachable KF fitting to be able to connect with vacuum system of plant for storage applications. Bins for storing, about 600 kg of briquettes and ~300 kg of magnesium metal sponge/refined ingots. As per designed volume (cylindrical), nos. of bins shall be provided to meet the requirement.
5.	Pilot plant tools	All tools for maintenance of pilot plant system provided shall be provide in duplicate.
6.	Structure/working access-platforms	Suitable MS structures, platforms shall be provide towards safe and ease of working i.e. charging the materials to retort and taking out slag, condenser, etc. from retort. Collapsible ladders (aluminium) about 12-15 feet height, shall be provided for maintenance and operations.

7.	Two (02) Ton crane (ghantry crane /chain pulley operated) – electric	Suitable lifting system, overhead crane over furnace and hearth-rails shall be provided towards operation and maintenance requirements. This can be rail mounted able to cover all furnace area including front-hearth movement area (approx.. furnace working area is shown in layout diagram)

E. ***Other technical specifications and general terms and conditions for A,B,C specified and described above***

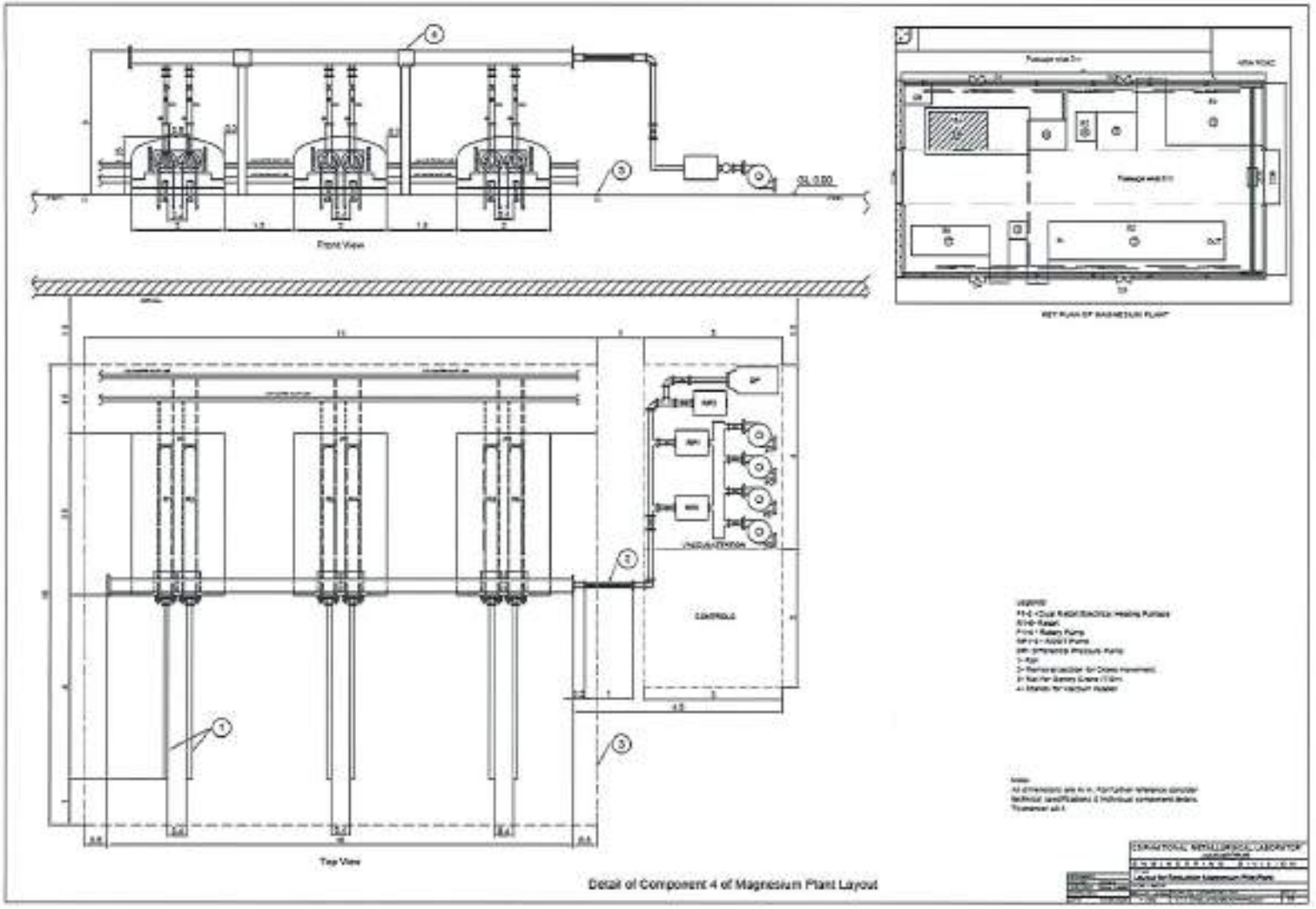
1.	Cables	With heat resistance/industrial grade cables and switches shall be used in all connections. All electrical and electronic connections shall be of industrial standard and nomenclatures/codes shall be used as per electrical circuit drawings. Cables should withstand high temperature industrial- work environments.
2	Safety switches	On furnaces and control panels, wherever required to cut off the furnaces in case of emergency. Over temperature alarms and indications shall be provided
3.	MIMIC Display	HMI Based MIMIC display (computer system (latest version OS/RAM/Memory with 15-18" screens) shall be provided to visualize the heating and temperature of various zones. Provisions /ports shall be provided to extract data, connect external system and transmit data /control to other devices if required. Original OEM softwares shall be provided wherever used with copies/licenses keys and warranty.
4.	Final Approved Drawings (FAD) and detailed Engineering drawings (DEG)	Detailed Engineering Drawings are to be provided along with single line diagrams. For any doubt in specifications or dimensions, CSIR-NML shall be asked for clarifications. For dimensional details and detailed engineering drawings attached drawings shall be referred. Single line diagram (SLD) of complete system shall be provided. Three nos. of A3 SIZE aluminium board printed with SLD shall be provided. Labelling of all components is mandatory.
5.	Power supply by CSIR NML	Single point Electrical input upto control (panel) of equipment as per final approved drawings (FAD) will be provided by CSIR NML. Extension lines as per requirement has to be drawn by supplier to components. Electrcial power points may be provided at Furnaces, vacuum system and central control room.
6.	Cooling water by CSIR NML	Cooling water @ambient temperature/ average pressure 2 kg/cm^2
7.	Compressed air BY CSIR NML	Compressors of required capacity alongwith pipelines and accessories shall be provided by supplier for operating the pilot plant system where applicable in the offered system
8.	Space requirements	Space as per FAD/engineering drawings will be provided for equipment installations. Layout diagram shall be referred. Requirement is to be provided with FAD to CSIR NML during vetting of design stage only.
9.	Drawings and schematics Provisional engineering drawings	a. Provisional drawings of components as well as integrated system shall be provided. It is **mandatory** for bid comparison and selection of technical qualifications of bids. **Non-submission of initial drawings** (based on tendered drawings) shall subject to technical disqualification/rejection of bid. **Verbatim copy or reproduction of tendered drawings under supplier's letterhead will not be considered as bidder's original drawing and therefore will not be considered for technical comparison.** b. Drawings shall be referred to the pilot plant layout provided in annexures. Space marked shall be used for layout drawings. c. Drawings and schematics provided for various parts (individual and integrated) of the pilot plant, in annexures shall be referred. Discussion shall be held to clarify the doubts before actual fabrications.

		d. Provisional Bill of material (BOM) shall be prepared and supplied in detail with technical bid.
10.	Design vetting conditions and submission of Final approved drawings	Equipment with parts and accessories as per technical specification and designs checked by CSIR NML Jamshedpur. Vetting of all mechanical, electrical and electronic circuit-control panel designs shall be done by CSIR NML before start of actual fabrication. Space requirements along with any specific requirements shall be provided with drawings for approval before fabrication. Single line diagram, CAD drawings (soft and hard copy), Detailed engineering drawings (3 hard copies and soft copy in adequate storage). All engineering Drawings must be vetted by both participating vendor and by CSIR NML team before actual fabrications
11.	ICT (onsite) (Installation, commissioning and testing)	Installation, commissioning, Training (ICT) for vacuum system and its parameters defined, tests, and training of the equipment with operation shall be provided by vendor to NML personnel. Vacuum system shall be tested for continuous running of 10 hrs atleast for cold runs. Atleast 02 nos. hot trials of furnaces will be tested during commissioning. Successful ICT by CSIR NML team/s will lead to acceptance of system supplied.
12.	Safety manuals	For furnaces, safety and maintenance manual (3 hard copies and soft copy in adequate storage). Safety certificates, material (construction) certificates and calibration certificates for thermocouples, SOPs shall be provided. Overheating of pumps shall be indicated on panels and alarms shall be put for such cases to activate the manual or automatic switch over to standby pumps in line. Safety and maintenance manual (3 hard copies and soft copy in adequate storage). Safety certificates, material (construction) certificates and calibration certificates for thermocouples, SOPs shall be provided
13.	Operation and maintenance manuals and SOPs	Operation manual by OEMs of controllers and other accessories (soft and hard copies) shall be provided. Technical details of all materials used shall be provided in 02 sets of equipment manual along with softcopy. Operation manual (3 hard copies and soft copy in adequate storage). Original Operation manuals of OEMs shall be provided. Maintenance manual of each component shall be provided
14.	Critical Spares/consumables essential for operation and Maintenance	a. For furnaces, spare of all electrical and electronic cables/ Thermocouples/ trays/ electronic fittings required for installation and one set wrench/LN keys. Atleast 5 Thermocouples and equivalent digital display meters shall be provided as spare and part of the system. Spare heating elements- 20 nos. SiC elements to be used in furnace and wire heaters-10 kg shall be provided alongwith equipment b. For vacuum and controls Spare cables and connectors shall be provided for sensor connections shall be provided. Spare pirani gauges with one dual display 02 nos and spare pressure transmitters with display 04 nos (all calibrated) shall be provided as essential spares with system. All wrench and LN key set to be used for maintenance of vacuum system shall be provided. Atleast 20 liters of vacuum oil and 2 kg of vacuum sealing grease shall be provided with equipment. Three (03) set of O-rings in addition to fitted one, with all technical details (size/material) shall be provided with vacuum system

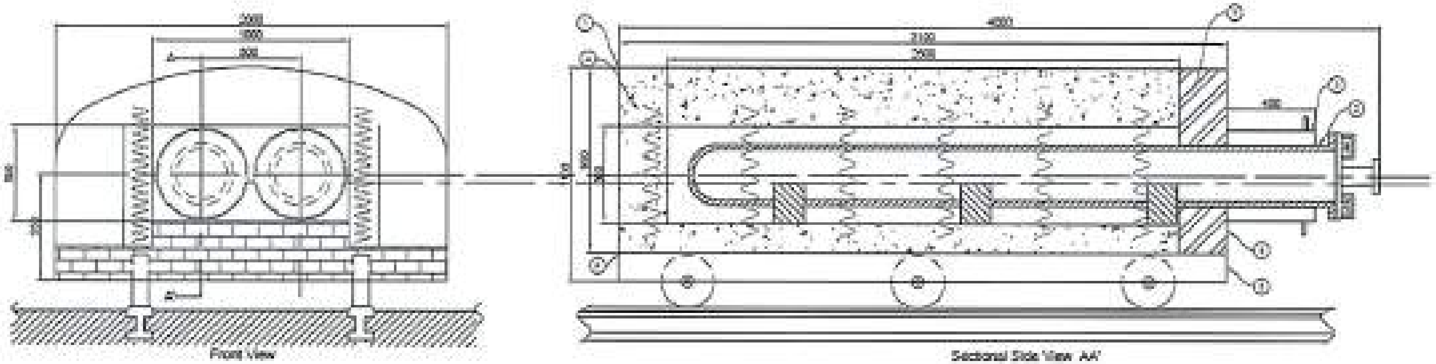
		supplied. 02 set of Spare Clamps of all connections and fittings size (used in system vacuum lines) shall be provided as spare. Spares of all KF fittings shall be provided with equipment. Critical spare list shall be provided with equipment.
15.	Test certificates	Vacuum and Leak test certificates and OEM certificates to individual items in the vacuum system shall be provided alongwith equipment. All welding joints shall be leak proof. Sensors (PTC/Pirani) shall be calibrated. Retort material test certificate alongwith, leak tests, NDT of welding and complete cast-tubes shall be provided.
16.	CSIR NML approvals on any doubts/ ambiguities	For dimensional details, attached drawings shall be referred, in case of any doubt clarification must be sought before actual fabrication.
17.	Warranty (Onsite)	Warranty of minimum 24 months (twenty four) from successful installation and commissioning shall be provided for equipment. **All consumable and non-consumable items/components should be covered under warranty without any exclusion whatsoever.**
18.	NDA/IP	The tendered designs and details is strictly confidential and shall not be shared to anyone without permission of CSIR NML, Jamshedpur. An NDA for design and specs shall be provided by selected vendor to NML before actual fabrication. Final equipment and its designs will be property of CSIR NML and hence vendor will be abiding with non-disclosure terms of CSIR National Metallurgical Laboratory (NML). All designs (mechanical/electrical/ electronic) and integrated pilot plant will be intellectual property of CSIR NML and alongwith NDA for the same, permissions must be sought before disclosing information to parties other than CSIR NML or CSIR at large. This clause has to be agreed by all bidders to be considered.
19.	CSIR purchase Rules	CSIR purchase rules as on date will be applicable for procurement.
20.	Standards and Tolerances	BIS standards shall be followed in construction and fabrication of the item specified. Tolerances as per standard protocols shall be mentioned wherever required in designs and fabrications. All electrical and electronics connections shall be of industrial grade and adhered to BIS standards. Referring the specifications and schematics, for all dimensions, temperature and vacuum levels ± 5% tolerances may be considered, if range is not provided or values are not explicitly mentioned.
21	Acceptance criteria:	Inspection of all dimensional details as PO and final approved drawings. Installation, commissioning and testing of equipment with all utilities, alongwith performances of individual subunits till the specified limit of all operational parameters. Atleast 02 nos. hot trials will be conducted in presence of vendor's representatives after commissioning of item. Successful ICT by CSIR NML team/s will lead to acceptance of system supplied.

Guidelines for Fabrication of Ni-Cr alloy steel –special Vacuum Retorts:

Code for construction for Retort	ASME Section VIII – Division-1
Materials shall conform to ASTM/ASME specification	Mill test certificates(MTC) shall be furnished during inspection. Composition tests shall be provided.
Welding of joints specifications	Suitable welding technology and procedures shall be used for defect free sound welds of all joints, for which test certificates are also mandatory to submit with item.
Retort material (tube, water condenser, welding, flanges)	Inspection of all welds shall be carried out in accordance with ASME Sec. VIII Division-1. **Liquid penetrant Inspection** • Each weld pass of the butt joints of retort is subject to DP testing and each weld pass other than butt weld joints in pressure boundary area of the retort. • Root and final pass of structural welding for non-pressure boundary area. **Radiography** Complete retort along with welding shall be subject to 100% Radiography. Gamma ray/ X- ray radiography may be used as per the conditions mentioned below a) Sensitivity of 2% shall be ensured b) Coverage of 10% overlap to be ensured on either side of weldment Acceptance level shall be as per ASME Section –V and also mutually agreed by manufacturer and purchaser. All test certificates, including leak tests applied for qualification shall be provided in soft and hard copy with item. As per technical specifications listed, vacuum specified shall be tested under cold and hot conditions for acceptance



Detail of Component 4 of Magnesium Plant Layout



Schematic drawing of Dual Retort Electrical heating Furnace

8.	MS Refractory Body	1	—
7.	Gate Vertical with chamber	1	—
6.	Retort holder gate with Hearth	1	—
5.	Movable Hearth	1	—
4.	Heating Element	1	—
3.	Water Cooling Jacket	1	OD450
2.	Retort	1	OD320
1.	Dual Retort Electrical Furnace	1	2500x1500x1100
Sl. No.	Parts Name	Qty.	Dimensions

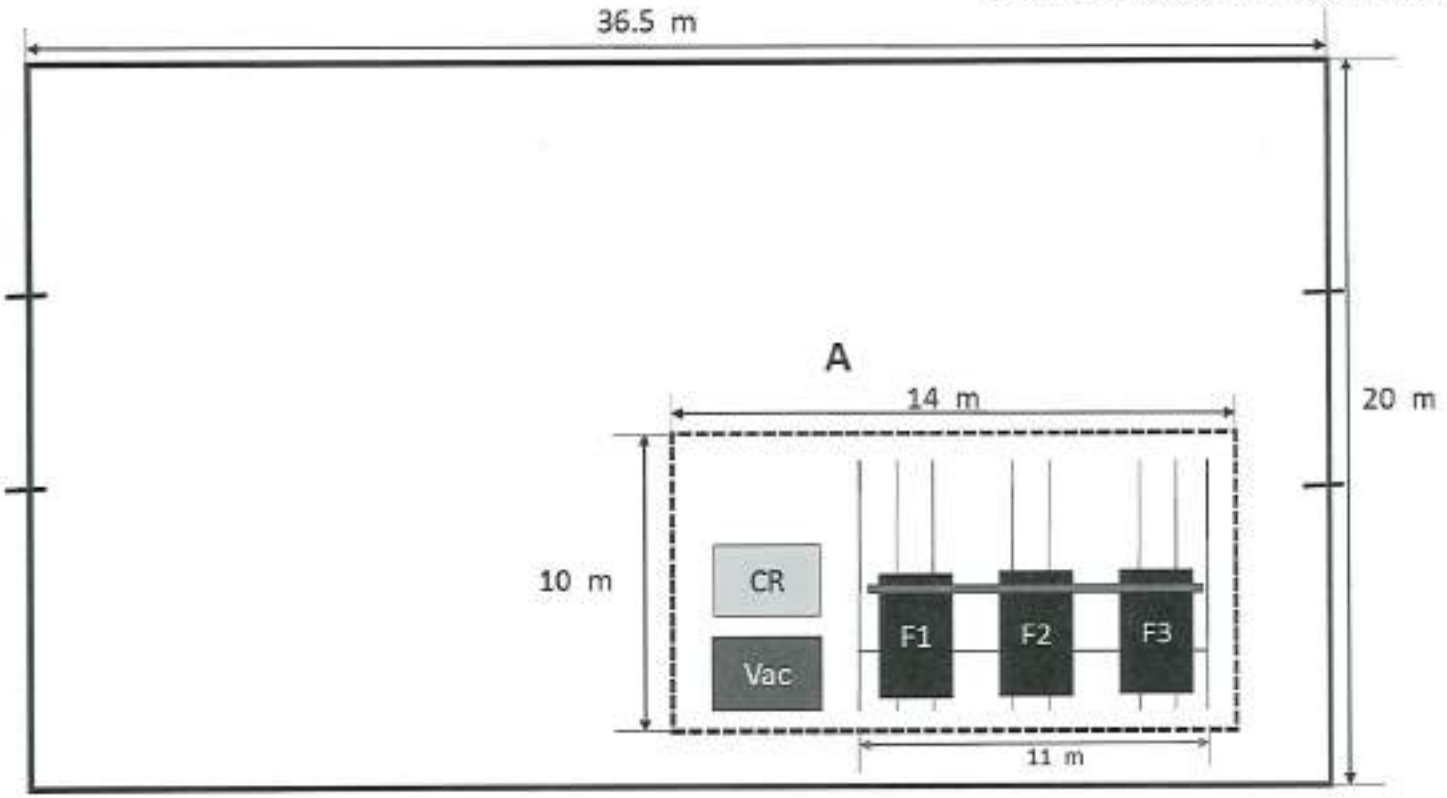
All dimensions are in mm.

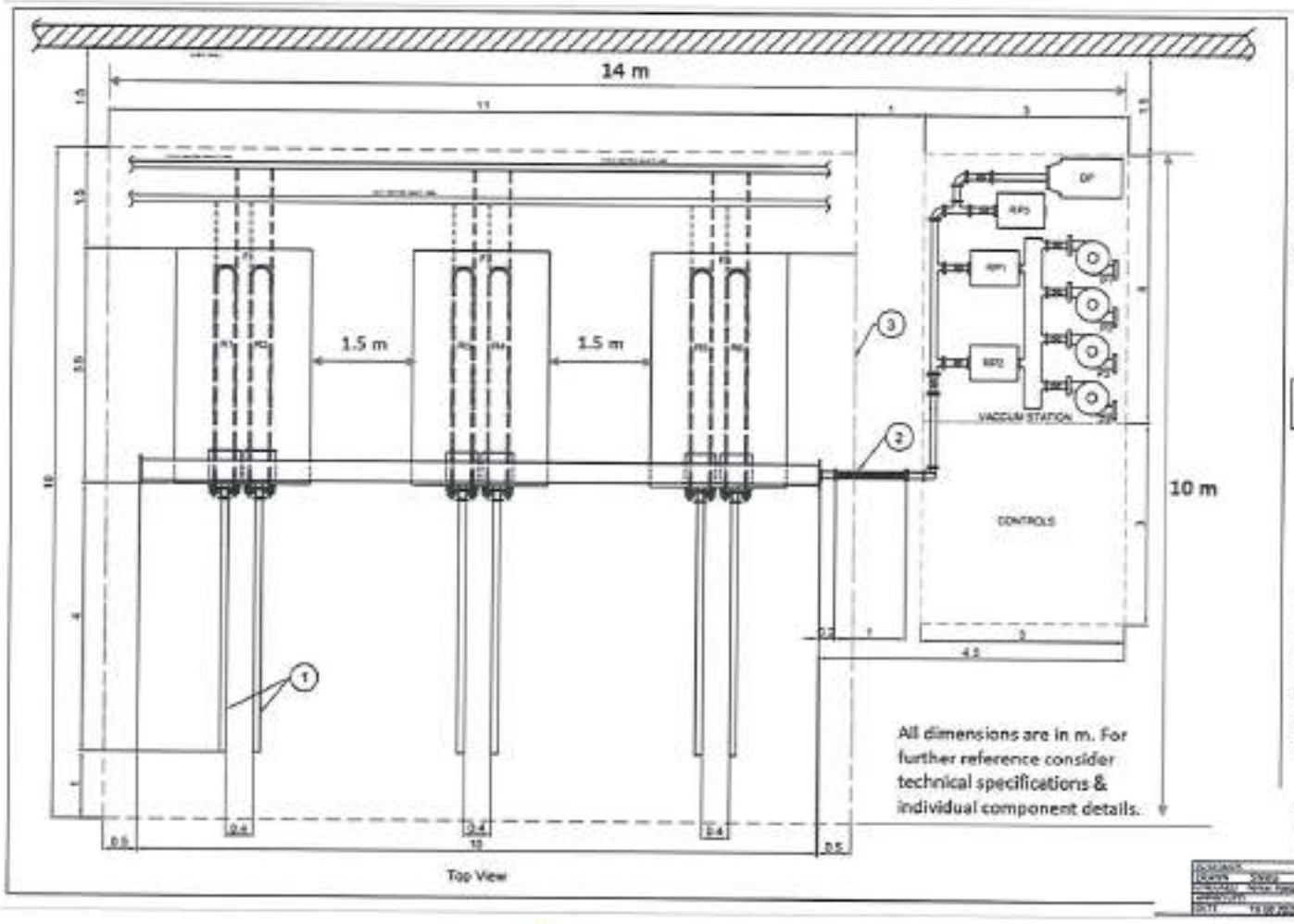
CSIR-NATIONAL METALLURGICAL LABORATORY
JAMSHEDPUR
E N G I N E E R I N G D I V I S I O N
TITLE
Dual Retort Electrical heating Furnace

Item: Vacuum Retort-Reduction Pilot Plant for Silico-thermic Reduction

Ref: (NML/MER/KK/09/2024/1984)]/ CSPS-PPP240009(HQRF)

Location and area marked in plant layout





GAD & Layout diagram,

detail of A with 3 lines of dual retort furnaces, vacuum piping and accessories

Top View of A

Legends

F1-3 - Dual Retort Electrical Heating Furnace
R1-6- Retort
P1-4 - Rotary Pump
RP1-3 - ROOT Pump
DP- Differential Pressure Pump
1- Rail
2- Removal section for Crane movement
3- Rail for Gantry Crane (7.5m)
4- Stands for Vaccum header

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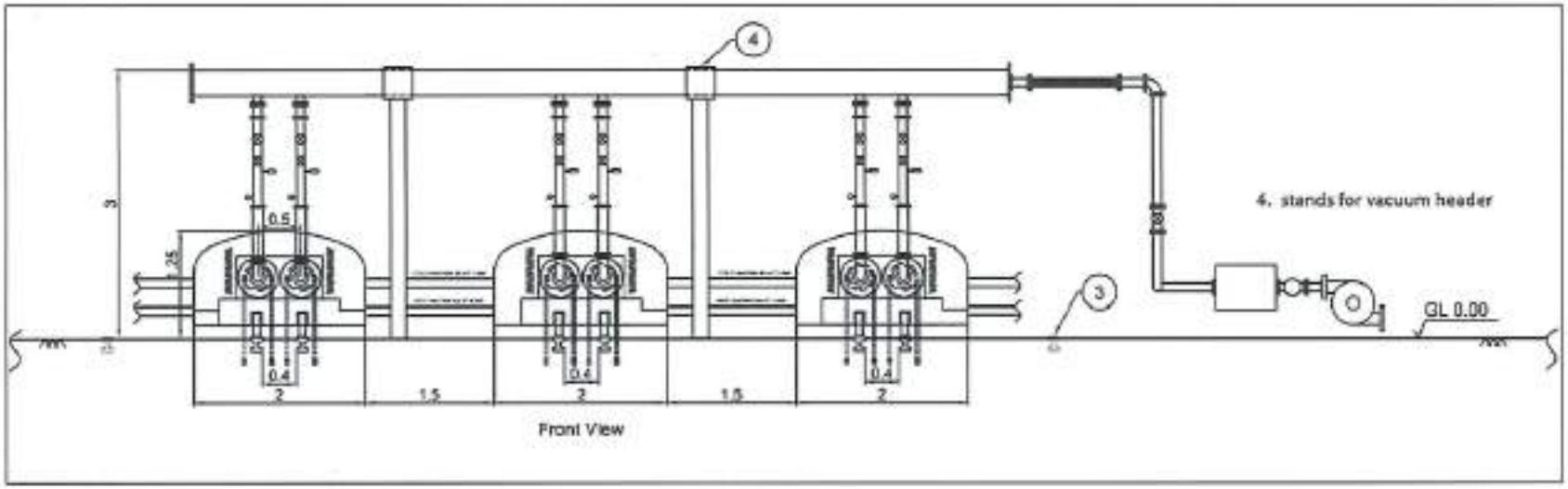
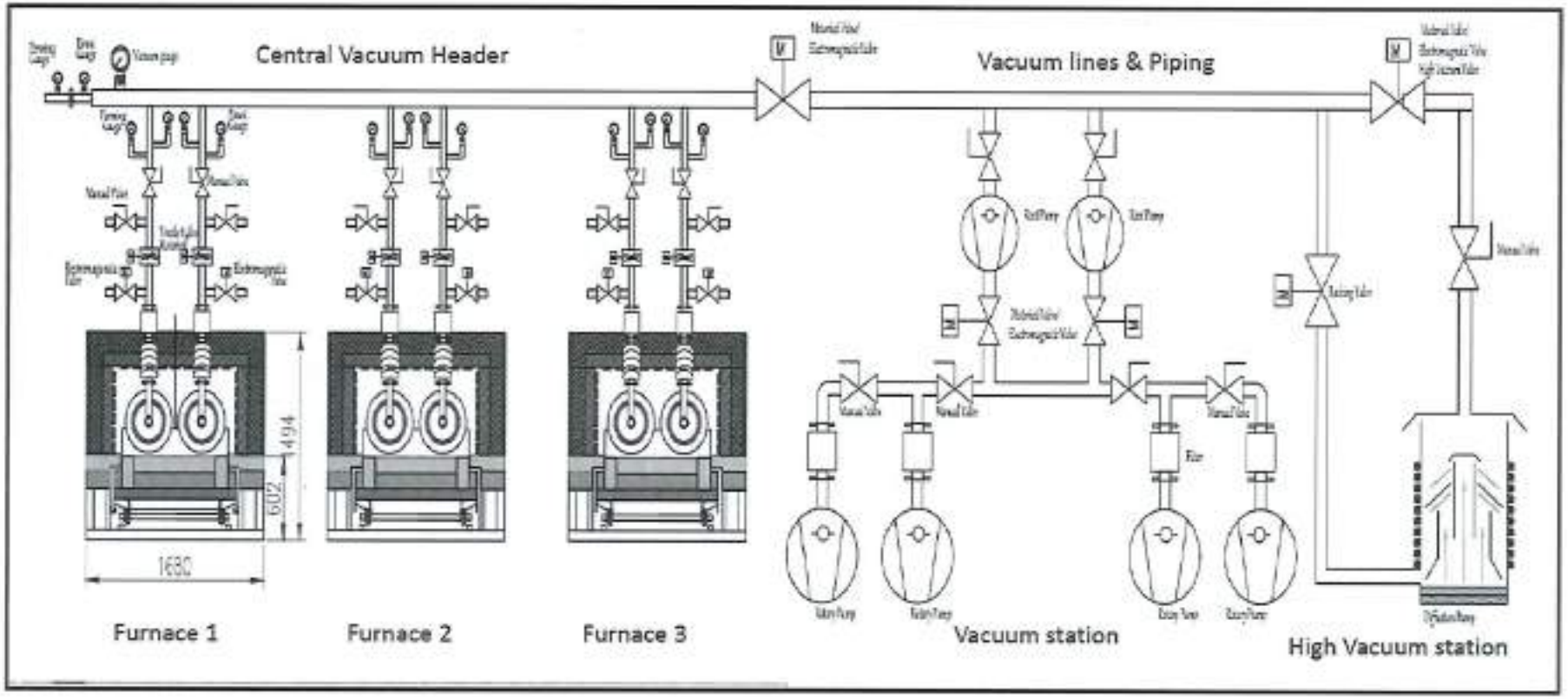
JAMSHEDPUR
ENGINEERING DIVISION
TITLE
Layout for Reduction Pilot Plant

Line diagram for Integrated Dual retort Vacuum Reduction Pilot Plant for 120 kg Mg/day



Front View of A

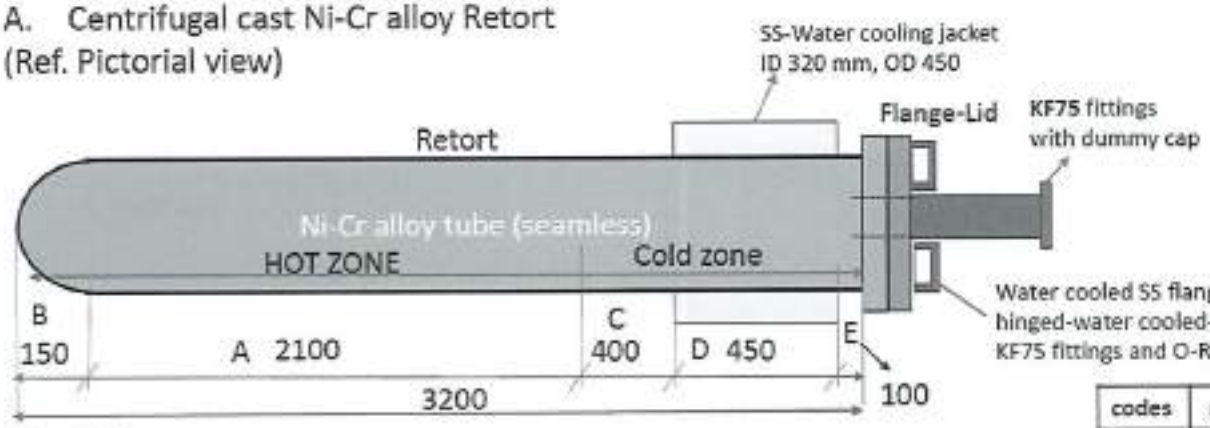
Indicative illustrations of complete assembly, Line Diagram with arrangements of various parts



For additional dimensional details layout plan may be referred

Annexure-I

A. Centrifugal cast Ni-Cr alloy Retort (Ref. Pictorial view)



MoC shall be referred to detailed technical specs.

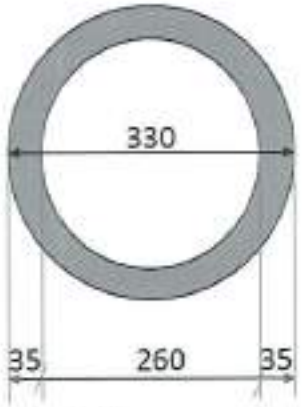
codes	specification/descriptions
A	Cylindrical retort in Hot zone, 2100 mm
B	Cap Closed end in hot zone, 150 mm
C	Refractory Cold zone, 400 mm
D	Water jacket-condenser cold zone, 450
E	Air cooled zone for Lid-fittings, 100

Description

Centrifugal Retort made by permanent metal mold process, One end cap welded, AS cast retorts for 1100-1150 °C heating operations and 0.005 mbar vacuum processes. Water jacket, Flanges and lids fabricated with suitable SS grade using TIG welding wherever required. Volume is 170-200 liters. Minimum thickness of retort shall be 33 mm.

Working temperature: 1100-1150 °C continuous heating application

Vacuum Requirement: shall hold upto 0.0005 mbar, empty cold test condition, and upto 0.005 mbar in full load-hot conditions

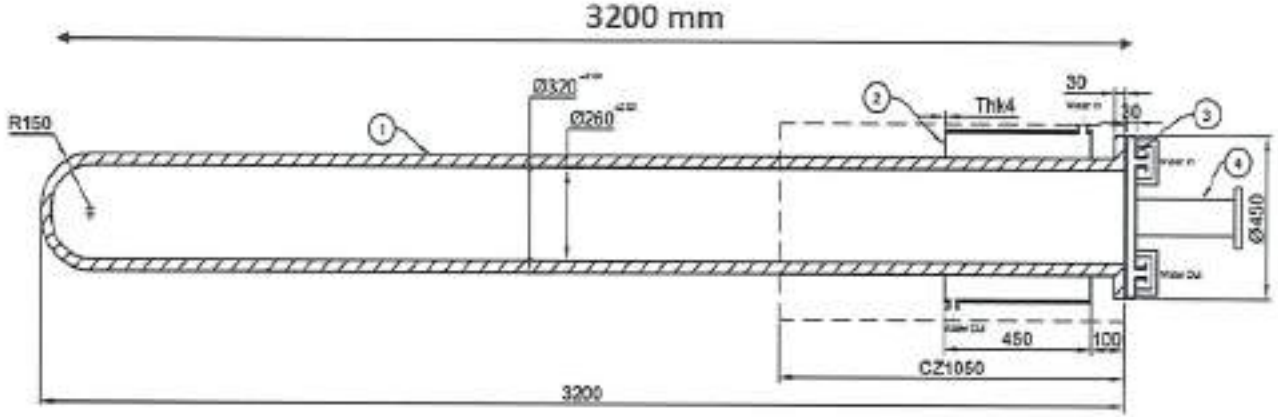


Retort tube cross section

All dimensions are in mm,
tolerances ±10 mm for 300 mm or higher
tolerances ± 5 mm for less than 300 mm

Reference: CSPS2024/NML/MgP/Retort

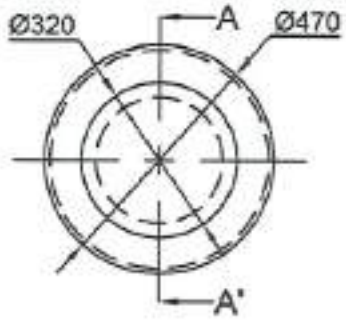
A. Centrifugal cast Ni-Cr/Special Retort Design and schematics



Sectional Front view A-A'

parameter	dimensions
Length	3200 mm
Weight	~1100-1300 kg
Quantity	06 nos.

All dimensions are in mm,
tolerances ±10 mm for 300 mm or higher
tolerances ± 5 mm for less than 300 mm



Side view

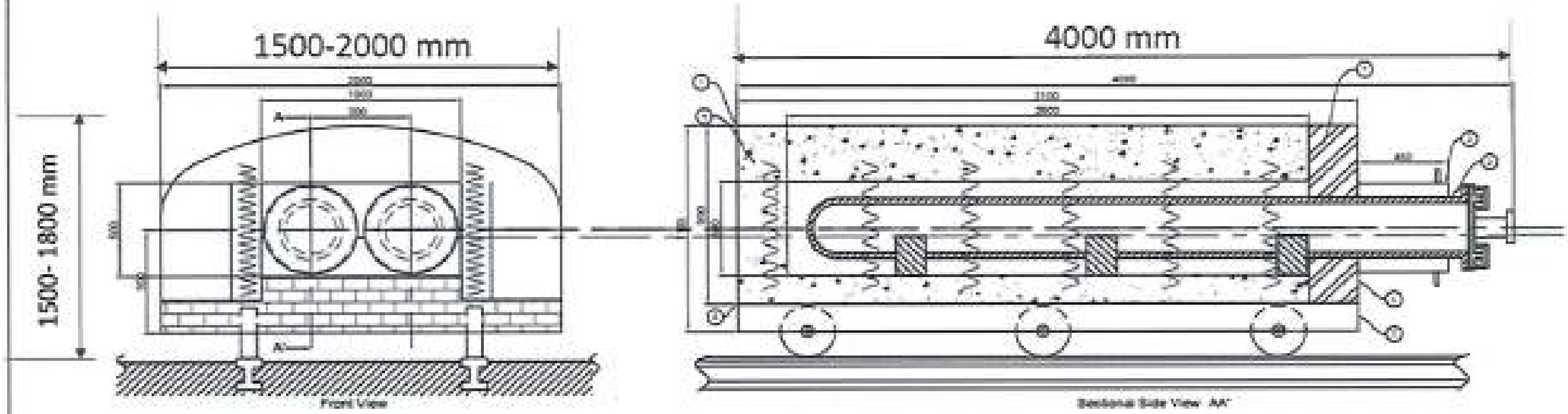
Minimum thickness of retort shall be 33 mm.

parameter	dimensions
ID	260-280 mm
OD	330-350 mm
MoC	Centrifugal casted Ni-Cr Alloy/22H/HRCS suitable grade As cast, leak proof

Sl No	Parts Name	Qty.	Mat.	Dimensions
4.	KF75 fittings	1	—	—
3.	Flange Lid water cooled	1	SS	OD450
2.	Cooling jacket water cooled	1	SS	ID320,OD470
1.	Retort Tube	1	Ni-Cr	OD320

CSIR-NATIONAL METALLURGICAL LABORATORY JAMSHEDPUR			
ENGINEERING DIVISION			
TITLE: Retort			
FOR - MER			
DESIGNED			
DRAWN			
CHECKED			
APPROVED			
DATE 20.08.2024	MECH. LEAD	SCALE: NTS	DRAWING NO. NML/ENG/MER/RT/SK-01 REV. 01

B. Design & Assembly of Electrically Heated Dual Retort Furnaces (03 sets)



Schematic drawing of Dual Retort Electrical heating Furnace

Assembly of Retort design on moving hearth trolley with Electrically Heated Furnace (120-140 Kw)

Quantity: 03 units with all accessories

8.	MS Refractory Body	1	—
7.	Gate Vertical with chamber	1	—
6.	Retort holder gate with Hearth	1	—
5.	Movable Hearth	1	—
4.	Heating Element	1	—
3.	Water Cooling Jacket	1	OD450
2.	Retort	1	OD320
1.	Dual Retort Electrical Furnace	1	2000x1300x1100
S.No	Parts Name	Qty.	Dimensions

All dimensions are in mm.

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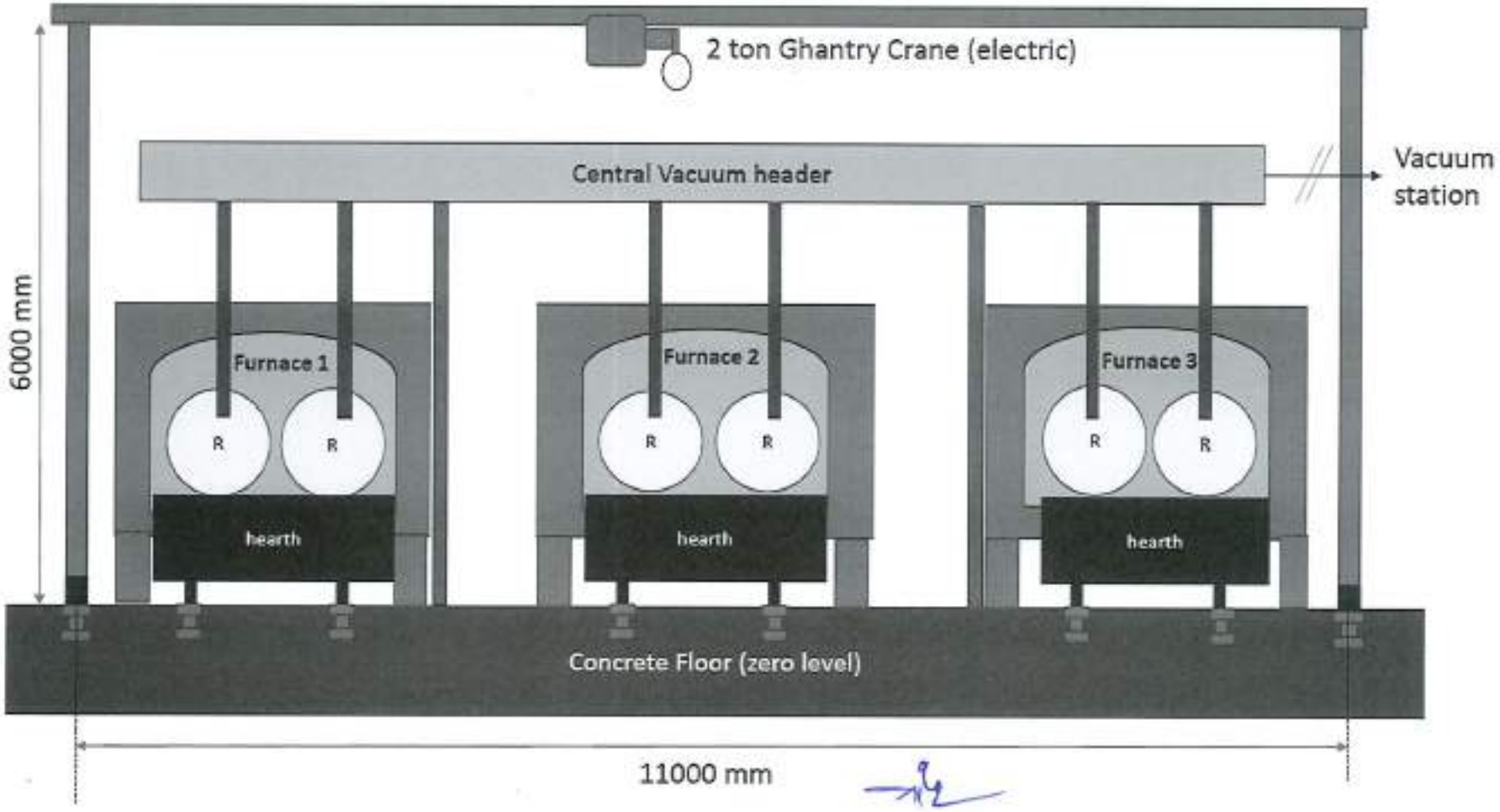
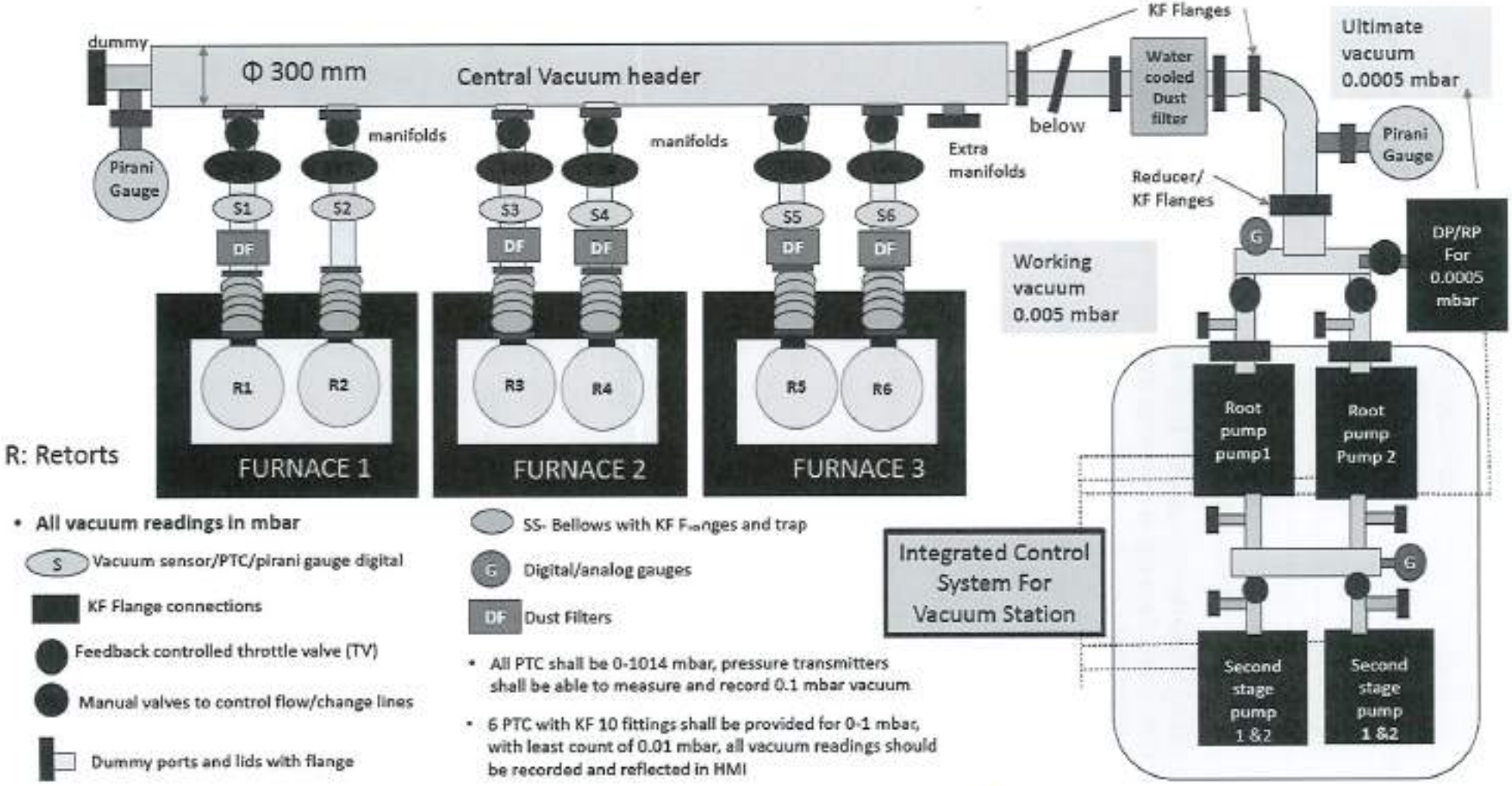
E N G I N E E R I N G D I V I S I O N
TITLE
Dual Retort Electrical heating Furnace

Illustration of Front view and illustration assembly of retort, furnace, vacuum and accessories



C. Illustration and ref view for Assembly of Retort based-Integrated Vacuum Reduction Pilot Plant



- **All vacuum readings in mbar**

S Vacuum sensor/PTC/pirani gauge digital

KF Flange connections

Feedback controlled throttle valve (TV)

Manual valves to control flow/change lines

Dummy ports and lids with flange

SS- Bellows with KF Flanges and trap

G Digital/analog gauges

DF Dust Filters

- All PTC shall be 0-1014 mbar, pressure transmitters shall be able to measure and record 0.1 mbar vacuum
- 6 PTC with KF 10 fittings shall be provided for 0-1 mbar, with least count of 0.01 mbar, all vacuum readings should be recorded and reflected in HMI

ACCEPTANCE CERTIFICATE FORM

No._____ Dated: _____

M/s. _____

_____

_____

Sub: Certificate of commissioning of ----------

01. This is to certify that the equipment as detailed below has/have been received in good condition along with all the standard and special accessories (subject to remarks in Para 2). The same has been installed and commissioned.

(a) Contract No. _____ Date_____

(b) Description of the equipment_____

(c) Name of the consignee_____

(d) Scheduled date of delivery of the consignment to the Lab./Instts._____

(e) Actual date of receipt of consignment by the Lab./Instts._____

(f) Scheduled date for completion of installation/commissioning_____

(g) Training Starting Date _____

(h) Training Completion Date _____

(i) Names of People Trained _____

(j) Actual date of completion of installation/commissioning_____

(k) Penalty for late delivery (at Lab./Instts. level)₹_____

(l) Penalty for late installation (at Lab./Instts. level ₹_____

Details of accessories/items not yet supplied and recoveries to be made on that account:

Sl. No.	Description	Amount to be recovered

02. The acceptance test has been done to our entire satisfaction. The supplier has fulfilled his contractual obligations satisfactorily

or

The supplier has failed to fulfil his contractual obligations with regard to the following:

(a) .....

(b) .....

(c) .....

(d) .....

The amount of recovery on account of failure of the supplier to meet his contractual obligations is as indicated at Sr. No. 3.

For Supplier	For Purchaser
Signature	Signature.....
Name	Name.....
Designation	Designation.....
Name of the firm.....	Name of the Lab/Instt.....
Date	Date.....

PERFORMANCE SECURITY FORM

MODEL BANK GUARANTEE FORMAT FOR PERFORMANCE SECURITY

To,

.....

WHEREAS ..... (name and address of the supplier) (hereinafter called "the supplier") has undertaken, in pursuance of contract No. ..... dated .....to supply (description of goods and services) (herein after called "the contract").

AND WHEREAS it has been stipulated by you in the said contract that the supplier shall furnish you with a bank guarantee by a scheduled commercial bank recognized by you for the sum specified therein as security for compliance with its obligations in accordance with the contract;

AND WHEREAS we have agreed to give the supplier such a bank guarantee;

NOW THEREFORE we hereby affirm that we are guarantors and responsible to you, on behalf of the supplier, up to a total of ..... (amount of the guarantee in words and figures), and we undertake to pay you, upon your first written demand declaring the supplier to be in default under the contract and without cavil or argument, any sum or sums within the limits of (amount of guarantee) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the supplier before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the contract to be performed there under or of any of the contract documents which may be made between you and the supplier shall in any way release us from any liability under this guarantee and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until the ..... day of ....., 20.....

(Signature of the authorized officer of the Bank)

.....

Name and designation of the officer

.....

Seal, Name & Address of the Issuing Branch of the Bank

Note: Whenever, the bidder chooses to submit the Performance Security in the form of Bank Guarantee, then he should advise the banker issuing the Bank Guarantee to immediately send by Registered Post (A.D.) an unstamped duplicate copy of the Guarantee directly to the Purchaser with a covering letter to compare with the original BG for the correctness, genuineness, etc.