

**FUEL FABRICATION  
INRPO, NRB, BARC, TARAPUR**

TECHNICAL SPECIFICATIONS FOR  
" Micro-Bulk Storage tank for liquid Nitrogen "



सत्यमेव जयते  
भारत सरकार

**GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE  
NUCLEAR RECYCLE BOARD**

**TECHNICAL SPECIFICATIONS**

**FOR**

"Design, Manufacturing, supply & PESO approval of entire site for 5.5KL Cryogenic Frame mounted  
micro-Bulk Storage tank for liquid nitrogen"

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**1.0 INTRODUCTION:**

This specification covers requirements for Design, Manufacturing, supply & PESO site approval for 5.5kl Cryogenic Frame mounted micro-Bulk Storage tank for liquid nitrogen for FF, INRP(O) BARC Tarapur.

**2.0 Scope of Work:**

Design, preparation and approval of fabrication drawing, manufacturing , supply and PESO site approval for 5.5kl cryogenic frame mounted micro-bulk storage tank for liquid nitrogen with the details as follows:

- 2.1 Quantity required: 01 no. of Micro-Bulk storage tank.
- 2.2 Place of delivery: Delivery of all item will be at FF, Stores, NRB, BARC, Tarapur and installation work will be carried out at designated site.
- 2.3 Approval letter along with approved drawings from PESO for inner vessel.
- 2.4 Design, Manufacture, Supply ,Installation and testing of 5.5kl micro bulk tank.
- 2.5 License of the liquid nitrogen tank from PESO.
- 2.6 Certification, acceptance and License from PESO for 5years.
- 2.7 Third party Inspection shall be carried out by PESO approved third party.
- 2.8 A Test Certificate from Third party for inner and outer vessel shall be submitted.
- 2.9 Cold stretch pressure test certificate.
- 2.10 Mechanical properties test report of materials used for inner and outer vessel.
- 2.11 Calibration Certificate of safety valve, pressure gauge and level gauge.
- 2.12 Calibration test certificate for flow meters and gauges.
- 2.13 Operation and maintenance manual in triplicate for Tank and evaporator.
- 2.14 Vendor After receiving P.O, needs to inform the requirement of area, flooring and fencing for getting approval from PESO.
- 2.15 Required Liquid nitrogen for commission and testing of 5.5kl tanks at suppliers site and also at purchaser's site.
- 2.16 The micro- Bulk storage tank and evaporator shall be designed, manufactured and approved from PESO as per the following technical specification:

| Sr. No | Description                                                  | Input                                                                                                                                       |
|--------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | 5.5KL Cryogenic vessel                                       | Design, Manufacturing, supply & PESO approval of entire site for 5.5kl Cryogenic Frame mounted micro-Bulk Storage tank for liquid nitrogen. |
| 2      | Gross volume of Tank                                         | 5500 ± 50 Ltr                                                                                                                               |
| 3      | Net Volume of tank                                           | 5200 ± 50 Ltr                                                                                                                               |
| 4      | <b>INNER VESSEL</b>                                          |                                                                                                                                             |
| 4.1    | Material                                                     | ASME SA 240 Type 304                                                                                                                        |
| 4.2    | Design & Manufacturing code                                  | ASME Sec VIII Div1                                                                                                                          |
| 4.3    | Max Allowable working pressure                               | 24.5±0.5 kg/cm <sup>2</sup> (g)                                                                                                             |
| 4.4    | DESIGN PRESSURE (Corrected for vacuum including static head) | 26±0.5 kg/cm <sup>2</sup> (g)                                                                                                               |
| 4.5    | DESIGN TEMPERATURE                                           | -196 to +40 °C                                                                                                                              |
| 4.6    | Cleaning Duty                                                | Oxygen                                                                                                                                      |
| 4.7    | Insulation                                                   | Vacuum+ Multilayer super insulation for cryogenic                                                                                           |

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|      |                                         |                                                                                                                                             |
|------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                         | application                                                                                                                                 |
| 4.8  | Inspection                              | PESO Approved Third Party Inspection                                                                                                        |
| 4.9  | Inner vessel Testing                    | Cold stretch                                                                                                                                |
| 4.10 | Acceptance                              | As per applicable code                                                                                                                      |
| 5    | <b>OUTER VESSEL</b>                     |                                                                                                                                             |
| 5.1  | Material                                | ASME SA 240 Type 304                                                                                                                        |
| 5.2  | Design & Manufacturing code             | CGA 341                                                                                                                                     |
| 5.3  | Operating pressure                      | VACUUM                                                                                                                                      |
| 5.4  | DESIGN TEMPERATURE                      | -20 to +55 °C                                                                                                                               |
| 5.5  | Inspection                              | PESO Approved Third Party Inspection                                                                                                        |
| 5.6  | Acceptance                              | As per applicable code                                                                                                                      |
| 6    | Empty Weight of Vessel                  | Less than 3500KG                                                                                                                            |
| 7    | Service                                 | Liquid Nitrogen<br>Non Lethal , Non Corrosive.                                                                                              |
| 8    | Out Side Diameter                       | 2200 ± 50 mm                                                                                                                                |
| 9    | Overall Height                          | 2600 ± 100 mm                                                                                                                               |
| 10   | External Surface                        | Mechanical Cleaning & mirror polish on outside SS Vessel                                                                                    |
| 11   | Filling Provision                       | Top filling and Bottom filling                                                                                                              |
| 12   | Withdrawal                              | Two independent bottom withdrawal                                                                                                           |
| 13   | Operating pressure & required flow rate | 10 kg/cm <sup>2</sup> (G) & 150 Nm <sup>3</sup> /hr                                                                                         |
| 14   | Orientation                             | Vertical type                                                                                                                               |
| 15   | Frame & external Evaporator             | Vessel should be frame protected & frame mounted evaporator to be supplied.                                                                 |
| 16   | Radiography                             | 100% radiography for all welding joints as per code.                                                                                        |
| 17   | Static evaporation loss                 | ≤ 0.50% per day based on ambient temperature of 25°C when filled to design capacity with saturated liquid nitrogen at atmospheric pressure. |
| 18   | Total piping work                       | Seamless SS 304/304l                                                                                                                        |
| 19   | Valves                                  | Bronze /stainless steel                                                                                                                     |
| 20   | Number of evaporator                    | 02 Numbers                                                                                                                                  |
| 21   | <b>Evaporator</b>                       |                                                                                                                                             |
| 21.1 | Type                                    | Aluminium star fin atmospheric evaporator                                                                                                   |
| 21.2 | Configuration                           | Frame mounted evaporators                                                                                                                   |
| 21.3 | FLOW Capacity                           | 150Nm <sup>3</sup> /hr                                                                                                                      |
| 21.4 | Design Temperature                      | -196°C to + 65°C                                                                                                                            |
| 21.5 | Outlet Temperature                      | 10°C below ambient                                                                                                                          |
| 21.6 | Duty Cycle                              | Required for 24 Hrs Continuous Duty                                                                                                         |
| 21.7 | Manufacturing Code                      | ASME Sec VIII, Div I                                                                                                                        |
| 21.8 | Flow measurement                        | GN <sub>2</sub> flow meter at outlet of evaporator                                                                                          |

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### 3. Site Work

1. Preparation of site layout drawing for PESO approval and **PESO approval: layout approval from CCOE, rule 33 and site inspection, CCOE license endorsement for 5 years.**
2. Preparation of detail civil foundation drawing for 5.5kl tank, construction of foundation and civil work: RCC Flooring for 5.5kl LN<sub>2</sub>, storage area 15m(l)X10m(w)X0.2m(h), (Height: 25mm leveling +75mm PCC +100mm RCC).
3. Fabrication and installation of system fencing with main & emergency gate, G I chain-link 50x50 Mesh and 2.0m height with MS angle 65x65x6mm support.
4. Arrangement of Vehicle and crane of sufficient capacity for loading/ unloading and installation of tank at site.
5. Supply and installation of earthing pit as per PESO guidelines.
6. Installation of sign board and safety sticker as per the PESO requirement.
7. Supply and installation of hard stand and flooring as per PESO requirement.
8. Supply of foundation bolt for its fitting, grouting, curing for tank and vaporizer.
9. Supply and installation of fire-fighting equipments e.g. fire extinguisher, fire buckets required on the tank yard layout as per PESO guidelines.
10. Color coding of gas service line and letter painting or stenciling .
11. Deputation of service engineer for supervision of installation and commissioning work at site.
12. Vendor shall arrange on site staff training.

### 4. Delivery period:

**01 year (12months)** from the date of purchase order.

### 5. Acceptance Criteria:

The Liquid Nitrogen Tank will be considered acceptable when

- a) All the points of testing & inspection reports are found as per technical specification.
- b) The fabrication is done as per approved drawing incorporating the technical specifications of Liquid Nitrogen Tank.
- c) The system is performing as per specification.

### 6. General Description:

1. The Cryogenic vessel should be Super Insulated Type & vacuum reading should be less than or equal to 5milli torr.
2. The Inner vessel should be Cold Stretched instead of Hydro test.
3. 100% RT (radiography) for inner vessel.
4. Vessel should be with 2 nos Primary & 2 nos Secondary safety valve with a secondary on higher safety pressure setting.
5. Along with Primary Safety valve and secondary safety valve one rupture disc is also required to be mounted at higher pressure setting than secondary safety valve.
6. Vent lines and LN<sub>2</sub> over flow lines shall be safely routed.
7. Stainless steel tagging of each line and valve shall be carried out.
8. Pressure building regulator along with economizer function suitable to the design pressure and tank withdrawal rate is in the scope of supply.

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9. PESO approved Third Party Inspection is required for outer vessel & inner vessel stage wise inspection.
10. Vendor has to take Site approval for tank and approval of filling for a period of 5years from PESO.
11. All arrangement required for PESO inspection & certification, acceptance tests and demonstration of performance of the installation shall be carried out by the supplier till the final acceptance of the tank and its accessories by purchaser.
12. Vendor shall supply the spares as per attached annexure-II.

**7. Material Management:**

1. Material of construction for all pipe shall be SS304 only
2. Vessel should contain following piping & valves
  - i. Fill line check valve
  - ii. Economizer Check valve
  - iii. Fill connection with Dust cap-SS Flange only
  - iv. Top fill valve
  - v. Vent & Full Trycock valve
  - vi. Full drain valve
  - vii. PB Outlet Valve
  - viii. Gas Use valve
  - ix. Liquid Withdrawal valve
  - x. Safety relief valve
  - xi. Suitable Pressure building coil
  - xii. 2 way Pressure building regulator along with economizer function.
  - xiii. Level gauge 160mm Dial [0 to 4000mmWC]
  - xiv. Pressure gauge 100mm Dial [0 to 40 kg/cm<sup>2</sup> (G)]

**8. Documentation:**

- i. The vendor shall prepare complete P & I diagram and submit.
- ii. Drawing of Pressure Building Unit with economiser & Evaporators.
- iii. Catalogue/ leaflets for tanks and evaporators
- iv. Scheme for installation and testing.
- v. The vendor shall offer a detailed Quality Assurance Plan (QAP), after placement of the purchase order within 15 days after acceptance of PO. The QAP offered shall be reviewed and approved by the purchaser. The QAP shall be under review during fabrication process and in case it is observed that the desired quality is not being achieved at any stage of manufacturing, the purchaser reserves the right to modify the QAP accordingly. The changes thus made shall be binding to the vendor.
- vi. PESO approved Manufacturing license.

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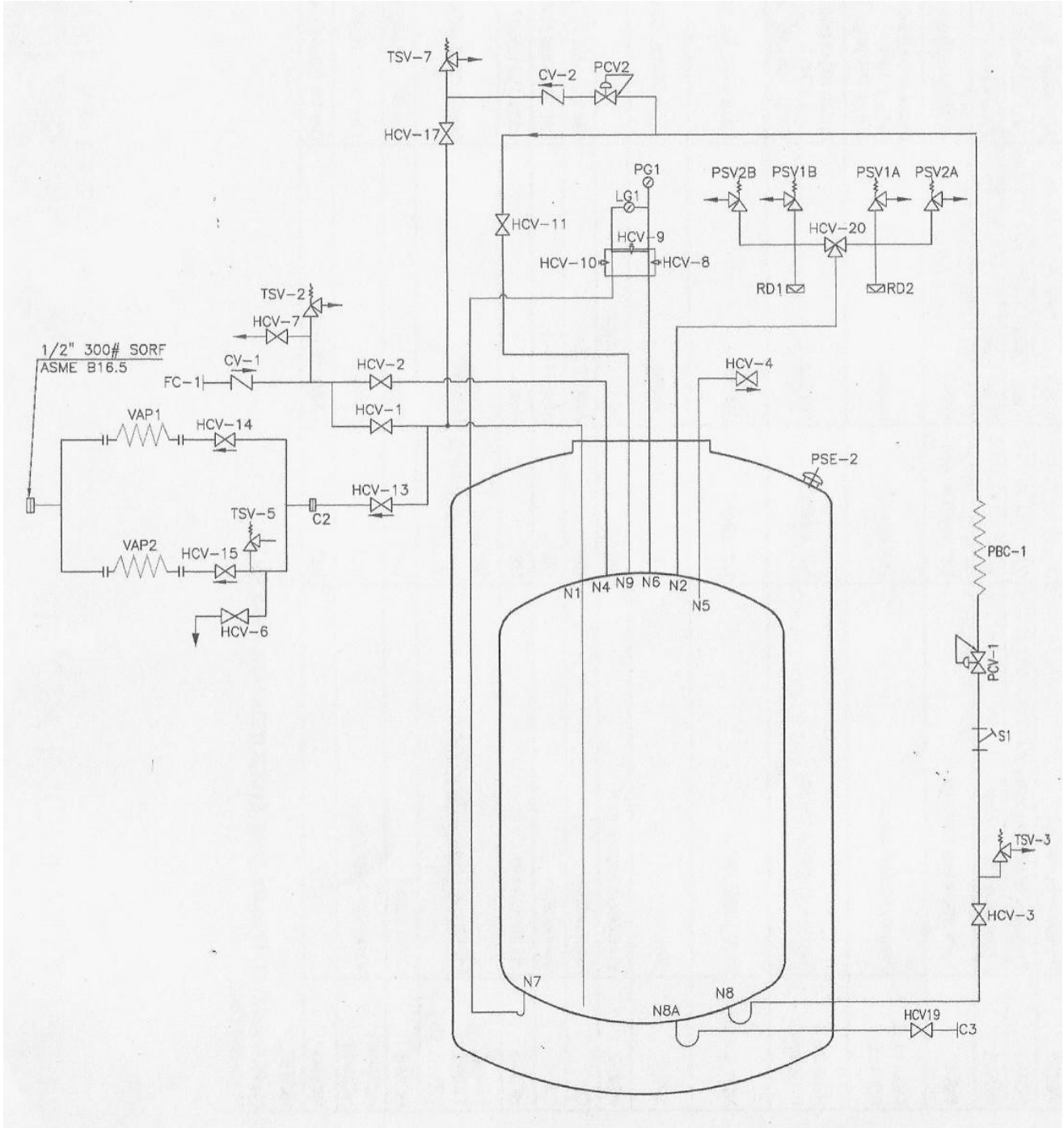
**9. Vendor evaluation criteria :**

- I.** The vendor shall have experience of execution of similar or higher capacity micro bulk liquid nitrogen tanks.
- II.** The vendor shall submit along with the offer a copy of work completion certificate, PO copy or any proof of the similar works carried out in last five years. **Similar works defined as "manufacturing/supply of PESO approved cryogenic storage tanks/ Bulk tanks/ Micro-bulk tanks of capacity equal to or more than 5.5kl for handling of liquid Nitrogen/ Oxygen/Argon."**
- III.** Vendor shall manufacture the storage tank at fabrication shop that should be approved by PESO.
- IV.** If the vendor is not original equipment manufacturer, Vendor has to submit MoU with OEM for execution of the work and all the above mentioned requirement (I,II,III) with respect to OEM needs to be submitted.
- V.** Submit the duly signed copy of annexure- I, II,III with all details. Offers without the annexure shall be considered invalid.

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10. Schematic Drawing:

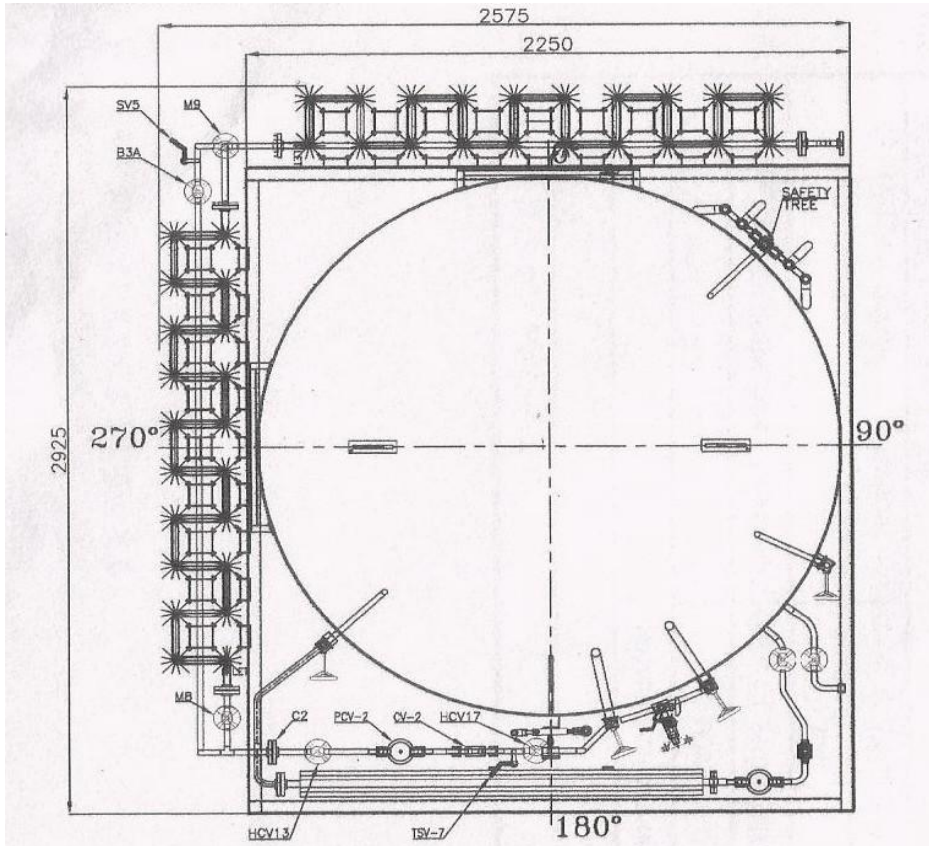




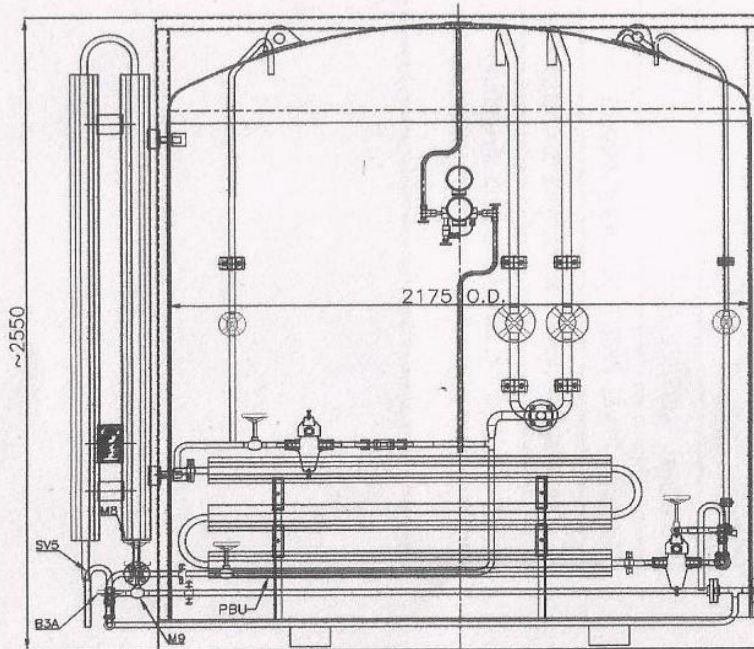
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PLAN



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Annexure I  
**“VENDOR EVALUATION PROFORMA”**  
(To be submitted along with the offer)

**Tender reference no. :**

**Name of Item :**

**Date :**

| <b>S N</b> | <b>Details Required</b>                                                                                                            | <b>Details to be filled by bidder</b> |
|------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <b>1.0</b> | <b>General</b>                                                                                                                     |                                       |
| 1.1        | Name of company & Details of registration.                                                                                         |                                       |
| 1.2        | Office address, Tel. No., Fax No., email-id                                                                                        |                                       |
| 1.3        | Works address & Tel. No., Fax No., email-id                                                                                        |                                       |
| 1.4        | Year of inception of the company                                                                                                   |                                       |
| 1.5        | Detail of ownership (Proprietary/Pvt. Ltd./Public Ltd./Govt. Undertaking)                                                          |                                       |
| 1.6        | Name, contact no., email-id of contact person                                                                                      |                                       |
| 1.7        | Declaration by contractor that he has not been debarred from tendering by any authority /Agency                                    |                                       |
| <b>2.0</b> | <b>Particulars</b>                                                                                                                 |                                       |
| 2.1        | Whether vender has experience of similar works in last 5 years. <b>Yes/No</b><br>Similar works certificate attached. <b>Yes/No</b> |                                       |
| 2.2        | Clients Details & completion certificates attached. <b>Yes/No</b>                                                                  |                                       |
| 2.3        | Whether manufacturer fabrication shop is approved by PESO. <b>Yes/No</b>                                                           |                                       |

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|     |                                                                                     |  |
|-----|-------------------------------------------------------------------------------------|--|
| 2.4 | Whether vender is OEM. <b>Yes/No</b><br>If No, MoU with OEM attached. <b>Yes/No</b> |  |
| 2.5 | PESO Manufacturing license attached. <b>Yes/No</b>                                  |  |

**Any other comment:**

**Declaration by bidder:** All above furnished information are true & in my knowledge. If any of above information is/are found incorrect, the department may take disciplinary action against me/us and our offer may get rejected. The decision of FF, INRP(O), NRB, BARC, Tarapur will be final in this regard.

**Sign & seal of Bidder with date**

**Name of bidder's Representative:** \_\_\_\_\_

**Designation of bidder's Representative:** \_\_\_\_\_

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**ANNEXURE-II  
Draft MOU With OEM**

**Letter Ref No.:**

**Date:** \_\_/\_\_/\_\_

1. **Tender reference no.**-..... dated .....
2. **Name of Item:** Design, Manufacturing, supply & PESO approval of entire site for 5.5KL Cryogenic Frame mounted micro-Bulk Storage tank for liquid nitrogen.
3. **Company name & address:**
  
4. **Third Party name, address & registration no:**
  
5. Detail description of Job to be executed by **Third Party:**
  
6. Previous year experience of similar work executed by **Third Party:**
  - a)
  - b)
7. **Validity of MOU** (at least for Delivery period): From \_\_/\_\_/\_\_ to \_\_/\_\_/\_\_
8. Declaration by **Third Party:**  
I/We hereby agree to complete above mention jobs (point no. 5) within prescribed tenure as per tender documents, if the said job(point no. 5) is assigned to me/us. I/We have read & understood all the tender documents and agree to complete the jobs as per tender. I/We also agree to provide any detail as per tender to the purchaser, as or when asked by purchaser.
9. Declaration by **Supplier:** All above furnished information are true & in my knowledge.

Sign & seal of **Third Party**

with date

Sign & seal of Supplier

with date

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**Annexure-III**

**Spares to be included in the offer:**

| S No. | Items                                            | Quantity |
|-------|--------------------------------------------------|----------|
| 1.    | Safety valve for each type installed on the tank | 2 Nos.   |
| 2.    | Pressure regulator                               | 2 Nos.   |
| 3.    | Level Gauge                                      | 2 Nos.   |
| 4.    | GN2 flow meter                                   | 2 Nos.   |
| 5.    | LN2 Flow meter                                   | 2 Nos.   |
| 6.    | Flow control valves of type used for evaporator  | 2 Nos.   |