



INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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Ref: ASE/11-12/112/EURU/SRCH

Date: 21.07.2013

Tender No.: ASE/SRCH/017/2013

Due Date: 12.08.2013, 3:30pm

Technical Bid opening on 13th August 2013 at 10.30am in the Conference Room, 2nd Floor of the IC & SR Building.

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

Dear Sirs,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of various Scientific Instruments "Circulating Fluidized Bed Coal Gasification System" conforming to the specifications given in Annexure.

I) Instructions to the Bidder

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

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

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

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

- (v) **Agency Commission:-** Agency commission, if any, will be paid to the Indian agents in Rupees on receipt of the equipment and after satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in Tender even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent.

- (vi) **Terms of Delivery:-** The item should be supplied to our Various Institutions as per Purchase Order. In case of import supply, the item should be delivered at the cost of the supplier to our Institution. The Installation/Commissioning should be completed as specified in our important conditions.

Yours faithfully,



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

SCHEDULE

I) Important Conditions of the tender

1. The due date for the submission of the tender is **12.08.2013, 3:30pm**.
2. The offer/bids should be submitted in two bid systems (i.e.) Technical bid and Financial bid. The technical bid should consist of all technical details along with commercial terms and conditions. Financial bid should indicate item-wise price for the items mentioned in the technical bid. The Technical bid and the Financial bid should be put in separate covers and sealed. Both the sealed covers should be put into a bigger cover. The open tender for supply of "**Circulating Fluidized Bed Coal Gasification System**" should be written on the left side of the outer cover.
3. (i) EMD:- Two percent (2%) of the tender value quoted by the company. The EMD should be included in the Financial bid which will not be opened for Technical evaluation. **Enclosing the EMD in the Technical bid will automatically disqualify the tenderer.** EMD should be in the form of DD in favour of "The Registrar, Indian Institute of Technology Madras" and payable at Chennai. The tender without EMD would be considered as UNRESPONSIVE and REJECTED. Photo/FAX copies of the Demand Draft/Banker's pay orders will not be accepted. The EMD will not be paid any interest and EMD shall be converted as a security deposit of the successful bidder and the same will be returned after the completion of the warranty period.

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

(iii) The Performance Security should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.

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

4. If an Indian agent is involved, the following documents must be enclosed:
 - i) Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.
 - ii) Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
 - iii) The enlistment of the Indian agent with Director General of Supplies & Disposals under the Compulsory Registration Scheme of Ministry of Finance.
5. The offer/bids should be sent only for a machine that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.
6. Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid.
7. Documentary proof for the claimed position and repetition accuracies must be obtained from the principals and submitted along with the relevant pages of the standards.
8. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.
9. **Validity:** Validity of Quotation not less than 90 days.
10. **Delivery Schedule:-** The tenderer should indicate clearly the time required for delivery of the item. In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.

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

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

Request for quotations to build circulating fluidized bed coal gasification system

Techno-economic quotation is invited for supply of coal gasification system consisting of:

- (A) Riser (B1) Cyclone (B2) Standpipe (B3) Loop seal (B4) Return-leg (C) Coal feeder (D) Particulate filtration unit (E) Ash collection unit (F) Air heater (G) Steam generator (H) Instrumentation system (I) Safety considerations,

as per the details given below and enclosed drawings: The system should be complete with the instrumentation and accessories and demonstrated for its satisfactory functioning as per following details.

A. Riser:

- Dimensions: Inner diameter = 90 mm; Height = 8000 mm; Wall thickness = 10 mm (to the nearest standard schedule, but not less than 10 mm).
- Material of construction: Inconel-601 or such material, design calculations should be provided for scrutiny.
- Operating conditions: Pressure = 10 bar, Temperature = 1000°C.
- Pressure and temperature sensors should be installed as per point H and drawing (thermocouples should be safe guarded against erosive environment and the lines for the pressure sensors should be water cooled properly).
- Leak proof operation should be guaranteed and demonstrated (12 bar, 1000°C).
- Ceramic Electrical heating should be provided at different locations with individual locations as shown in the drawing.
- Entire system should be insulated with ceramic wool of sufficient thickness to give outside temperature = 50 °C on the aluminium foil wrapping the ceramic wool.

B. Cyclone, Stand pipe, Loop seal and Return leg:

- Dimensions as provided in the drawing.
- Material of construction: Inconel-601 or such material, design calculations should be provided.
- Electrical heating should be provided at required areas shown in the drawing as indicated in section A.
- Entire system should be insulated with ceramic wool of sufficient thickness to get outside temperature of 50 °C as above.

C. Coal feeder:

- Feed coal particle size up to 3 mm.
- Positive feeding device such as screw conveying should be designed and fabricated.
- Should have lock hopper system, where one hopper will be at atmospheric pressure and the other one will connect to the riser at 10 bar through proper leak-proof, high temperature valves.
- Material of construction: SS-310 or such material, design calculations should be provided.
- Leak proof, non-clogging and adiabatic operation should be demonstrated.

D. Particulate filtration unit:

- Should be able to filter micron-sized ash and carbon particles.
- To be connected at cyclone outlet and insulated to avoid heat loss.
- Any proper method of de-pressurization should be adopted (please specify).
- Material of construction: SS-304 or such material, design calculations should be provided.

E. Ash collection unit:

- Consists of a screw conveyor and lock hoppers.
- Proper leak-proof, high temperature valves should be provided.
- Any other positive ash collection technique from the bottom of the riser should be incorporated (please specify).
- Material of construction: SS-310 or such material, design calculations should be provided
- Heat recovery from ash should be provided to pre-heat air.

F. Air heater:

- Air fed into the gasification system should be heated from ambient temperature to 400°C at the pressure of 12 bar with flow rate in the range of 30 kg/h to 120 kg/h.
- Proper flow control and metering devices should be installed and should work at high pressure and temperature conditions.
- Material of construction: SS-310 or such material, design calculations should be provided.

G. Steam generator:

- Steam supply up to 450°C and 12 bar to the gasification system, with flow rates in the range of 1 kg/h to 15 kg/h with provision of by-pass.
- Please specify the methodology and fuel to be employed.
- Proper leak-proof valves and metering devices to be installed.
- Material of construction: SS-310 or such material, design calculations should be provided.

H. Instrumentation system:

- Temperature sensors are thermocouples made of Cr/Ni-Cr (N-type) junction or equivalent suitable types, with justification; range, response time and calibration chart to be provided.
- Since erosive environment prevails in the gasification system, proper protection in the form of thermo-well or equivalent method should be provided.
- Differential pressure transducers (DPT), capacities up to 100 mm of water column and 1000 mm of water column, should be procured and installed as per the drawing. There should be provision for isolating the instrument from the system.
- Provision to water-cool the DPT lines should be made available as per DPT specifications.
- The piping arrangement for these instruments should be provided with purge gas to cleanse the particles accumulating in the pathways.
- All the instruments should be connected to a data logger and recorded in a personal computer, through a multi-channel (10 channels for pressure and 20 channels for temperature) analog-to-digital converter in a time-resolved manner (up to 10 Hz frequency or better) throughout the operation; give specifications of data acquisition system offered.

I. Safety and other considerations:

- High pressure barricade around the set-up, at least for 6 m height, should be provided for safety.
- All the valves for instrument purge gas and air/steam operation should be remotely controlled – proper control system to be installed and demonstrated on an easily accessible control panel – temperature control for heating pad, proper pressure regulator and flow control for steam, air and purge air circuits, and coal feeding rate, and ash collection, etc.
- Pressure regulating valve should be provided through out system including air and steam generator.

J. Installation:

- The above system should be installed in IITM and all operating and safety features should be thoroughly demonstrated.
- The truss structure for holding the installation should be designed and mounted with basin foundations
- The system should be maintained for at least 3 months after installation on a regular basis.

Specific conditions:

(i) Cost of individual items (A) to (J) to be given separately. Timeline of manufacturing, testing and installation should be provided in detail. The testing/working of the assembled set up should be demonstrated at Chennai for inspection.

(ii) Method of manufacturing and assembly to be specified in the quote

(iii) Performance guarantee of (all components including bolts, nuts, studs, etc.) uniformly one year minimum to be given.

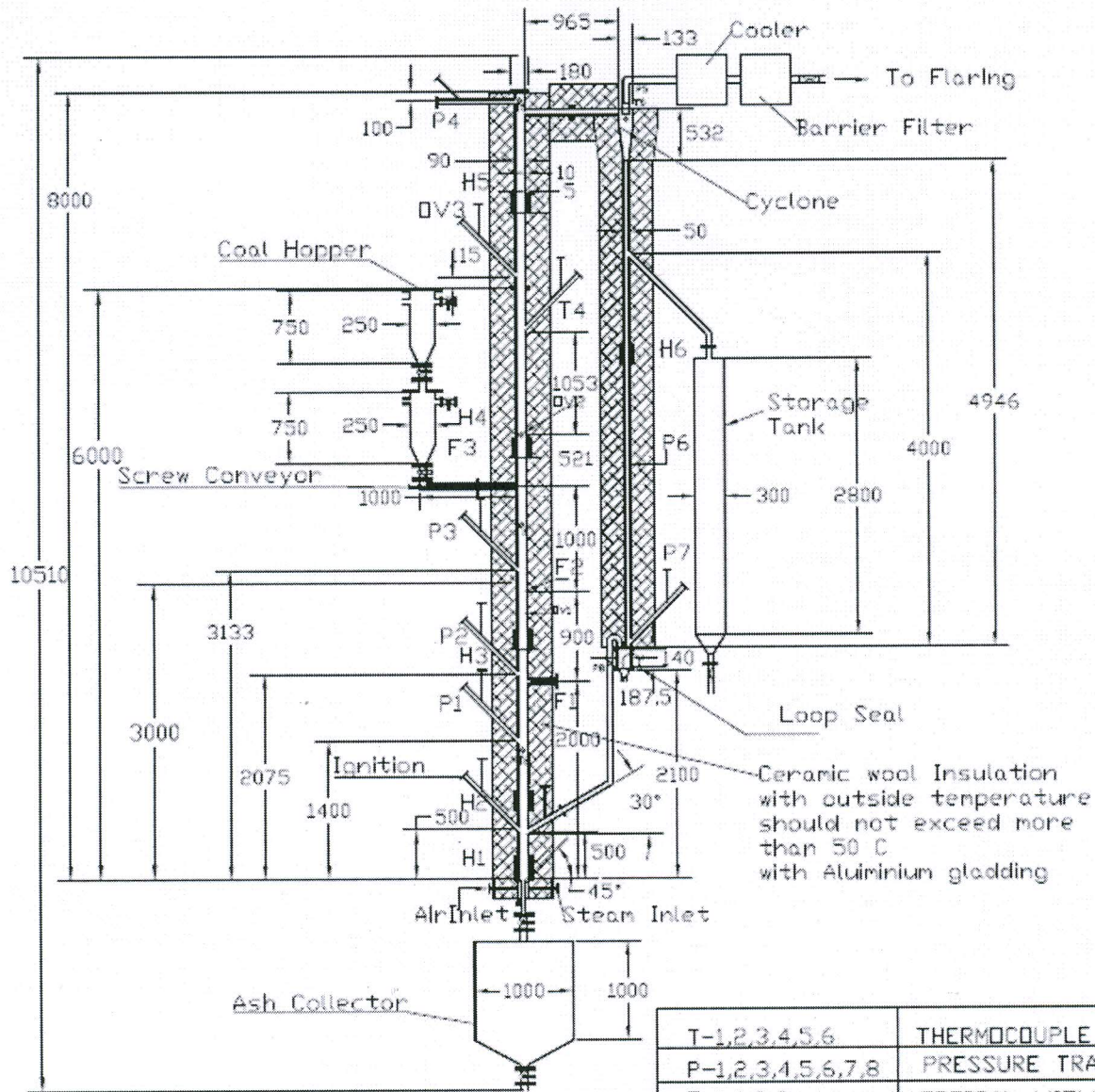
(iv) Make and models of bought-out items (e.g., thermocouples, DPTs) should be mentioned.

(v) Any technical clarifications will be made on **01.07.2013 at 3 PM** in the office of Mr. John George / Mr. Vijayakumar in Rarefied Gas Dynamics lab, Department of Aerospace Engineering. Phone: +91-9842797432

(vii) Past experience: The vendor should have past experience in building similar high pressure, high temperature systems. A list of customers to whom the vendor has supplied such systems with details such as item description, their values and supply date, customer's addresses, etc. must be provided.

Drawings of various parts of CFB Gasifier

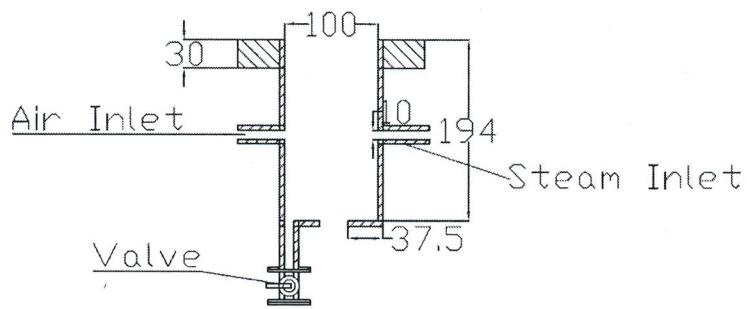
CIRCULATING FLUIDIZED BED GASIFIER



ALL DIMENSIONS ARE IN mm

T-1,2,3,4,5,6	THERMOCOUPLE
P-1,2,3,4,5,6,7,8	PRESSURE TRANSDUCER
DV-1,2,3	OPTICAL VIEWER
F-1,2,3	FEED LOCATION
H-1,2,3,4,5,6	HEATING ELEMENT- 6 kW x 5 = 30 kW

Fig. 1: CFB Gasifier



Wind Box

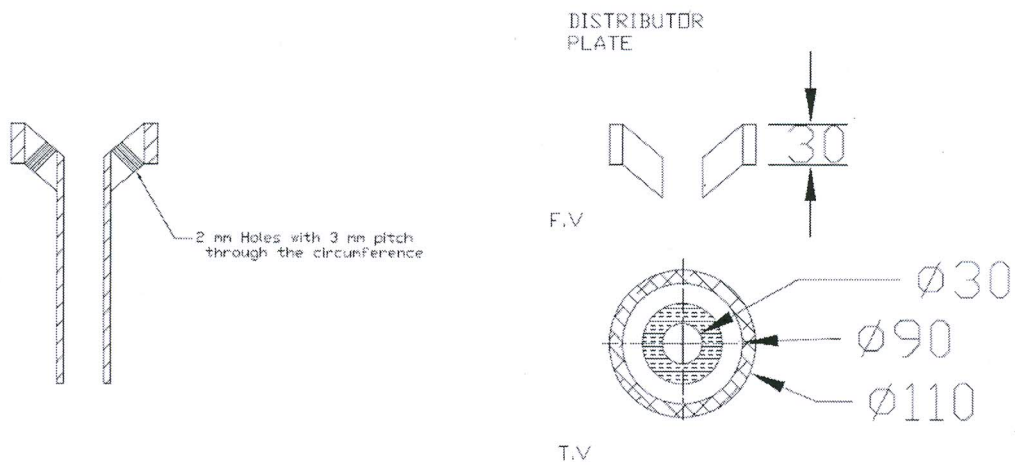


Fig. 2: Distributor plate

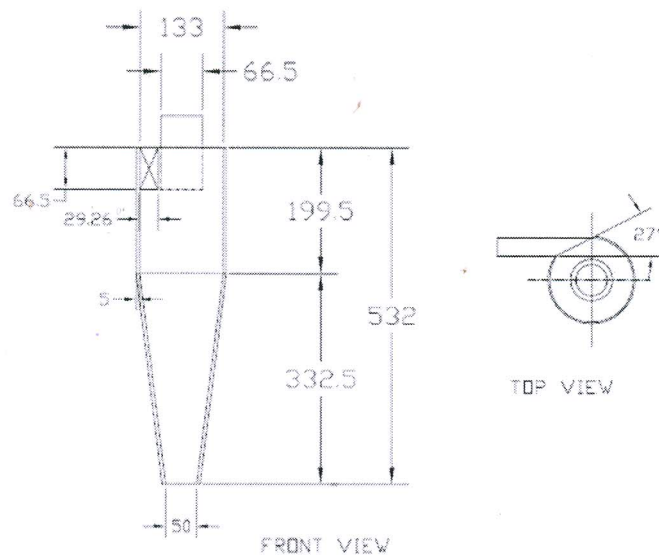


Fig. 3: Cyclone separator

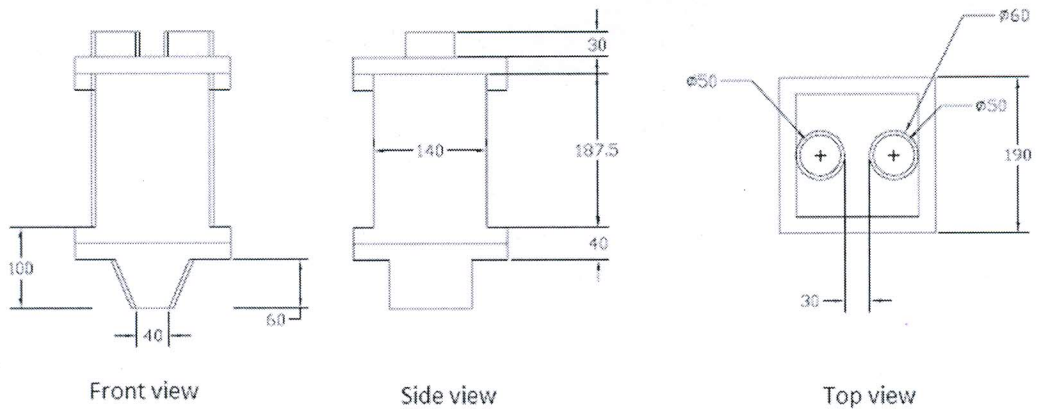


Fig. 4: Loop seal

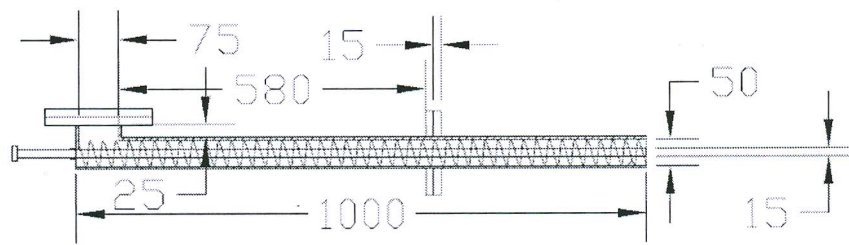


Fig. 5: Screw feeder for coal feeding (feed rate up to 50 kg/h)

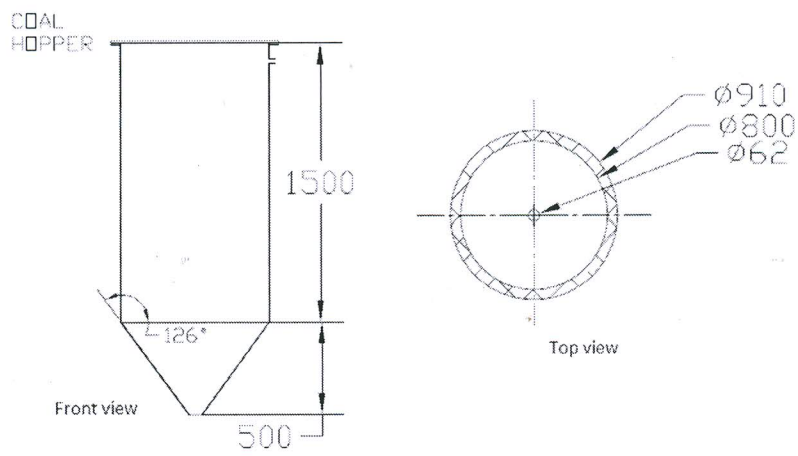


Fig. 6: Coal hopper

ASH COLLECTOR

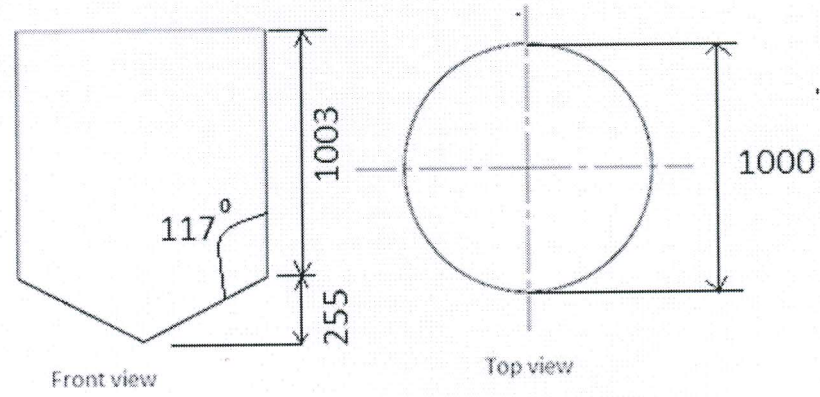


Fig. 7: Ash collector

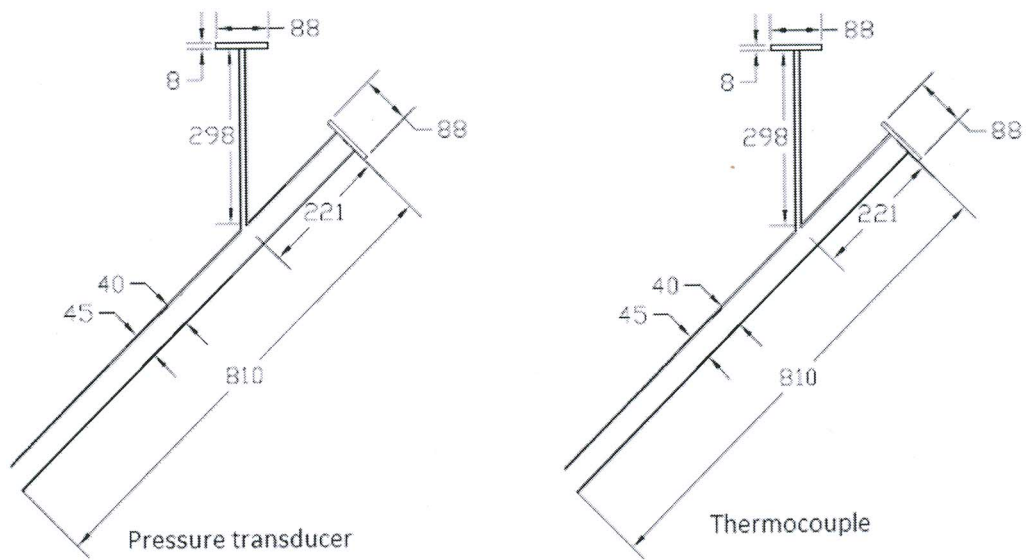


Fig. 8: Pressure transducer and thermocouple