

ANNEXURE TO TENDER NO. DPS/MRPU/1/3/598/TPT

1. Description of the item : Steel room for lung monitor
2. Quantity required : One number (1 No)
3. Two part tender :Yes
4. Detailed specifications :

The steel room of inner dimension 6m X 3m X 2.5m will house specialized radiation detectors like Phoswich and HPGe, which will be used for monitoring of radiation workers from different radioactive facilities of IGCAR like CORAL, DFRP, FRFCF for the internal contamination of actinides like Plutonium, Americium, Uranium.

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Part- I

Design, supply, fabrication and installation of steel room for lung counter at IRMS, Anupuram

1.1 . Scope:

The scope of this work includes supply of materials, design, preparation of detailed fabrication drawings, fabrication and machining etc. as per approved drawings, assembly, inspection and testing at supplier's site, epoxy painting, packing, transportation, erection, installation, lining and testing at Purchaser's site at IRMS, Anupuram as per Technical Specifications and enclosed preliminary design drawing of Steel Room for Lung Counter.

1.2. Description

The Steel Room for Lung Counter has to be fabricated, erected, installed and lined at IRMS, Anupuram as shown in the key plan in the design drawing. Table 1 gives the list of items to be supplied. Maximum wall thickness of the Steel room is 200 mm for all sides such as floor, ceiling and walls. In order to build the shielding of desired thickness, multiple plates can be laminated as per design convenience. Plug welding shall be designed to avoid radiation streaming due to the lamination between plates. Embedded panels (16 Nos) have been provided on the floor of the building and also hooks provided on the ceiling. It is suggested that the physical dimensions of the EP shall be ensured at site well before preparation of fabrication drawing by the vendor. The material of Steel Room for Lung Counter shall be conforming to IS 2062 Gr B and total weight comes to around 147 MT. In addition to that inside of the steel shall have graded lining of 3mm Pb + 2 mm Tn/Cd and 1 mm Cu sheet which comes to around 83.2 sq m each. The room has to be partitioned into two using sliding 5 cm thick lead screen. The inner dimension of each room should be 2975 mm X 3000mm x 2500 mm. the rooms should have individual openings of 1000 mm X 2500mm (ht). Two separate motorized sliding doors each with dimension 1200 mm x 200 mm x 2500 mm with manual override has to be provided as per the specification given in Table 2. The dimensions of room should comply with that provided in the enclosed drawing No. IGCAR/HSEG/RSD/2018/IRMS/STEEL ROOM/01. Viewing window of 300mm x 200 mm dimension made of 200 mm equivalent (12mm) lead glass has to be provided in each partition. Six night vision camera one in each room and one outside with two monitors have to be provided as per the specification given in Table 3. The room should have a music system as per the specification provided in Table 4. Air blower system should be provided. Interior and exterior paneling and lighting has to be provided. Specification for the same is provided in table 5. Monitoring mechanism to detect the tilting of steel room/door over a time has to be installed. One Hole of 5 cm diameter has to be provided on all sides of the rooms. In addition to this holes have to be provided for the inlet of air blowers. The room should have electrical fittings as provided in Table 6. The inner side of the room should be lined with 3 mm acrylic sheet and outer side with wooden plank having aesthetic look.

Table 1: List of items to be supplied	
S. No:	Work Description
1	Steel room with linings
2	Camera & monitor DVR (6 nos)
3	Music systems
4	Air blower systems

Table 2 Specification for door operation:	
S.No	Specification
1.	Door shall be mounted on rail with wheels on bottom side, as well as the door shall be supported on the top side with roller and I-beam arrangement fixed with suitable structure or suitable linear movement mechanism(which will be approved by indentor with following specification.
2.	Door shall be electrically operated using 3-phase induction motor with Gear box.
3.	The speed of the door shall be 0.5m/min
4.	It shall be provided with limits on either side.
5.	The movement of motor shall have sensor controller for emergency stopping, in case any person is crossing the door opening, the door movement shall be stopped immediately.
6.	Electrical cable shall be routed properly to avoid the damage during the door operations.
7.	Wired pendent shall be provided for motor operation with inching switch, emergency switch, indicator lamp etc.
8.	All the motor and electrical components shall meet the Indian standards
9.	In case of electrical failure, the door shall be able to operated manually using hand wheel.
10.	Safety interlocking provision should be provided
11.	Audio and visual indication during the movement

Table 3 Specification for night vision camera		
S.No	Parameters	values
1.	Lens	5 to 50 mm motorized
2.	Shutter speed	1/30 to 1/60000 sec
3.	Image sensor	CCD image sensor to produce 1000 p HD in AHD, HD-TVI and HDCVI mode
4.	Angle of view	5 to 60
5.	Operating temp/Humidity	20 to 30° C and humidity 30 to 90%
6.	Monitor	22” LED monitor with USB and HDMI ports
Should be able to perform in low light as low as 0.01 LUX or in zero light condition		

Table 4 Specification for music system		
S.No	Parameters	values
1	Sound quality	10 – 20 watts RMS
2	Bluetooth compatible	Yes, Version 4.2
3	Source	Ability to play music CDs & DVDs
4	USB port	1
5	Catch all connector	Enables to plug in any device that has a headphone socket.
6	Format supported	MP3, AAC and WAV
7	Head phone	Over the ear, wireless with suitable battery

Table 5 Specification for ventilation system		
S.No	Parameters	Values
1	Type	SISW
2	Capacity	120 CMH
3	Static Pressure	30 mmWC
4	Fan Speed	2865 Rpm
5	Drive	DIRECT
5	Sound level	<80 dB.
6	Filter	20 micron pre filter & 0.3 micron HEPA filter

Table 6 Specification for electrical fittings		
S.No	Parameters	values
1	Power point (2 sets)	15 amp -1 & 5 amp- 5 Nos.
2	Lighting	2 cool LED lamps with 5 W in the roof of each room

1.3 General Specifications

1.3.1 The drawings submitted are for tender purpose only. There can be small modifications. The supplier shall design and submit four sets of fabrication drawings within two weeks from the receipt of the PO for approval of purchaser.

1.3.2 On approval of the fabrication drawings by the purchaser, a detailed fabrication and fitment schedule and stage inspection schedule shall be finalized with the approval of purchaser.

1.3.3 The supplier should initiate procurement of all required raw material and consumables for fabrication.

1.3.4 The supplier is free to suggest modifications, if any, which will improve the performance. However, such modifications shall be incorporated only after the final approval of the user.

1.3.5 Quotation shall be valid for a period of four (4) months from the date of opening of the Tender.

1.3.6 Testing and inspection of the steel room for lung counter at the manufacturer's works at specified and mutually agreed stages shall be intimated to the purchaser in advance.

1.3.7 Erection, installation and lining of steel room for lung counter as per design indent at Purchaser's site Anupuram are in the scope of the supplier.

1.3.8 Electrical power supply shall be provided on chargeable basis based on the written request by the supplier.

1.4 Materials and applicable standards

1.4.1 Supply of Materials:

Supply of all mild steel materials, lead, tin and copper sheets for completion of the job as per our technical specifications shall be in the scope of supplier with relevant test certificate. All consumables such as electrode, epoxy paint etc. shall also be in the scope of the supplier.

Supply of air filter along with air blower shall be in the scope of the supplier.

The graded lining sheet specifications:

- I. 99.99% purity of 3 mm thick lead sheets with 2% Antimony. Free from radioactive contamination.
- II. 99.99% purity of 2 mm thick Tin/Cd sheets. Free from radioactive contamination.
- III. 99.95% purity of 1 mm thick electrolytic grade Copper sheets. Free from radioactive contamination.

An important note:

It is to be ensured that the plate materials used for steel room for Lung Counter shall be free from any manmade radioactive contamination. Also the natural radioactivity level shall be low/normal (natural K < 9mBq/g, Th<1mBq/g, U< 10mBq/g) and it shall be certified by the competent authority at IGCAR, Kalpakkam.

1.4.2 Applicable standards are provided in Table 7:

Table 7: standards for different materials and fabrication methods		
S.No	Standard	Material/fabrication methods
1.	ASME section IX	For welding procedure and performance qualification of welders.

2.	ASTM-E-165/ASME Sec – V	For dye penetrant examination.
3.	IS 2062 Grade B	Structural steel materials
4	IS 1875	Specification for forgings
5.	ANSI N 5.9	Protective coatings (paint) for Nuclear industry.
6.	IS 813	For scheme of symbols for welding.
7.	IS 814	For covered electrodes for metal arc welding and structural steel.
8.	IS 816	Code for practice for use of metal arc welding for general construction in mild steel
9.	IS 823	Code for procedure for manual metal arc welding of mild steel
10.	IS 405 Part I	Lead sheets and strips. Specifications for Chemical purpose.
11.	IS 4811	Rolled Copper plate, sheet, strip and foils for general engineering purposes – Specification
13.	BS 970	Wrought steel for mechanical and allied engineering purposes
14.	RP 188 (European commission), ICRU 169	Steel room for invivo monitoring
The specifications shall, unless specifically stated otherwise, confirm to the latest editions of all the above mentioned standards. In case of conflicting requirements between specifications and standards, the more stringent requirements shall apply.		

1.5. Applicable design drawings:

The drawing No.: IGCAR/HSEG/RSD/RDS/2018/IRMS/STEEL ROOM/01 Rev 0, is for Steel room for lung counter. It is intended for indicating the design feature and sizes only. The supplier shall prepare fabrication drawings for approval of the purchaser before fabrication. Soft copy of all the drawings should be provided in storage media. Welding symbols to be used on the drawings shall confirm to those prescribed by the Indian Standard. This drawing when approved in writing by the purchaser shall form part of this specification. After approval, one tracing and three additional copies of the approved drawings shall be submitted by the fabricator to the purchaser. The purchaser reserves the right to make minor changes prior to the approval of fabricator's shop drawings. Such changes shall be considered as within the scope of the specified work and shall not be considered as extra. After completion of the work, supplier has to submit "as built drawings": 2 set of hard copies and one soft copy in Autocad.

1.6. Documentation:

Three No. of bound copies of Quality Surveillance reports containing manufacturer's test certificates pertaining to chemical analysis and mechanical properties of materials, Procedure Qualification Record (PQR), Welding Procedure Specification (WPS), Welder's Qualification Record (WQR), "As- Built" drawings, shipping release etc. shall be furnished along with the supply. Wherever applicable, certification from reputed third party like M/s. Lloyds etc. shall be acceptable.

1.7. Vendor evaluation proforma:

The bidder shall provide the infrastructure in tabular form covering the machinery capabilities and man power details. This will be evaluated during the tender process.

1.8. Essential Eligibility criteria to participate in the tender (Bidder Evaluation criteria)

Experiences of having successfully completed similar works during the last seven years. The bidder should have successfully completed three similar works each costing not less than Rs 1.17 Crore [or] Two similar works each costing not less than Rs.1.76 Cr [or] One similar completed work costing not less than Rs.2.35 Cr.

Similar work shall mean "Design, fabrication and installation of structural/ shielding work".

1.8.1. The proof of similar work executed shall be submitted along with the bid [Purchase order /work order & completion certificate/ acceptance report]. The similar works executed in India only will be considered.

1.8.2. The offers submitted by bidders not meeting the essential eligibility criteria or without submitting proof of it will be rejected.

1.8.3. The value of executed works shall be brought to the current costing level by enhancing the actual value of the work at a simple rate of 7% per annum; calculated from the date of completion to the last date of receipt of bids.

1.9. Bid evaluation criteria.

1.9.1. Technical: The sample materials to be submitted along with the bid will be evaluated for internal contamination as specified in section 1.4.1. If samples don't conform to the specifications, that offers will not be considered.

1.9.2. Price bids. The overall landed cost including taxes, installation & testing charges will be considered for arriving L1.

1.10. Acceptance criteria.

1.10.1. All the material supplied shall conform to the specifications given in this tender.

1.10.2. All the components and final assembly of the product shall conform to the approved drawings and to meet the tolerances specified in the drawings approved by the purchaser.

1.10.3. The radiometric inspection of the assembled structure will be done by the purchasers engineer using ^{60}Co source, after completion of the work. The actual effective shielding thickness of the structure shall not be less than 98% of the specified value, in any location.

1.10.4 The sliding door provided shall meet the specifications and its performance shall be demonstrated as per table 2.

Part-II

Fabrication, inspection, testing, erection, installation and lining

2.1 Fabrication:

The fabrication of Steel Room for Lung Counter shall be started only after the approval of QA plan, Fabrication drawings, welder qualification record (WQR), and procedure qualification record (PQR). The steel room for lung counter shall be fabricated in accordance with approved procedure.

2.1.1 Material Control:

Material of construction shall be as specified on the approved fabrication drawings. The fabricator shall maintain a detailed record that lists the description and marking of each piece of material used in the fabrication and shall correlate this information with material test reports. This record shall be incorporated into the fabrication record. Minor defects in material may be repaired after approval of the method and the extent of repairs by the inspector.

2.1.2 Cutting and Forming:

All materials shall be grounded, smoothed and straightened. The material identification markings used during fabrication shall remain distinguishable until fabrication is completed. All materials shall be cut to correct shape and size by suitable mechanical means such as shearing/gas cutting that shall not impair the mechanical/physical properties of the material. If carbon arc cutting is used, at least 1/16" of metal must be subsequently removed from the cut edge by machining. Flame cut edges shall be cleaned of slag by grinding or machining prior to welding.

2.1.3 Cleaning:

Wire brushed and grinding wheels used shall be new. All final grinding shall be made with No. 120 grit or finer grinding wheels.

2.1.4 Jigs & Fixtures:

Temporary mild steel clamps, supports, braces and jigs used during fabrication shall be welded directly to any surface of carbon steel. The supplier shall establish a fabrication and welding sequence to avoid or minimize distortion of the component.

2.1.5 Dimension Control:

- (i) Common drill jigs and templates shall be used for drilling and cutting of identical parts.
- (ii) Removable components having common dimensions shall be fully interchangeable. Jigs and templates used for location of bolts and bolt holes are to be available for the purchaser's inspector for the purpose of checking dimensional accuracy.
- (iii) Dimensions and tolerances stated on the drawings apply to the finished piece of the component.

2.1.6 Welding:

Shielded Metal Arc Welding (SMAW) process shall be used for welding. E7018 electrode with approved relevant test certificates shall be used.

- (i) For base metal thickness greater than 25 mm, a minimum preheat of 79°C shall be used before welding.
- (ii) The size of welding shall be as per the details given in the approved drawing.
- (iii) To assure welds of acceptable quality on the work covered by this specification, each welding procedure to be used in the fabrication and performance qualification of the welder and welding operator must be qualified prior to fabrication in accordance with Section IX of the ASME Boiler and Pressure code. All the qualification testing shall be done under the aegis of Purchaser's representative. A copy of the above two test reports shall be furnished and got approved by the purchaser's representative and form part of the fabrication report.
- (iv) All welding consumables shall be provided with linkable test certificates and shall be submitted to the inspector for review and approval. Electrodes shall conform to the latest AWS/ ASME Section II part C requirements and shall deposit metal comparable in chemical composition and mechanical properties to those of parent metal. The fabricator shall assure the inspector that only the proper welding electrodes are used in fabrication.
- (v) All baking & holding ovens used for E 7018 electrode shall be in good operating condition with valid calibration certificate.
- (vi) Where full penetration double welded butt joints are specified; back chipping is required unless the welding process used assures full penetration.

- (vii) Fillet welds shall have full penetration and have equal legs. The throat of the fillet weld shall be equal to or greater than, the thickness of the thinnest member is being joined.
- (viii) Surfaces to be welded shall be clean and free from foreign material such as grease, oil, lubricants and marking paints for a distance at least 25 mm from the weld preparation area. When weld metal is to be deposited over a previously welded surface, any slag shall be removed.
- (ix) All welds are to be continuous. Other types of welds such as intermitted welds may be used only, if specified in the approved fabrication drawing.
- (x) All welds shall be subjected to liquid penetrant test (LPT) for both root and final passes as per approved procedure. LPT procedure & operator shall be qualified in accordance with ASME Section V Article 6 requirements. The contractor shall provide all LPT consumables and sets of equipment along with necessary qualified manpower. LPT consumables shall have halogen content less than 25 ppm and Sulphur less than 1% by weight. Acceptance criteria of LPT is as per Mandatory Appendix 8 of ASME Section VIII Div 1.
- (xi) Purchaser reserves the right to carry out radiographic examination of randomly selected butt welds as an audit measure. Entire cost towards this activity will be borne by the purchaser. In the event of observing defect in RT, Repairing of Defective portion is in the scope of contractor. RT shall be performed in accordance with ASME Section V Article 2 requirements and the acceptance criteria is as per UW 51 of ASME Section VIII Div 1.

2.1.7 Machining:

All the parts specified in the approved fabrication drawings shall be machined to the accurate dimensions given unless otherwise specified on the drawings, tolerance on any linear dimensions shall not exceed 0.5 mm/meter. Surface finish for machined and fabricated surfaces shall be obtained to the satisfaction of the purchaser. The height of the roughness peak (R_a) shall be <1.6 μ m.

2.1.8. Painting:

All MS surface shall be cleaned thoroughly. Before paint is applied the surfaces shall be dried and free from rust, dirt, scale and grease. MS parts shall be provided with one layer of appropriate coating (redox) to prevent rusting.

2.2 Inspection:

2.2.1 The inspection requirements for the Steel Room for Lung Counter shall confirm to design and fabrication requirements as defined in the relevant codes and standards.

2.2.2 The Steel Room for Lung Counter shall be inspected by the purchaser or his authorized representative at all stages of fabrication to verify that the material identification, dimensions are in accordance with the requirements shown in the fabrication drawing duly approved.

2.2.3 Inspection by the purchaser or his authorized representative will be carried out at the following stages:

2.2.3.1 Inspection of materials compliance with manufacturer's material test certificates and identification of materials

2.2.3.2 Inspection of Steel Room for Lung Counter for dimensional compatibility and finish as per technical specification and approved fabrication drawings.

2.2.3.3 Inspection of natural/manmade Radioactivity level for all the materials and consumables.: Before procurement of steel from the supplier, radiation survey of the steel lot will be carried out by the indenter or his representative for the presence of man made Radionuclides.

A sample plate of the steel to be used for the construction (1"X1") should be submitted along with the tender to MRPU for radioactivity analysis. The company whose sample does not meet the criteria specified in 1.4.1 of part I will not be considered for bid evaluation.

After the placement of Purchase order, the supplier should submit samples from each source and lot of the steel for radioactivity analysis. The radioactivity analysis will be carried out by IGCAR. If the first samples are not found to be satisfactory then the supplier should submit a second sample within 2 weeks of intimation. The first submitted sample analysis will be carried out free of cost. The firm has to pay for subsequent samples at the rate of Rs. 3211 per sample. The payment should be made in the form of SBI DD taken in favour of Accounts Officer, IGCAR, Kalpakkam which should be submitted along with the sample. The sample should be submitted to the indenter. The delivery time should not be affected because of this. Two number of the subsequent samples only will be entertained.

All the steel material should have the batch number.

2.2.4 Proforma for inspection records for Steel Room for Lung Counter shall be got approved earlier by the purchaser's inspector. The fabricator shall maintain records of all inspection and tests. The relevant records and documents shall be finally handed over along with the supply of item.

2.2.5 In case of stage wise inspection, the supplier is advised to proceed from one stage to other only after inspection of each stage. Any non compliance in this regard shall be at the risk of the supplier.

2.2.6 The inspector shall assure himself that the welding procedure, welders and welding operators employed in the fabrication have been qualified in accordance with section IX of

ASME Boiler and pressure code. The inspector shall have the right, at any time, to call for and to witness tests of the welding procedures or tests to determine the ability of any welder or welding operator. All butt joints, T joints and fillet welds including heat affected zone shall be inspected with liquid penetrant as per ASME section VIII div I code.

2.2.7 All passes shall also be examined by the dye penetrant test. All defects shall be repaired and retested. The penetrant material shall satisfy the limits for Sulphur and halogen contents as per the latest ASTM specifications.

2.2.8 Cracks, in line porosity or other linear defects should be removed down to sound metal and then repaired.

2.2.9 All edges and corners inside and outside are to be rounded to a minimum radius of 3/8". Remove all mill and fabrication markings, which mark the surface like center punch marks, scribe lines and stampings. All surfaces shall be free of sharp edges, cracks, pits, oxides, embedded slag, burns, sharp ridges and grooves, weld splatter, tool marks and any other surface irregularities that would make it difficult to wipe clean with a rag or otherwise decontaminate.

2.2.10 Machined surfaces which are specified in the drawing shall have the AA finish according to ANSI B 46.1

2.2.11 in order to enable the purchaser's engineers to carry out the pre-despatch inspection at the supplier's works, the contractor shall send 15 days advance notice to site. All correspondence in connection with this work should invariably quote Purchase Order No. issued by Madras Regional Purchase Unit.

2.3 Erection, installation and lining:

2.3.1 After carrying out the fabrication and assembly at manufacturing works as specified in this tender specification after match marking, the equipment covered in the contract shall be sent to site for erection and installation.

2.3.2 The erection and installation will be done at IRMS, Anupuram. The contractor has to complete the erection and installation job at the site.

2.3.3 All manpower, material handling equipment, machines, consumables, tools and tackles required for handling, erection and installation of the equipment and transportation of all the materials from the contractor's works to erection site shall be arranged by contractor at his cost. Contractor shall demonstrate the smooth performance of the system after the assembly, erection and installation at site.

2.3.4 After erection and installation of steel room, all the inside surface shall be lined with 3 mm Pb+2mm Sn+1mm Cu sheets. This lining shall be done by stainless steel screws and the top surface of the screws shall not be projected outside.

2.3.5 The contractor has to follow the Department of Atomic Energy Security and Safety procedures during erection and installation.

2.4 Test Certificate and Testing:

2.4.1 Test Certificates:

Following test certificates shall be furnished by the supplier and approved by the purchaser:

- I. Manufacturer's test certificates for mechanical properties and chemical composition of all materials and Electrodes used for welding
- II. Dimensional Inspection Reports.
- III. Test certificates for all bought out components mentioned in the approved fabrication drawings.
- IV. Test reports of Liquid Penetration Examination of welded joints

Part-III

3.0 PACKING AND TRANSPORTATION

3.1 PROTECTION:

After carrying out final inspection at supplier's work, the Steel Room for Lung Counter will be properly packed, suitably crated and protected from damage during transport, transit and storage at site. The packing shall include adequate cushioning, blocking, bracing, anti-skidding, hoisting and tie down provisions with the approval of the department. The contractor is fully responsible for any damage to the components during transport and transit and handling at site. If there is any damage to the Steel Room for Lung Counter supplier shall repair the Steel Room for Lung Counter/replace the part as the case may be.

Part-IV

4.0 TIME SCHEDULE AND GUARANTEE

4.1 TIME SCHEDULE:

The supplier shall submit to the purchaser the detailed time schedule and Quality Assurance Plan (QAP) covering various aspects involved in the manufacturing such as

preparation of fabrication drawings, procurement of raw materials, fabrication, inspection, testing, delivery at stores, erection, installation and lining. The entire scope of contracts should be completed within ten (10) months from the date of placement of purchase order.

Table 8: Time schedule			
S.No	Description	Time(month)	Cumulative time(month)
1.	Submission of drawing and steel plates sample for radioactivity analysis	1	1
2.	Procurement of raw material	2	3
3.	Completion of fabrication	2	5
4.	Stage inspection	1	6
5.	Supply at site	1	7
6.	Installation, commissioning and final inspection	3	10

4.2 GUARANTEE:

Supplier shall guarantee that the goods furnished by him shall be in full accordance with the requirements of the specifications. Suppliers shall provide warrantee that the Steel Room for Lung Counter is free from defects in design, materials or workmanship. Warrantee shall cover a period of minimum 12 months from the date of acceptance after erection, installation and lining at IRMS, Anupuram.