भारत सरकार/GOVERNMENT OF INDIA

अंतरिक्ष विभाग/DEPARTMENT OF SPACE

विक्रम साराभाई अंतरिक्ष केंद्र/VIKRAM SARABHAI SPACE CENTRE

तिरुवनंतपुरम/THIRUVANANTHAPURAM – 695 022

विज्ञा. सं. वीएसएससी/पी/विज्ञा./300/2020 दि. DT. 21.05.2020

ADVT. NO. VSSC/P/ADVT/300/2020 DT. 21.05.2020

भारत के राष्ट्रपति के लिए तथा उनकी ओर से वरिष्ठ प्रधान, क्रय एवं भंडार, विक्रम साराभाई अंतरिक्ष केंद्र (वीएसएससी), तिरुवनंतपुरम, निम्नलिखित के लिए मोहरबंद निविदाएं **(क्रम सं. 1 के लिए)** तथा , **ई-प्रापण के ज़रिए** निविदाएं **(क्रम सं. 2 के लिए)** आमंत्रित करता है।

For & on behalf of the President of India, the Sr. Head Purchase & Stores, Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram invites Sealed Tender **(for Sl. No. 1) &** Tenders **through e-procurement (for Sl. No. 2)** for the following :-

क्रम सं. Sl. No	निविदा सं. Tender No.	वर्णन / Description	मात्रा Qty.	निविदा शुल्क Tender Fee
01.	A671-2019-4749-01 **[दो भाग / TWO PART]**	निम्नतापस्थापी Cryostat	1 सं./No.	रु. 560/-
	नोट:- विनिर्देशन तथा विस्तृत निबंधन एवं शर्तें निविदा दस्तावेज़ के अनुसार Note :- Specification and detailed terms & conditions as per Tender document			
02.	VSSC/CMSEPUR/2020E 2006001 **[दो भाग / TWO PART]**	3 अक्ष फिलामेंट कुंडलन मशीन का पुनःसज्जीकरण Revamping of 3 Axis Filament Winding Machine	1 लॉट/Lot	लागू नहीं / NA

निविदा प्रारूप जारी करने की अंतिम तिथि **Last Date for issue of Tender Forms (क्रम सं. / Sl. No. 1)**	**22/06/2020 up to 16:00 Hrs.**
निविदा प्राप् करने की अंतिम तिथि / **Due Date for Receipt of Tender (क्रम सं. / Sl. No. 1)**	**23/06/2020 up to 16:00 Hrs.**
निविदा खोलने की तिथि / **Tender Opening Date (क्रम सं. / Sl. No. 1)**	**24/06/2020 at 10:00 Hrs.**

Sl. No.	निविदा प्रारूपों को डाउनलोड करने की समय-सीमा / **Time limit for download of Tender Forms**	बोली प्रस्तुत करने की समय-सीमा / **Time limit for submission of Bid**	बोली खोलने की तिथि **Bid Opening date**
02.	**Upto 22.06.2020 [17:00 Hrs.]**	**Upto 22.06.2020 [17:00 Hrs.]**	**30.06.2020 [10:00 Hrs.]**

विवरण ई-प्रापण पोर्टल **http://eprocure.isro.gov.in** पर उपलब्ध है।
Details are available on ISRO e-procurement portal **http://eprocure.isro.gov.in**.

शुद्धिपत्र, यदि कोई हो तो, हमारे वेबसाइट **www.vssc.gov.in** / **www.isro.gov.in** में मात्र प्रकाशित किया जाएगा।
Corrigendum, if any will be published in our websites : www.vssc.gov.in / www.isro.gov.in only.

हस्ताक्षरित/Sd/-
वरि. प्रधान, क्रय एवं भंडार / Sr. Head, Purchase & Stores

Note :-

1. Full details and specification of the item and general instructions to be followed regarding submission of tender is indicated in the tender document.

2. Tender Documents can be downloaded from our websites and also be obtained from the following address on request and submission of tender fee :

   For Sl. No. 1 : Sr. Purchase & Stores Officer, SPRE Purchase, RFF Area, VSSC, ISRO PO, Thumba, Thiruvananthapuram – 695 022, Ph : 0471-256 3775 / 3609.

   While requesting for Tender Documents please indicate on the envelope as "Request for Tender Documents- Tender No…….. dt……".

3. Tender Fee (Rs. 560/-) shall be paid in the form of CROSSED DEMAND DRAFT ONLY. Other mode of payment is not acceptable. **The Demand Draft should be in favour of : Accounts Officer, Centre Accounts (For Sl. No. 1) payable at State Bank of India, Thumba, Thiruvananthapuram** [The tender fee is NON-REFUNDABLE].

   Government Departments, PSUs (both Central and State), Small Scale Industries units borne in the list of NSIC and foreign sources are exempted from submission of tender fee. Those who are coming under the above category should submit documentary evidence for the same.

4. While submitting your offer, the envelope shall be clearly superscribed with Tender No. and Due Date and to be sent to the following address.

   For Sl. No. 1 : Sr. Purchase & Stores Officer, SPRE Purchase, RFF Area, VSSC, ISRO PO, Thumba, Thiruvananthapuram – 695 022, Ph : 0471-256 3775 / 3609.

5. Quotations received after the Due Date/Time will not be considered.
6. VSSC, Thiruvananthapuram is not responsible for any postal delay/loss of documents in transit.
7. Sr. Head, Purchase & Stores, VSSC, Thiruvananthapuram reserves the right to accept or reject any/or all the tenders in part or full without assigning any reasons thereof.

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
VIKRAM SARABHAI SPACE CENTRE
PURCHASE UNIT-III,PRSO,RFF AREA
THIRUVANANTHAPURAM 695022
KERALA, INDIA

Ph No: 0471-2563775,3609,3617
Fax 0471-2562105
Email: spso_prso@vssc.gov.in

Date : 11/05/2020

INVITATION TO TENDER

Our Ref No : A671 **2019-004749-01**

M/s

Tender Due: **Hrs ISTon**

Dear Sirs,

Please submit your sealed quotation , in the Tender Form enclosed here along with the descriptive catalogues / pamphlets /literature ,superscribed with Our Ref.No. and Due Date for the supply of the following items as per the terms & conditions mentioned in Annexure(Form No: FORM NO. 20 & 22 ATTACHED

S.No.	Description of Items with Specifications	Unit	Quantity
1	DESIGN,FABRICATION,TESTING,SUPPLY,INSTALLATION,COMMISSIONING , COMPLETE DOCUMENTATION OF LARGE SIZE CRYOSTAT AT VSSC TEST ENVELOPE : DIA 350 mm x 430mm(L) DETAILED SPECIFCATION AND OTHER CONDITIONS AS PER DOCUMENT VSSC/ASOE/HRAG/STED/TR/012/19	NO	1

****

Please Note the Following:-

01. Standard Warranty for 1 Year + 2 Year Extended Warranty is required.

02. Third Party Inspection by BVQI/Lloyds. Clearly indicate the agency in your Technical Bid, and charges,if any, shall be mentioned only in PRICE BID.

03. Detailed Specifications as Annexure-I. Compliance Matrix as per Annexure-II. Commercial Conditions as per Annexure-III. Tenderers are requested to submit duly filled Compliance Matrix along with the Technical Bid.

04. Detailed Cost Break-Up shall be provided in Price Bid (if applicable). All price details shall ONLY be entered in the Price Bid.

05. Tenders shall be submitted on TWO-PART Basis. Detailed Instructions as per Annexure-IV

DELIVERY AT: VSSC

MODE OF DESPATCH BY AIR/SEA/ROAD

DUTY EXEMPTIONS PARTIAL DUTY EXEMPTION APPLICABLE

SPECIAL INSTRUCTIONS COMPLIANCE MATRIX, COMMERCIAL TERMS AND CONDITIONS ATTACHED

SPECIFIC TERMS FORM NO. 20 & 22 ATTACHED

Part A
Technical

A1. General terminology, abbreviation, definition

CF	Cryostat Facility
CS	Control System
DAQ	Data Acquisition
DUT	Device Under Test
EBW	Electron Beam Welding
FDR	Final Design Review
FEM	Finite Element Method
GHe	Gaseous Helium
LHe	Liquid Helium
LH2	Liquid Hydrogen
LOX	Liquid Oxygen
MTBF	Mean Time Between Failure
OFHC	Oxygen Free High Conductivity
PDI	Pre-Deliver Inspection
PLC	Programmable Logic Controller
QA	Quality Assurance
QC	Quality Control
SCADA	Supervisory Control And Data Acquisition
Sub-system	Major subdivision of total system
SS	Stainless Steel
System	Total system under the scope of the document
TMP	Turbo Molecular Pump
TPIA	Third Party Inspection Agency
VSSC	Vikram Sarabhai Space Centre

Chapter 1
General Description and Requirement

1.1 Introduction

In any space mission, the systems, sub-systems &components encounter various environments like temperature, vacuum, mechanical vibrations, acoustics etc during the launch and in-orbit phases and must withstand the extreme environments. For developing higher payload capacity, Cryogenic stage is used in launch vehicle. Cryogenic stage uses Liquid Hydrogen (LH2) and Liquid Oxygen (LOX). Components used in the stage often experience very low temperature of the order of 20 K. Hence, it is essential to prove the launch worthiness of these elements under simulated service condition.

VSSC is developing a number of critical devices which need to be tested and qualified in20K environment. These devices perform important events in Cryo-stage during the launch phases. Hence it is mandatory to have testing capabilities to achieve stringent goals of reliability and schedule. Tests are carried out on these devices under 20K environment to ensure the design adequacy and functional fitness. Being aerospace application, these tests assume great importance and are highly essential. In this context, VSSC proposes to establish additional test facility for 20K tests.

Thermal cycling test between 20 K and 343 K where the test article is subjected to a specified number of cycles comprising of cold and hot soaks is one major requirement. Functional performance test at 20 K is the other requirement needing Cryostat.

1.2 Test Article Description

The test articles, made mainly of metallic, are tested in Cryostat. Size and shape will vary from device to device. The envelope and mass details of test article are given below:

Sl No	Description	Requirements
1	Maximum overall size, mm	Φ330 x 350(L)
2	Mass, kg	1-20(approx., metallic mass)
3	Number of test articles	One unit at a time or smaller units grouped together

1.3 Expected Test Condition

The thermal exposure consists of specified number of cold and hot soaks. The envisaged level limits of temperature to be achieved in Cryostat are 10 K (minimum) and 350K (maximum).

1.3.1 Requirement, Specification/Design feature

1.3.1.1 Type of Cryostat

- Convective cooled cryostat (specimen to be cooled by direct contact of vapour helium, no wetting by liquid helium (LHe)).
- Cryostat supplied shall have the provisions for using the unit in:
  1. Closed loop with gaseous Helium (GHe) as a refrigerant (continuous flow mode).
  2. Open loop with (LHe) as refrigerant.
  3. All operation in closed loop automated through PLC/SCADA.

1.3.1.2 Specimen envelope size (usable test space), capacity & sample positioning features:

- Top loading type having specimen envelope size of **dia. 350 mm and height430 mm**.
- Capacity to cool varying mass in the range of 1 to 20 kg (SS metallic mass) to 10K.
- Suitable sample positioner with test article mounting provision.

1.3.1.3 Temperature requirement

- A temperature controlled zone with uniform temperature is required at the bottom of the sample chamber (test space envelope) This shall be achieved by suitably incorporating controlled Helium vapour flow, proper selection of material of construction at the zone, heater design etc.
- Lowest temperature of test specimen: 10 K (to be maintained steady for 7.5 hrs min)
- Operating temperature range: 10 to 350K
- Time taken to reach 20K from ambient:4 hrs. maximum with 20 kg metallic mass
- Time taken from 350K to 20 K and vice versa:4 - 5hrs maximum with 20 kg metallic mass
- Temperature accuracy at 10 K: ±1K measured over a period of 10 minutes

- Temperature accuracy at 350 K: ±2K measured over a period of 10 minutes
- Steady state temperature homogeneity across the test space: ±2 K
- Automatic temperature controller (through Helium vapour flow rate and heater controls).
- Specify the maximum allowable ramp rate for cooling and heating and necessary interlocks shall be built-in to ensure that the same is not exceeded.

1.4 General Requirement

i) Total system as also all other sub-systems shall be designed for minimum of 240hours of continuous operation without failure. This, apart from reliability of components, must also ensure that there is no additional requirement for Liquid Helium when the Cryostat is operated in closed cycle.

ii) The proposed configuration shall be optimally designed with respect to the requirement of VSSC/ISRO and the supplied utilities like space, electricity, water and GHe/LHe.

iii) The proposed configuration shall ensure highest level of reliability, precision and controllability combined with operation and maintenance ease meeting the safety needs of VSSC/ISRO.

iv) The following guidelines shall be adhered to:

- Selection of mechanical/electrical/electronic equipment/components shall have established generic reliability and long standing in market.
- Judicious incorporation of full or partial redundancy as required while maintaining its cost effectiveness.
- Modular design concept allowing future augmentation.
- High quality workmanship using well trained, well qualified and certified personnel under expert supervision.
- Use of standard/recommended fabrication and assembly procedures and construction practices.
- All gauges, temperature sensors, transducers and instruments shall be from reputed manufacturers and shall be supplied with catalogues and calibration reports ensuring full traceability.
- Full documentation shall be provided on procedures to be followed, standards adhered in design, analysis, fabrication procedure, quality control procedure,

testing, qualification and non-conformances disposed of during course of execution.

v) Efforts proposed shall be put in during design and execution stage for delivering safe and reliable system and wherever possible, MTBF values of individual equipment's or system shall be indicated.

vi) The site for the proposed facility is within200m from the sea shore and hence the entire system including associated electronics shall be able to operate in a salty and humid environment.

vii) Complete system performance shall be demonstrated for a continuous period of 240 hours during acceptance testing as per mutually agreed test plan. During these tests, the systems as well as its sub-systems are expected to be operated to their respective design limits.

viii) Fabrication, transportation and installation schemes shall be compatible with the conditions of local roads and utilities/supports available at the site.

ix) System layout shall be neat and shall ensure easy access to all elements.

x) The chamber shall be fail safe and hazard free during interruption of power, loss of vacuum, GHe etc.

xi) Particle and chemical cleanliness as desired shall be ensured at all stages of facility establishment.

xii) All elements requiring periodic maintenance shall conform to the following:

1. Convenient access, easy assembly procedure.
2. Minimum disturbance to surrounding elements.
3. Locking system, identification marks, keyways, alignment provision, wherever necessary.
4. Steps, platforms, handling support, base etc necessary for proper layout and operation, shall be designed, fabricated and supplied by the vendor along with the Cryostat.

xiii) Being a hot and humid place with salty environment due to nearness to the sea shore, all outside surfaces (all items) shall be passivated.

xiv) The equipment and sub-system layout shall conform to the building layout given this document.

xv) Third party certification at design stage and at all the identified stages of realization and testing is essential.

xvi) The necessary instrumentation, control, safety interlocks, alarms and display of operating parameters of the entire system are to be provided as required to prove the system capability and reliability.

1.5 Scope of Supplier

Design, FEM and FEA of design, Fabrication, Assembly and Testing of Cryostat, its sub system, components and elements, qualification and demonstration, transportation, installation and successful commissioning of the Cryostat at STED/HRAG/VSSC/ISRO, Thiruvananthapuram, Kerala, India. Training of operating personnel of VSSC, complete documentation and third party certification at design, fabrication and testing stages at supplier's premises as per the requirement specification mentioned in subsequent sections below.

List of essential spares for Cryostat and associated systems/equipments with OEM part number shall be provided with price and included in the quote.

The above Cryostat shall have maintenance support by the principal or through an authorised Indian service agent, capable of attending the service call within 48 hrs, at least for 15 years. Supplier should submit the dimensioned layout, envelope size(s), details of equipments and accessories, total as well as individual power requirement including required number of power points with their rating.

1.6 Scope of VSSC

1. Generation of requirement/specification document.
2. Review of techno-commercial offer, recommendation & approval.
3. Providing building layout with offered space.
4. Providing the space as per the layout.
5. Providing utilities like LHe & GHe for the post installation test is in the scope of VSSC. All these tests shall be completed within reasonable time frame. Further requirements of testing and the expenses thereon on account of inadequate design or underperformance of total system, if any, shall be borne by the supplier.
6. Providing electrical power of required ratings.
7. Stage and/or Pre-Deliver Inspection (PDI) by VSSC/third party at supplier's premises.
8. Any civil work required as part of installation, as informed by supplier during design phase.

9. Facilitates installation, trial run & commissioning at VSSC.
10. Entry pass & logistics for the supplier during installation & commissioning work at VSSC.
11. Providing Cryostat lid handling system.

1.7 Documentation requirement

The following approved documents are essential and shall be provided at appropriate stages of the project execution.

1. Specification, design (PDR & FDR) and design analysis documents
2. Design drawings
3. Fabrication drawings
4. Weld configuration drawing
5. Fabrication process plan
6. QC/QA plans
7. Material test certificates
8. Stage and final inspection reports (Dimensional, NDT, visual etc) of components, sub-assembly and assembly
9. Leak test report for stages, pre & post acceptance and demonstration tests etc
10. Non-conformance reports
11. Handling, packing, transportation procedure documents
12. Assembly procedure documents
13. Integration documents
14. Installation & Commissioning plan
15. Integrated facility operation procedure document
16. Acceptance test plan
17. Demonstration test plan (at VSSC)
18. Pre and post acceptance test dimensional and visual inspection report
19. Comprehensive technical descriptions of the critical items
20. All control diagrams
21. O & M manual for all brought out equipment
22. Calibration reports of all measuring & monitoring devices deployed as well as supplied as spares. Report shall be valid for one year from the date of supply.
23. List of all bought out item and spares with origin OEM part number.
24. Third party inspection reports and certification.
25. Catalogues, specification document, Service manuals, warranty certificates etc. for bought-out items

26. Training manual
27. Control system software in CD media with key
28. Any other additional documentation deemed necessary for the project execution / operation.

Chapter 2
Test Chamber

2.1 Introduction

This section provides details of the Chamber specification and construction for the Cryostat. Contractor shall adhere to the proposed specification and achieve the performance requirements.

2.2 Major Scope of Supply

Supply includes the following:

1.	Top loading type having specimen envelope size of diameter 350 mm and length 430 mm.
2.	Sample positioner suitable to handle specimen mass of 1-20kg (metallic)
3.	Sample space closure (top lid) with provision for vacuum and pressure monitoring using single differential pressure gauge.
4.	All surfaces shall be well protected during various stages of fabrication so as to prevent any scratch marks / dents / other defects.
5.	All welds shall be as per ASTM standard. Welder shall be qualified following due procedures.
6.	Outer chamber A. Material of construction: Cryo compatible Stainless steel (SS 304L/ equivalent low carbon austenitic stainless steel). B. All the weld detail shall be brought out in the relevant documents / drawings C. Surface: All external surfaces shall be passivated.
7.	Inner chamber A. Materials: Cryo compatible Stainless steel (SS 304L/equivalent low carbon austenitic stainless steel) &OFHC copper at isothermal zone. B. Inner chamber bimetallic weld shall be properly configured suitable for large number of cyclic operations over many years. C. The inner chamber shall be designed to maintain the required temperature stability. D. Emissivity of chamber shall be such that the required temperature stability

	is maintained. The same shall be measured and reported. Emissivity measured at room condition shall be less than 0.1. E. All the weld detail shall be brought out in the relevant documents / drawings. No brazing or soldering is permitted F. Surface treatment: Thin film metallic coating for inner and outer surface to prevent corrosion. Specify type and thickness in the offer. G. Proper surface finish shall be maintained.
8.	Sample positioner features A. Sample positioner should have test article mounting provision. B. Lifting provision on lid for up and down movement. C. Test article mounting interface: M12 x 1.25-6H D. Mounting provisions for temperature sensor and cartridge heater.
9.	Features like number of vacuum jackets, radiation shield, bayonet etc. to be suitably adopted so as to maintain heat loss to the minimum.
10.	Radiation shield features A. Mode of cooling: Vapour cooled/conductive cooled. B. All the weld detail shall be brought out in the relevant documents / drawings. No brazing or soldering is permitted C. Design shall be compatible for vacuum exposure. D. Temperature gradient across the radiation shield length: 10K. E. Provision shall be there for thawing. F. Provision for automated temperature control for heating and cooling. G. Design shall take care of adequate radiation shield temperature requirement to satisfactorily cater to the wide range of sample space temperature reaching 10 K & 350 K.
11.	Construction features of Copper isothermal zone A. Material: OFHC copper. B. Surface treatment: Thin film metallic coating for inner and outer surface to prevent corrosion. Specify type and thickness in the offer. C. All the weld detail shall be brought out in the relevant documents / drawings. No brazing or soldering is permitted. D. Mounting location of heater and temperature sensors shall be easily accessible for calibration and maintenance.
12.	Vacuum jacket A. Minimum vacuum level: $1x10^{-5}$ mbar *B.* Evacuation port size: NW60 (Minimum)- C. No of evacuation ports : 2

13.	Bayonet (for transferring vapour helium / LHe to sample space) Interface: Suitable for 0.38" OD standard flexible transfer line. Dummy closure: 2 no. Super insulated vacuum jacketed flexible transfer line shall be included in the supply.
14.	Any other necessary hardware as required for realizing the proposed scheme shall be brought out in the quote.
15.	Design of Cryostat: Design shall consider temperature extremities and differential temperature experienced by the Cryostat. It shall be designed for no distortion of shields (when subjected to large number of widely varying temperature cycles), sample chamber, sample holder etc. The design shall be documented and submitted for review and approval by VSSC.
16.	Structural & thermal finite element analysis shall be carried out for all elements including inner copper isothermal zone, radiation shield and fixtures. The results of the FE analysis shall be documented and submitted for review and approval by VSSC.
17.	Following design analysis /calculations shall be done for the chamber systems and submitted during FDR for review. A. Isothermal zone temperature stability, both at 10K & 350 K. B. Radiation shield stability under vacuum& at temperature extremes. C. FEM model of the overall unit. D. Chamber lower structure rigidity verification. E. Anchoring structure calculation. F. Positioning of all the ports and flanges. G. Positioning of all interface with the supporting structure of the radiation shield.
18.	All fabricated components and sub-assembly shall be inspected for dimensional conformity and reports shall be generated. Appropriate techniques shall be employed defect detection/ elimination and defects, if any, shall be suitably corrected through proper procedure and reported to VSSC.
19.	Suitable mechanism shall be devised to dispose all snags, repairs, if any, shall be carried out following due procedures and reported to VSSC.

2.3 Detailed specification of test chamber system

2.3.1	**Purpose**		Cryostat is used for thermal cycling and functional test exposure for critical space

			systems. Test articles are tested at the specified environment of temperature (10K and 350K), based on test requirement.
2.3.2	**Overall System Requirements**		
2.3.2.1	**Sample space loading**		Vertical (Top loaded)
2.3.2.2	**Clear test space (within test space envelop)**		Test space shall be configured by OFHC copper isothermal zone. Test space ofDiameter: 350 mm, Length: 430 mm (along chamber axis).
2.3.2.3	**Configuration**		Design configuration shall meet the requirement specified. Party should specify the following dimensions in PDR. 1. Chamber outer diameter. 2. Overall length. 3. Radiation shield dimensions. 4. Estimated shell thicknesses. 5. Top lid thickness.
2.3.2.4	**Chamber support**		Party shall provide appropriate mounting base. Location requirements of associated equipment shall also be specified.
2.3.2.5	**Test article loading & unloading**		Manual
2.3.2.6	**Ports & Interfaces**	1)	Pressure line: Seamless tube of cryo compatible material having ID 6 mm & OD 10 mm (meant for pressurization of test specimen during environmental exposure) along with suitable feedthrough.
		2)	Sample tube vent port
		3)	Electrical feed through: 50 pin connector, 10 Amps rating-2 Nos, Type: Through & through
		4)	Pressure relief valve ports with suitable safety relief valves.
		5)	Temperature sensor (mounted on test article) feed through ports.
		6)	Dummy port of NW 25 with closure-2 no.

		7)	Blank NW 50 with closure -1 no.
		8)	Vacuum port NW 40 -2 no.
		9)	Test article temperature sensor feed through ports (for 15 no. of channels).
2.3.2.7	**Special provision**		Anchoring points for radiation shield such as mounting lugs and other supports. Design should take care of all thermal and structural loads. Details to be worked out by contractor and presented during the design phase.
2.3.2.8	**Permissible Leak rates**	1)	Individual leak rate (helium) shall be better than $5x10^{-9}$mbar·L/s. Total leak rate of the vacuum jacket should be better than $1x10^{-7}$mbar·L/s. before and after subjecting to operational cycle. This shall include leaks from vacuum jacket, radiation shield etc. This shall be verified at various stages of fabrication as per QA plan and witnessed by TPIA.
		2)	All weld joints of radiation shield, outer chamber , inner chamber, 'O' ring seals and any other joint used on pressure /vacuum interface shall have individual leak rate better than $1.0x10^{-8}$mbar.L/s.
2.3.2.9	**Material of construction**	1)	Outer chamber: Cryo compatible Stainless steel (SS 304L/equivalent).
		2)	Inner chamber: Cryo compatible Stainless steel (SS 304L equivalent) & OFHC copper.
		3)	Radiation shield: Appropriate material shall be selected meeting the requirement.
		4)	Sample positioner: Cryo compatible Stainless steel(SS 304L/equivalent) & OFHC copper.
		5)	Supports for fixing radiation shield, all flanges, including user ports, feed throughs, blank off flanges and other parts or elements both exposed not exposed to vacuum shall be made of SS 304L/equivalent.
		6)	The design shall have adequate margin to take care of pressure/vacuum and temperature

			effects and its combination on material.
2.3.2.10	**Interface seals**		All O rings shall be compatible for low temperature application. 'O' ring shall be joint free, single molded type, baked and free of any surface defect. Seals at user required ports shall be with retainer and O-ring and clamps suitable for ISO/NWF connections.
2.3.2.11	**Chamber Internal finish and sealing surface finish**		Surface finish for all vacuum exposed surfaces & sealing surfaces shall be between 0.025 to 1.6 µm (Ra value)
2.3.2.12	**Fabrication**	1)	All finished component / elements shall be safeguarded against scratch, damages, contamination etc. at all stages of fabrication.
		2)	All "O" ring grooves and matching surface shall have surface finish 0.025 to1.6 microns and shall meet the leak rate requirements.
		3)	Blank off flanges shall be provided for all ports (both user ports and system ports on the chamber) with gaskets/"O" rings, retainers and fasteners.
		4)	All welding shall be as per the ASTM standard meeting design requirements

Chapter 3
Vacuum System

3.1 Introduction

The main objective of the vacuum system is to pump out vapours and gases present in the isolation area and thereby maintain a thermal isolation. These gases are present in the system and given out by outgassing from the vacuum jacket and chamber elements during testing.

Following guidelines shall be considered for suitably configuring the vacuum system:

i) All vacuum pumping system and vacuum control shall be integrated through PLC.
ii) Pumping system: Turbo & Dry friction less scroll pump in single chain.
iii) Vacuum jacket evacuation: Vacuum level $1x10^{-5}$ mbar or better for operational requirement.
iv) Sample space evacuation and purging operation to avoid ice formation in sample space and flow lines ensuring a moisture free helium environment.
v) Necessary bellows/vibration isolation systems shall be provided for preventing pump vibration from transmitting to the cryostat.
vi) Appropriate pump capacity and port size shall be selected to ensure that the pump down time specified is achieved.
vii) Provision shall be there for isolation and to switch-off the pumping system on achieving required vacuum level.
viii) Total pump down time shall be less than 60minutes from ambient to vacuum of $1x10^{-5}$ mbar with single chain and with gas loads of internal elements at ambient temperature.
ix) Pumping system shall have adequate pumping capacity for continuous operation up to 240 hrs.
x) Safety interlock shall be provided to ensure specified vacuum is reached before starting of closed loop system operation. However, GUI based override (with supervisory control) shall be provided.
xi) All necessary safety interlocks required for the safe operation / shutdown of the various sub systems shall be satisfactorily addressed in the PLC system and the same will have to be demonstrated during acceptance test.

3.2 Vacuum System Sizing

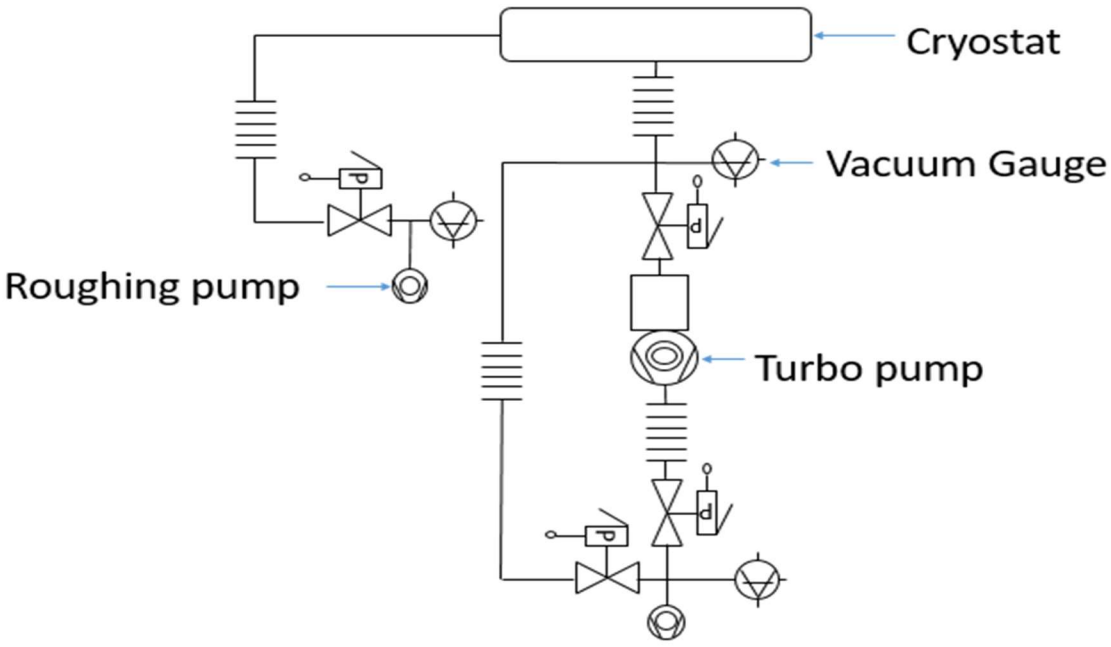
Configuring and sizing the vacuum system for the intended application involves:

- Conductance loss calculation and estimation of effective pumping speeds at the pumping ports.
- Estimation of active and passive gas loads for vacuum jacket and radiation shield elements and other internal elements.
- Evacuation time calculation for rough vacuum pump (Dry scroll pump).
- Evacuation time calculation for total pumping system.

For these calculations, the relative locations of the chamber vacuum system elements are to be chosen considering minimum conductance losses.

The proposed vacuum system shall include Dry scroll pump (roughing) and Turbo-molecular pumps, Chamber air admittance valves, Roughing lines, electro-pneumatic valves, vacuum monitoring and instrumentation system. Operation and control of pumps shall be through PLC.

3.3 Detailed Specification of Vacuum System



3.3.1	**Purpose**		The vacuum system is to create and sustain a desired vacuum level within the specified time period inside the vacuum jacket with the radiation shield and its attachments.
3.3.2	**Overall System Performance Specification**		
3.3.2.1	**Type**		Oil free clean vacuum system with adequate redundancies as above
3.3.2.2	**Configuration**	1)	a. Single chain of Dry scroll pump capable of achieving a vacuum level of $1x10^{-2}$ mbar, connected through electro pneumatically operated gate valves &bellows. The Roughing Dry scroll pump shall have gas ballast facility and oil mist eliminator with oil return circuit. b. Vacuum gauge shall be provided for each stage. c. Vacuum pump operation: Independent operation of Dry multi roots pump& turbo pump. d. Vacuum gauge on/off operations. e. Real time vacuum gauge readouts. **Details of rough vacuum system:** 1. Dry multi roots pump **Make: M/s Pfeiffer/Addison** Qty: 2 Nos 2. Gate valve (Electro-Pneumatic): **Make: VAT, Pfeiffer vacuum** Size: appropriate to the port design Qty: 2 Nos 3. Bellow (SS 316 Hydro formed): **Make :M/s Pfeiffer/Mewasa** Size: appropriate to the port design Qty: As per requirment.
		2)	i) Turbo Molecular Pumps (TMP)capable of

			achieving a vacuum level of $1x10^{-5}$ mbar or better. Make: **M/s Pfeiffer** ii) TMP shall be air cooled. iii) Two separate lines with independent connection to the ports on vacuum jacket and connecting the TMP to the port through electro pneumatically operated gate valves & bellows. iv) Vacuum chain shall have one TMP and one back-up Dry multi roots pump in series. **Details of fine vacuum system:** **1. Turbo Molecular Pumps (TMP)** **Make: Pfeiffer vacuum** Qty: 1 No. **2. Gate valve (Electro-Pneumatic)** **Make: VAT, Pfeiffer vacuum** Size: appropriate to the port design Qty: 2 No. **3.Bellow (SS 316L Hydro formed)** **Make: Mewasa** Size: appropriate to the port design Qty: As per requirement v) TMP controller shall be provided with suitable voltage stabilizer, spike arrestor etc. vi) Appropriate isolation shall be provided between TMP and dry multi roots pump.
		3)	All electro pneumatically operated vacuum gate valves shall be made out of stainless steel and the valves shall be operable either by compressed air. The provision shall be made at the common main

			inlet line for air or GN2 with necessary isolation valves
Note: Pump Models indicated above are tentative and shall be finalized during design review. Pumping speed for the entire vacuum system shall be computed by the Contractor. Computed values shall be submitted during PDR.			
3.3.2.3	**Vacuum measurements**	1)	Vacuum level measurement for vacuum jacket and sample space.
		2)	Adequate vacuum measurement gauges (preferably Pirani/Capacitance gauges for rough vacuum measurements and cold cathode gauge for high vacuum measurements) with display shall be provided for total vacuum system. *1. Pirani gauge: up to 1.0x10^{-2} mbar,* *2. Capacitance Gauge: up to 1.0x10^{-4} mbar* *3. Cold Cathode gauge:1.0x10^{-3}mbar to 5.0x10^{-9} mbar* *Qty: 2 nos. each*
3.3.2.4	**Vacuum gauge types & locations**	1)	Vacuum gauges for vacuum measurement at different locations shall be available as given below. I. Sample space: *Pirani gauge* II. Vacuum jacket: *Pirani gauge, Capacitance Gauge and Cold Cathode gauge*
3.3.2.5	**Vacuum control**		Through PLC. However, manual overriding feature shall be provided through GUI.

Chapter 4
Thermal System

4.1 Introduction

Thermal system is used to achieve the extreme temperature environments (10K to 350K) for continuous operation. The Design philosophy shall be adopted for the extreme temperature conditions encountered during operation. This system envisaged is formed by a copper isothermal zone for sample space envelope and radiation shield for thermal barrier.

The radiation shield design and configuration shall be such that it achieves the following requirements:

- Desired temperature uniformity in the sample space.
- Minimize heat loss from inner test space to ambient.

The temperature shall be controlled and the required control logic shall be worked out by monitoring the reference temperature for copper isothermal zone. Steady state temperature uniformity within the test space shall be$\pm$1 K at 10K and $\pm$2K at 350Kassuming that the test article is more or less uniformly distributed over sample space. Temperature overshoot of the test article shall not exceed 2 K, both in cold and hot tests. The mass of the test article varies from 1 to 20 kg. Heating/cooling system design shall consider thermal mass, temperature requirement, material of construction, their thermo-physical properties etc. Thermal system shall be designed so as to achieve the ramp rate envisaged during cooling and heating phases. Temperature uniformity in steady stage condition within the test space shall be $\pm$2K.

4.2 Sample space cooling/heating

- Closed loop cycle
  - Cooling method: Vapor helium
  - Input refrigerant: GHe
  - Heaters: Should meet the requirements of both heating as well as temperature maintenance of Helium vapour, number of heaters and wattage shall be selected based on heating and cooling requirement, shall be compatible for operation at 10 K.

- Selection of cooling and heating modes and temperature should be controlled through PLC/SCADA.

- Open loop cycle
  - Cooling method: Vapor helium
  - Input refrigerant: LHe
  - Heaters: Should meet the requirements of both heating as well as temperature maintenance of helium vapor, no. of heaters and wattage shall be selected based on heating and cooling requirement, shall be compatible for operation at 10 K.
  - Selection of cooling and heating modes and temperature should be controlled through PLC/SCADA.

4.3 Radiation shield cooling/heating

- Closed loop cycle
  - Cooling method: Vapor helium/Cold head type
  - Input refrigerant: GHe.
  - Heaters: Should be provided to meet the requirements of both heating as well as temperature maintenance of radiation shield.
  - Selection of cooling and heating modes and temperature should be controlled through PLC/SCADA.

4.4 Sample space detail

Sample space shall be made into an isothermal zone using OFHC Copper mounted with heating elements (cartridge heater), closed loop gas re-circulation system (GHe) and open loop LHe cooling system. The copper isothermal zone should allow controlled cooling and heating of specimen in the chamber. Cooling and heating modes and temperature should be controlled through PLC/SCADA.

In cold test, with closed loop gas re-circulation system (GHe) or open loop LHe cooling system, the temperature on the test specimen shall be brought to 10K, depending on the mode selected. In hot test, with cartridge heater, DUT temperature shall be brought to 350 K. Temperature uniformity across the test space envelop shall be within ±2K.

Working Temperature : 10K to 350 K

Construction material : OFHC Copper in isothermal zone (bottom half), SS 304L in top half which are EB welded together, and cartridge heater mounted at the bottom of isothermal zone.

4.4.1 Detailed Specification of sample space (Isothermal zone)

4.4.1.1	**Purpose**	:	Sample space is meant for thermal conditioning of test article predominantly by conduction and convection.
4.4.1.2	**Materials of construction**	:	OFHC Copper
4.4.1.3	**Configuration**	:	Cylindrical but optically tight arrangement giving total clear specimen volume not less than dia. 350 mm and 430mm height.
4.4.1.4	**Design capability**	:	Shall be designed for service temperatures of 10 K and 350 K, pressure 10 psi and vacuum 10^{-2} mbar.
4.4.1.5	**Construction**	:	Bimetal construction, bottom isothermal zone using OFHC Copper and top zone with SS 304L/equivalent, joined by EBW
4.4.1.6	**Leak tightness**	:	Individual leak rate shall be better than 5x 10^{-9} mbar l/s and total leak rate (sum of all leaks) into the chamber shall be better than 1x10^{-7} mbar l/s before and after subjecting to operational cycle. Shall be verified at various stages of fabrication as per QA plan and witnessed by TPIA.
4.4.1.7	**Surface Finish**	:	Inner surface of the isothermal zone has to be polished to better than 1.6 microns.
4.4.1.8	**Surface coating**	:	Suitable thin metal coating, compatible for stainless steel and copper, meeting the temperature uniformity and extremities, shall be provided. Shall specify the coating material and thickness in offerand shall be included in the design report.

4.5 Radiation shield detail

4.5.1	**Purpose**	:	To minimize the thermal coupling between inner chamber and outer chamber
4.5.2	**Materials &construction details**	:	Material selection based on design, detachable type mounting
4.5.3	**Design &Configuration**	:	Suitable design shall be adopted so as to minimize heat loss. Cylindrical configuration, appropriate shielding for isothermal zone shall be obtained by design. Adequate stiffening shall be considered at design stage.
4.5.4	**Structural requirement**	:	Shall have adequate stiffness. Neither pressure / vacuum nor thermal gradient or its combination shall not cause any permanent deformation to radiation shield and associated structures after subjecting it to number of operational thermal cycles. It shall be proof tested to 1.5 times operating pressure.
4.5.5	**Surface Finish**	:	Suitable surface finish shall be adapted.
4.5.6	**Surface coating**	:	Suitable coating to minimize the radiation losses.
4.5.7	**Cooling method**	:	Cold head or Vapour helium.
4.5.8	**Uniformity of temperature across height**	:	a) ±10K (on stabilization) b) ± 20K (during transition)
4.5.9	**Accuracy of control**	:	±10 K
4.5.10	**Temperature Monitoring**	:	Through suitable RTD, mounted top and bottom, two nos. each, shall be offset by 90 deg. Between top and bottom sensors.

4.6 Temperature sensor

Type : Cernox RTD
Temperature range : 0.10K to 350 K
Sensitivity : -10785 to -0.0654Ω/K

Temperature accuracy	:	±3.6 to ±414mK
Resolution	:	6μK to 16mK

Note: Temperature sensor shall be as per the above specification or select appropriate model to meet the requirements.

Chapter 5
Control System

5.1 System architecture

As the launch vehicle component's acceptance test in Cryostat requires personnel participation round the clock for days, the implementation of suitable automation systems, control and data acquisition capabilities will help in significantly reducing the total run time, manpower requirement and helps in improving efficiency, reliability and test support quality. Additionally, the Control System (CS)for cryostat shall be designed and configured to control interlock and sequencing logic, provide continuous/ customized check of sub-systems and to acquire, process, store and display data in user-defined formats for real time decisions or post-test analysis.

Programmable logic controller (PLC) with Supervisory Control and Data Acquisition (SCADA) software has been chosen to perform the control functions keeping in mind the following requirement:1) flexibility, i.e., the ability to modify control strategies, displays etc,2) expandability, i.e., extension to other process unit's additional I/O or consoles, 3) interconnectivity, i.e., present or future communication ability with other system or devices, 4) better operator interface and5) higher reliability and maintenance free operation. Limited memory, multi–tasking requirement and limited communication capabilities of PLCs may not permit equipment performance analysis or real time overview of process parameters. Hence, additional computer based systems are required to accomplish performance analysis and real time view of the equipment and test object status.

The control system shall have the following features:

1. Cryostat control system shall be designed and configured to provide control and to implement sub-system level interlock and sequencing logic, inter sub-system level interlock to ensure the safety of operating personnel, test object and equipment.
2. Facility control system shall have the provision for following modes operation.
   - Closed loop cycle: Fully automated mode of operation
   - Open loop cycle: Fully manual mode of operation
3. Programmable Logic Controller (PLC/SCADA) shall:

- Acquire reference temperature from sensor mounted on sample mount and bottom of isothermal zone.
- As multiple test articles are mounted and exposed to 20 K in single go, count soaking start time only when both reference temperature reach 20K and required temperature homogeneity is achieved.
- Shall control the refrigeration system (in closed loop)

4. Facility shall be controllable from the Desktop Computer/Laptop (industrial grade) and shall be implemented in such a way that with a single initiation from the console, the process shall proceed automatically with the operator remaining as an observer as the process proceeds to its defined completion in Auto mode. Necessary control logic, sequencing and safety interlocks to be built into the PLC / software.

5. Test profile input shall be accepted through GUI in the PC. PLC shall process and control the connected systems to complete the test as per the input.

6. Provision shall be available for the selection of operation mode, ie, open loop or closed loop, through GUI and appropriate control system initiation.

7. Instrumentation, control, data logging and display of test parameters:

   - Real time display, logging of vacuum and temperature data and plotting of time vs temperature graph of all RTDs.
   - DAQ system (PLC/SCADA) software appropriate to the equipment shall be provided and shall have lifelong licence.
   - The software shall be installed in the industrial grade PC sourced from Indian market (reputed make like Advantech, Data pro etc.) by the Indian agent and made operational. Shall have high end graphic capabilities.
   - All the instrumentation required for the data acquisition and control operation of the cryostat shall be in the scope of supplier.

8. Total automation needed for the control and operation of the Cryostat is in the scope of the supplier.

5.2 Measurement and control requirements

The main measurements in thermal system are temperature measurements in copper isothermal zone and radiation shield, helium vapour flow measurement and vacuum measurement. The major control functions involve operation of closed loop He cycle. The CS should control the temperatures of copper isothermal zone and radiation shield as per the test input profile and feedback from the thermal environment generators,

radiation shield and isothermal zone through temperature controller integrated to PLC and SCADA software. Heating required both for hot and cold test shall be controlled in the similar manner with field inputs and outputs. Provision shall be available for independent temperature control in radiation shield and sample space.

5.3 Instrumentation requirement

5.3.1 Temperature control

1. Close loop PID controller and recorder for temperature control and monitoring sensors.
2. Provision for plotting temperature vs time graph.
3. Configuring PLC & development of SCADA software based on the output of the PID controller.
4. All instrumentation required for data acquisition (temperature, vacuum, Helium vapour flow rate etc) for the operation of the chamber shall be provided by the supplier.
5. Automation includes total control of the system/test process with real time plotting of temperature vs time graph in addition to temperature maintenance during the test cycle.
6. Control logic shall be device based on reference temperature measured at sample mount and bottom of isothermal zone. Soaking starts only when both reference temperatures reach 20 K or below.
7. Test time shall be counted when the specified temperature homogeneity is reached in sample space.
8. Cooling and heating ramp rate assumed for design and operation shall be settable through GUI between minimum and maximum value. Alarm (visual indication in console & audible) shall be raised if bounds are exceeded.

5.3.2 Helium Flow Control

1. In close loop system, low temperature vapour flow shall be controlled through appropriate flow control valves/meters with feedback provision, preferably actuator type control system. The flow control system shall be integrated and control through PLC/SCADA to achieve the desired thermal condition inside the sample cryostat.

2. In open loop system, liquid helium flow shall be controlled through manual metering valve.
3. Design shall take care of flow rate requirement for extreme conditions of thermal mass and test temperature.

5.3.3 Vacuum Control

The following features shall be provided as part of vacuum control.

1. Vacuum pump operations: Independent operation of rotary & turbo pumps through PLC/SCADA.
2. Vacuum isolation valve operations (Pneumatic valves).
3. Vacuum gauge ON/OFF operations.
4. Real time vacuum gauge read-outs at remote console.
5. Vacuum pump sequencing and operation shall be integrated to and controlled through remote console.
6. During power failure, the vacuum system shall be in fail-safe mode.

5.4 Data acquisition and logging

Provision for real time acquisition of temperature *(15no.monitoring on test article, 4 no. control on radiation shield and 2 to 4no. control on sample space),* vacuum level and helium vapour flow through PLC/SCADA system using LAN. Sampling rate of acquisition shall be as follows:

1. Test article temperature (for monitoring) : 10 samples/s (all sensors)
2. Radiation shield temperature (for control) : 5 samples/s(all sensors)
3. Sample space temperature (for control) : 5 samples/s (all sensors)
4. Vacuum level (for sequencing and monitoring) : 5 samples/s (all sensors)
5. Helium vapour flow (for control) : 5 samples/s (all sensors)

However, the sampling rate shall be operator specifiable (settable) through GUI. Test profile input shall be through GUI. Provision shall be available for saving all inputs for future reference. Temperature sensor shall be managed by suitable data recorder and taken to PLC for control/monitoring. Reference temperature shall be acquired from sensor mounted on sample mount and bottom of isothermal zone.

Heater power and vapour Helium flow rate control shall be controlled to meet the test profile and temperature homogeneity in test space. Provision shall be made for superimposing the control and monitoring temperature data on the graphical plots. Different levels of authorisation like Admin., Test Authorisation, Operation, View etc shall be provided with user ID and password control.

Complete instrumentation for data acquisition in the scope of supplier. The basic configuration of external industrial PC shall be as follows:

1. Processer type : Intel core i7-880 processer or advanced.
2. RAM : Minimum 8GB.
3. Hard disk : 2TB
4. Monitor : LED 32”
5. OS : Windows based
6. Colour laser jet printer : Required for printing/plotting of data

Industrial grade PC of required configuration (reputed make like Advantech, Data pro) and Colour LaserJet Printer (HP) shall be sourced from India through the Indian agent. Cryostat supplier shall install the DAQ software in the PC and interface with the supplied PLC system. Lifelong development license for software shall be provided. One-year post installation software support shall be extended.

All the instrumentation required for the data acquisition for the operation of the Cryostat shall be provided/is in the scope of supplier.

All control shall be through PLC.PLC design shall have built-in self-diagnostic features like logic error handling, alarms, communication failure etc. PLC and SCADA software shall be user friendly with good documentation support. All software licenses shall be transferred to VSSC. All necessary passwords (for operation as well as for meeting emergency / re-installation requirements) shall be provided to VSSC.

5.5 Design Guideline

1. Hardware used for data acquisition and control shall preferably be designed with following features:
   - ‘Plug & Use’ type with software configurable settings with address.

- Hardware shall have sufficient protection against over voltage, over heating etc with good stability.

2. PLC design is preferred with following features:
   - Industrial grade design in terms of high electrical noise immunity, compatible to harsh environmental conditions and rugged construction.
   - Built-in self-diagnostic features like logic error, alarms, communication failure etc.
   - Future expansion capabilities in terms of hardware and software.
   - User friendly PLC software / Programming interface with good documentation.
   - Graphic User Interface for test profile input/edit.
   - Provision for real time modification of test profile.
3. Overall system design shall have adequate redundancy to reduce downtime during failures.
4. Overall system design shall have in built capabilities to take care of technological up gradation in hardware or software.

5.6 Software

1. Software necessary for the control system shall be developed and tested by the supplier.
2. All software shall have lifelong license.
3. The software shall be installed in the industrial PC supplied by vendor.
4. A copy of all necessary software shall be provided for re-loading in case the pre-loaded software is corrupted.

Chapter 6
Quality Assurance

6.1 QA Management

AeroSpace Ordnance Entity, VSSC, shall be the prime agency for the entire operations connected with establishment of Cryostat Facility (CF). However, cryostat design, fabrication and testing at all stages shall be certified by mutually agreed third party.

6.2 General Requirement

Third party inspection Agency (TPIA) involvement from design upto the final certification stage is essential. Once the process is finalized, QC and QA plans (made by the Contractor) shall contain all third party inspection/certification stage details. Once these plans are approved by VSSC, the same shall be followed. Welding jobs shall be done with qualified welders only. All weld joints subjected to vacuum/pressure/structural loads shall be 100% radio graphically inspected and certified by third party. The third party inspection and stamping shall be available at all stages of fabrication including raw material procurement.

The design, development, procurement of materials equipment, manufacture, assembly, factory qualification testing, containerisation, transportation, installation, acceptance/performance evaluation testing at works/site and commissioning shall be done as per the Project realization plan.

The Contractor shall have all the required facilities, resources and expertise to meet the specification requirements of the contract. The design, analysis, verification and reviews shall be carried out to ensure that the quality requirements are met during the entire life cycle.

6.3 Documentation

The following documents shall be supplied by the Contractor and the same shall be reviewed by TPIA and or VSSC.

1. Specification, design (PDR & FDR) and design analysis documents
2. Design drawings
3. Fabrication drawing
4. Weld configuration drawing
5. Fabrication process plan
6. QC/QA plans

7. Material test certificate
8. Stage and final inspection reports (Dimensional, NDT, visual etc) of components, sub-assembly and assembly
9. Leak test report for stages, pre and post acceptance and demonstration (at VSSC) tests etc
10. Non-conformance reports
11. Handling, packing, transportation procedure documents
12. Assembly procedure documents
13. Integration documents
14. Installation and Commissioning plan
15. Facility operation procedure document
16. Acceptance test plan
17. Demonstration test plan (at VSSC)
18. Pre and post acceptance test dimensional and visual inspection report
19. Comprehensive technical descriptions of the critical items
20. All control diagrams
21. O & M manual for all brought out equipment
22. Calibration: Calibration certificate for all measuring and monitoring devices like thermal sensor, temperature controller, indicators, vacuum gauges etc shall be provided from an approved certifying agency. Method of calibration and periodicity of calibration of cryostat/sensors may be mentioned in the offer. Shall provide self-calibration features in system for the periodic verification of performance wherever applicable. Calibration shall be valid for one year from the date of supply.
23. List of all bought out item and spares with origin OEM part number
24. Third party inspection reports and certification
25. Catalogues, specification document, service manuals, warranty certificates etc. for bought-out items
26. Training manual
27. Control system software in CD media with key. Any software developed shall be given to VSSC in installable CD media along with source code. Any licensed software used in the system shall be given to VSSC along with the development license. License shall be valid for life long.
28. Any other additional documentation deemed necessary for the project execution

An effective Quality management system shall be established to demonstrate achievement of desired quality levels during the entire course of realization of the Project. Traceability of all system including raw material shall be maintained.

Non-conformances shall be reported in separate reports. The items with non-conformances shall be used only after detailed review and acceptance.

All parts shall be protected against corrosion, contamination and deterioration during fabrication phase. The workmanship standards shall be established throughout various phases of manufacturing, assembly and integration to ensure acceptable and consistent quality levels.

6.4 Design review

Preliminary design shall be offered for review by VSSC to assess the adequacy and validity of system definitions.

Final design reviews will be done to ensure that the design meets all input requirements.

The detailed design drawings, process plan and QC plan incorporating the operational details shall be generated and reviewed.

Design shall be approved by design review committee(s).

6.5 Acceptance and delivery

A formal acceptance plan shall be established to assess the capability of the facility against the specification requirements.

Inspection & quality control requirements	1)	All materials must be tested at source for composition and strength values prior to use and shall be certified.
	2)	Strict quality control and approved third party inspection must be implemented.
	3)	Welding procedure qualification and welder qualification shall be done as per ASME section IX. All welding operations shall be done by qualified welders only.
	4)	Non-destructive testing like DP Test, Ultrasonic examination and Radiography shall be carried out as per applicable standards used for design of chamber and also as per vacuum system design practice.
	5)	A comprehensive inspection and quality control scheme shall be prepared and implemented in respect of each of the systems/sub-systems.

Acceptance and Demonstration tests of Cryostat	1)	Supplier shall generate acceptance plan to assess/demonstrate the capability of the supplied Cryostat system against the specification/ requirements.
	2)	Acceptance test shall be carried out with dummy mass and as per the test profile provided by VSSC.
	3)	The mutually agreed test plan shall be vetted by VSSC.
	4)	Pre and post-test / repeated cycling tests inspection and measurements (visual, dimensional etc) shall be included to demonstrate the structural design adequacy.
	5)	The elements of the cryostat shall be leak tested at all appropriate stages of realization (witnessed by TPIA) including pre and post factory acceptance test and post installation tests (at VSSC) stages.
	6)	No individual leak in weld joints shall exceed 1×10^{-8} mbar l/s before and after subjecting it to operational cycle (wherever possible).

6.6 Performance evaluation

The equipment shall be factory tested to demonstrate its capability to meet the design requirements. A typical cycle, specified by VSSC, shall be demonstrated exercising the design to the extremes of all operating parameters. All sub-system shall perform to the requirement and overall capability achieved. All control functions and in-built interlock capability shall be verified.

Performance shall be verified both for closed loop and open loop modes. Time to reach the specified thermal limits shall be verified in closed loop operation. In open loop mode, LHe consumption for typical duration / cycle (after stabilization) shall be verified to assess the total heat in-leak and effectiveness of shields / jackets.

6.7 Post-test inspection

Measurements critical dimensions need to be done after cycling tests / demonstration for worst case scenario. The same shall be compared with pre-test values.

6.8 Warranty

The equipment supplied shall have post-installation warranty for one year against faulty components and inadequate performance. Any repair/replacement carried within the warranty period shall be free of cost. Extended warranty for 5 to 10 years beyond normal one-year warranty period with the scope of work and additional cost shall be indicated at tender stage.

6.9 Standards and quality control

Vendor must specify quality standard followed at all manufacturing works where system/subsystem is manufactured (say, conforming to ISO, CE, UL, ASME, ASTM etc).

6.10 Tools

Set of maintenance tools and any special tools required for the regular operation of the cryostat shall be supplied along with the equipment.

6.11 UPS

On-line UPS of sufficient rating, with 30-minute backup of a reputed make shall be provided as a power back up for the control system.

Chapter 7
Safety Requirement

7.1 Introduction

This chapter includes the total safety requirements of Cryostat Facility (CF). Redundant safety features, wherever feasible, shall be incorporated for CF. Safety system shall be divided into the system and sub-systems levels.

7.2 Sub-system Level Safety Provision

Safety provisions for various sub-systems are given below:

7.2.1 For test chamber

Chamber shall be designed compatible for extreme temperature conditions (10K – 350K), Pressure (10psi) and vacuum (10 mbar). Appropriate relief systems with redundancy shall be incorporated. All the exhaust generated shall be vented safely above building height meeting VSSC safety requirements.

7.2.2 For vacuum system

Exhaust plumbing lines of vacuum pumps shall be designed properly for easy dispersion of exhaust gases outside the building above building height meeting the safety requirements of VSSC. In case of power failure, the system shall be in fail- safe mode.

7.2.3 For Thermal System

Temperature overshoot shall be maintained within the specified limit. Suitable calibrated pressure and temperature sensors shall be used for operations of Cryostat and all associated equipments. All venting lines shall be designed properly for easy dispersion of exhausts outside the building and above building height meeting the safety requirements of VSSC.

7.2.4 For control system

Control system shall have all necessary safety interlocks. In case of power failure, the

entire system shall be in fail safe mode. Elements of the control system shall be capable of running both in closed loop and open loop modes as per the mode selected.

7.3 General safety features

The following general safety features shall be followed for CF by the Contractor.

- Design requirements shall conform to approved codes and standards.
- Manufacturing and inspection shall be as per the approved procedures.
- Electrical safe guarding shall be done as per approved procedures.
- Written down procedures for facility operations and maintenance shall be generated and provided.
- Do's and Don'ts pertaining to facility operations shall be generated and provided.
- Vendor shall ensure safe transportation of total system.
- Standard electrical and mechanical safety features as per relevant practices shall be incorporated within the system wherever required and shall be compatible with the statutory and regulatory requirements of India.
- All statutory safety requirements for the equipment shall be complied. Details of safety features incorporated in the equipment like relief valve, shutoff valve, bust diaphragm etc and safety procedures to be followed during the operation shall be part of SOP. Safety interlocks shall be provided wherever necessary.
- The vacuum pumping system shall be protected from reverse phasing, over voltage, under voltage, single phasing, over loading etc at the panel end.
- Vendor shall ensure safe transportation of total system.
- Standard electrical and mechanical safety features as per relevant practices shall be incorporated within the system wherever required and shall be compatible with the statutory and regulatory requirements of India.
- All statutory safety requirements for the equipment shall be complied. Details of safety features incorporated in the equipment like relief valve, shutoff valve, bust diaphragm etc and safety procedures to be followed during the operation shall be part of SOP. Safety interlocks shall be provided wherever necessary.
- The vacuum pumping system shall be protected from reverse phasing, over voltage, under voltage, single phasing, over loading etc at the panel end.

PART-B
Commercial

B1. Commercial Terms and Condition

1. Scope of supply

1.1 ***Design, fabrication, Acceptance testing, intial training, packing & forwarding, transportation, installation, performance demonstration, and commissioning of Cryostat at ASOE, third party certification, imparting training, complete documentation and supply of essential spares.***

1.2 The project shall be completed on a turnkey basis and third party certification by agencies like BVQI / LLOYDS at all mandatory stages shall be ensured with complete traceability.

2. Bidding process

2.1 The quote should be presented in **TWO** parts, namely, Techno- Commercial bid (Part 1) and Price bid (Part 2). Each bid must be separately sealed and clearly identified.

2.2 The offer must be for complete activity as specified above in the scope of supply. All equipment and consumables required for acceptance tests at works will be in the scope of the supplier. Offer shall be for the total work as above and incomplete/partial offers will not be considered.

2.3 The technical bid shall address each and every specification and shall specify design values of all sub systems like thermal system, vacuum system control system etc, wherever necessary. Also sources / makes of individual equipment / parts proposed shall be mentioned in the quote for evaluation of the quality aspects of the components used in the realization of the system as a whole.

2.4 Supply of all necessary equipment base, stands, support, dummy closures etc shall be in the scope of the supplier. All such items shall be made of stainless steel material only.

2.5 Compliance Matrix in the enclosed format shall be filled up and submitted along with the techno-commercial bid (Part 1).

2.6 Quote must also include

The design methodology and specific details of calculations.

Temperature in sample coolers and associated refrigeration systems at steady state and transient stages.

Cool down and heating up time for the specified test cycles.

Materials used and the standards followed in design.

The international standards to which the bought out items conform to and drawings, if any, depicting the configuration of the system.

2.7 The price bid should provide

Price for one complete system

The cost breakup of all major sub systems

The cost breakup of the spare parts proposed

Year wise cost of post warranty period AMC, at least for 10 years.

3. Delivery

3.1 The chamber shall be supplied, installed and commissioned by the supplier at ASOE/VSSC, Thiruvananthapuram within 14 months from the date of obtaining export license. Export license shall be obtained within reasonable period from the date of receipt of valid purchase order. Vendor shall commission the Cryostat at VSSC, meeting all the configuration requirements, performance requirements, interface requirements, statutory and legal requirements of India and safety requirements specified in the specification requirement document and other conditions specified in the commercial T & C. All other technical requirement implied or mandatory by virtue of the design & law of land shall also be satisfied.

3.2 Pre delivery inspection: Party shall offer the integrated system for pre-delivery inspection to VSSC/third party at their works. Party shall make arrangement for acceptance/performance evaluation of system experiencing the design extremes at this stage prior to dispatch. Party shall impart preliminary training for the operation and maintenance of the equipment to our engineers at this stage.

4. Levies & Duties

All levies and duties at the prevailing rate are applicable. Duty exemption certificates will be provided by VSSC/ISRO for imported parts/systems, as applicable.

5. Equipment Layout

Vendor shall provide a layout diagram of the proposed system showing major equipment with the minimum floor area / space required for installation along with the offer and should match with the utilities offered by VSSC.

6. Vendor expertise and proof of satisfactory working

Vendor shall have enough expertise in the design, supply and commissioning of similar systems in the past. Details of these systems and customers address and contact details shall be provided along Part 1 of bid.

7. Material and bought-out item

7.1 Being used for testing of high value launch vehicle components, the system supplied by the vendor must use material, component and equipment sourced from makers of proven heritage, high reliability and international repute.

7.2 All material shall be procured with test certificate ensuring full traceability.

7.3 Make, model, technical details like range, accuracy, response time, environment of operation etc of bought out items like thermal sensor, temperature controller, vacuum pump, liquid helium transfer line, helium flow control valve, vent valves, relief/safety system, vacuum gauges, temperature indicators, ice filter, flexible connections, PLC and associated systems etc shall be clearly mentioned in the offer. In the case of temperature sensor, recorder and controllers, following are the preferred options:

a. Sensor: CERNOX.
b. Recorder/controller: LAKESHORE.
c. PLC: Siemens

7.4 Vendor shall specify whether the supplied systems are fully designed, manufactured and integrated at vendor's works or integrated from outsourced subsystems with details of such item and sources.

8. Offer specification

8.1 It is mandatory that the vendor shall, in full, provide technical parameters of the system offered vis-à-vis each point mentioned in the tender specification, with demonstrated values wherever applicable and wherever being asked for and with all applicable documentation like drawings, catalogues, data sheets, test results etc and supported by calculations as a proof of their claims. Achieved and demonstrated values vis-à-vis specifications of the system offered shall be presented against each of the technical specification in later stages/review.

8.2 Compliance matrix in the enclosed format shall be filled up and submitted.

9. Design review

Vendor shall be ready to give technical presentation, at key stages of project execution, to the technical committee formed for the purpose of finalizing

the procurement at VSSC, Trivandrum. The vendor will be intimated 15 days in advance on this presentation.

10. Test and acceptance of system

10.1 Vendor shall give full details of his proposed Acceptance Test Plan at his work and at VSSC, Trivandrum. Vendor shall also propose the schedule of test activities. Acceptance tests at works may be witnessed by VSSC representative.

10.2 Vendor shall provide the details of the consumables, such as liquid Helium/ helium gas etc., at least 3 months prior to installation, required to demonstrate the performance of the chamber at VSSC, Trivandrum at the time of installation and commissioning. Consumables required for factory demo and acceptance tests shall be in the scope of the vendor.

11. Outsourcing

11.1 All sub-contracting and its extend shall be clearly spelt out in the Part 1 bid. Quality control of such out-sourced process and product shall be the responsibility of the vendor. Third party certifiers shall have hinder free access to such process for verification.

11.2 Performance of all bought out component/sub-system shall be ensured and shall collectively contribute in meeting the overall system performance. Appropriate interface shall be designed to achieve specified optimum performance of each component/sub-system in the integrated stage.

12. Maintenance and Service support

Vendor must have Service Centre/agent in India for pre/post guarantee/warranty service and technical support. Vendor shall submit detailed list of Service Centre/s. The selected service provider shall have the necessary technical expertise in handling all sub system associated with supplied Cryostat and associated system. All services shall be attended within 48 hrs of service call.

13. Training

Vendor shall impart basic training related to operation, maintenance and trouble-shooting to VSSC personnel at ASOE/VSSC, Thiruvananthapuram at no extra cost.

14. Packing, forwarding and transportation

After the initial acceptance at supplier's works, party shall make arrangements for the dismantling of system, its proper packing (sea-worthy/air-worthy), forwarding and transportation of the equipment to our site at VSSC, Trivandrum, India for final installation and commissioning. The details of freight forwarder shall be indicated in the offer. Details of VSSC's freight consolidator will be indicated in the purchase order.

15. Vendor is completely responsible for

15.1 Safe transportation of total system.

15.2 Arranging warehouse to warehouse insurance.

15.3 Providing safe handling procedure of the consignment at VSSC site, Trivandrum.

15.4 Installation and commissioning of total system at VSSC site, Trivandrum.

15.5 Demonstration of total performance of the integrated system including vacuum systems, thermal systems, control system and other associated system supplied.

16. Warranty

All the equipment's offered by the vendor shall have warranty of one year and shall offer free service support of at least one year from the date of installation and acceptance of total system at ASOE/VSSC, Trivandrum. Warranty shall be for the entire supplied system in the integrated form against any system/sub-system failures or any failure in meeting the specified performance of the system/sub-system from the date of final acceptance at VSSC.

17. Spares

Along with the offer vendor shall submit a list of essential spares required with cost for trouble free operation of total system beyond standard guarantee period for minimum of 3years. They should provide service support for a minimum period of 10 years. Preventive maintenance strategy shall be specified in O&M manual.

18. Design

18.1 Offer shall spell out the working principle & construction details of the cryostat. Technical details and specification of special jacketed high efficiency liquid helium transfer line, helium flow control valve for high flow/fast cool down, cryo pump, thermal sensor etc. shall also be specified.

18.2 Vendor shall attach technical catalogs, literature and detailed data sheets of all items offered by the vendor in support of their technical offer.

18.3 Offer shall include design drawings, layout/block diagram of the system. Redundancy and reliability factors shall be considered in the system design.

19. Documentation

Total documentation is in the scope the vendor. Installation, operation, maintenance and trouble-shooting manuals of all subsystems and for the integrated system shall be provided at the time of installation. Approved engineering drawings of components, sub-assembly and circuit diagrams relevant to maintenance shall also be included. The entire documentation shall be available in hard form and in soft form in CD media.

20. Legal

Vendor's Company / Associates should not have been banned or black-listed at any time by any Government Department/ Public Sector Unit/ Court of law in India. If ever banned / blacklisted, the same shall be disclosed and the offer from such vendors will not be accepted.

21. Contact details

Vendor shall provide the contact details of his representative and Indian counterpart for any further communication regarding the tender.

22. Auxiliary systems required, if any, shall be quoted separately with detailed specifications, catalogue and cost.

23. Pre fabrication approval

The vendor shall submit the vendor & TPIA approved fabrication drawing of the Cryostat and shall obtain prior approval from VSSC before starting the fabrication works.

24. Build programme

Time schedule for the completion of work shall be indicated in the offer.

25. Third party certification

Before dispatching, the equipment shall be tested and certified by a third party (approved certifying agency, mutually agreed) for its technical specifications and performance. Cost for third party testing/certification may be quoted

separately/included in the cost. They shall participate throughout the execution of programme and certify the system at all mandatory stages.

26. Installation and commissioning

It is the responsibility of the party to do the installation and commission the equipment at ASOE/VSSC, Thiruvananthapuram, India. The final demonstration test shall be carried out satisfactorily as per agreed procedures. Final training on the operation and maintenance shall be given at this stage.

27. Payment terms

All payments will be made by sight draft. Party may mention clearly about payment terms in the offer. However, a performance bank guarantee for value not less than 10 % of order value, valid till the expiry of warranty period, shall be furnished by the party. Details of supplier's bank shall be provided at tendering stage.

28. Capital equipment insurance

The equipment shall be insured by the vendor to cover the total interest, including VSSC's interest, till such time the equipment is handed over to VSSC after successful commissioning.

29. Any other items that are essential for realization of the equipment conforming to all specification requirements, installation and for the regular operation, but are not referred herein, may also be included in the offer.

———————————

Compliance matrix for Large Size Cryostat

(Ref. Doc. VSSC/ASOE/HRAG/STED/TR/012/19)
(Tender no. A671 2019004749)

1. General Description & Requirements

1.1 Scope of Supply

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Design, FEM and FEA of design, Fabrication, Assembly and Testing of Cryostat, its sub system, components and elements, qualification and demonstration, transportation, installation and successful commissioning of the Cryostat at STED/HRAG/VSSC/ISRO, Thiruvananthapuram, Kerala, India. Training of operating personnel of VSSC, complete documentation and third party certification at design, fabrication and testing stages at supplier's premises as per the requirement specification		

1.2 Design input considered

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Suitable for test article maximum envelope size of Φ 350 mm x 430 mm (L)		
2	Design considered test article mass range of 1-20 kg (metallic mass) with specified thermal limits		
3	Design of cryostat for max. thermal mass of 20 kg specified thermal limits		
4	Test envelope size: **dia. 350 mm and height 430 mm.**		

1.3 Expected Test Requirement

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Design for temperature limits of 10 K (minimum)		

	to 350 K (maximum).		
2	Provisions available for following: a. Closed loop with GHe as a refrigerant (continuous flow mode)		
	b. Open loop with LHe as refrigerant		
3	Type: Top loading		

1.4 Temperature requirement

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Lowest temperature achieved on test specimen: 10 K (to be maintained steady for 7.5 hrs)		
2	Time taken to reach 20K from ambient:3-4 Hrs. maximum with 20 kg metallic mass		
3	Temperature accuracy at 10 K: ±1K measured over a period of 10 minutes		
4	Temperature accuracy at 350 K: ±2K measured over a period of 10 minutes.		
	Steady state temperature homogeneity across the test space: ±2 K		
5	Automatic PLC based temperature controller(through helium vapour flow rate and heater controls)for closed loop system		

1.5 General Requirement

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Total system shall be designed for minimum of 240hours of continuous operation with out failure.		
2	The proposed configuration shall ensure highest level of reliability, precision, safety and controllability.		
	a. Modular design concept allowing future augmentation.		
	b. High quality workmanship using well trained, well qualified& certified personnel under expert supervision.		

	c.	All gauges, temperature sensors, transducers and instruments shall be from reputed manufactures, supplied with catalogues and calibration reports ensuring full traceability.		
	d.	Full documentation of procedures to be follow, standard adhered design, analysis, fabrication procedure, quality control, testing, qualification to be supplied.		
	e.	The chamber shall be fail safe and hazard free during interruption of power, loss of vacuum, GHe etc.		
3.	Steps, platforms, handling support wherever necessary shall be provided by supplier.			
4.	All outside surfaces (all items) shall be electro polished and passivated.			
5	Third party certification at design stage and at all identified stages of realization and testing .			
6.	The necessary instrumentation, control, safety interlocks are to be provided			

1.5 Documentation requirement

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Design reports - Preliminary Design Report & FDR		
2	Fabrication drawings,		
3	Finite element analysis, wherever applicable,		
4	Material certificates.		
5	Process plan		
6.	QC/QA plan		
7.	Third party inspection reports and certification.		
8.	Qualification test plan.		
9.	Calibration certificates where ever applicable.		
10.	Operating & maintenance manual		
11.	Catalogues, specification document, Service manuals, warranty certificates etc. for bought-out items.		
12.	Handling and transportation procedure.		
13.	Installation & Commissioning plan.		

2.0 TEST CHAMBER

2.1 Major Scope of Supply

Sl No		Activity /Description	Compliance (yes/No)	Remarks
1		Sample space closure with provision for vacuum & pressure monitoring		
2		**Outer chamber & Inner chamber** Material of construction: Cryo compatible Stainless steel (SS 304L/equivalent low carbon austenitic stainless steel)		
3		Features like number of vacuum jackets, radiation shield, bayonet etc. to be suitably adopted so as to maintain heat loss to the minimum.		
8.		**Radiation shield**		
	a.	Mode of cooling:Vapour cooled/conductive cooled.		
	b.	compatible for vacuum exposure.		
	c.	provision for automated temperature control for heating and cooling.		
	d.	provision for thawing.		
	e.	Detachable type mounting		
9.	1	**Construction features ofCopper isothermal zone**Material: OFHC copper.		
	2	Surface treatment: Thin film metallic coating for inner and outer surface to prevent corrosion.		
11.	1	**Vacuum jacket** Minimum vacuum level: 10^{-5} mbar		
	2	No of evacuation ports: 2		
12.	1.	Structural & thermal finite element analysis shall be carried out for all elements including inner copper isothermal zone, chamber structure rigidity verification, anchoring structure calculation, radiation shield and fixtures & FEM model of the overall unit, dimensional details to be submitted for review and approved.		
	2.	stability of radiation shield and isothermal zone stability.		
13.		Bayonet Interface : Suitable for 0.38" OD standard flexible transfer line with dummy closures.		

2.2 Overall System Requirements

Sl No		Activity /Description	Compliance (Yes/No)	Remarks
1		**Chamber support:** Party shall provide appropriate mounting base for chamber and associated interfaces. Location requirements of associated equipment shall also be specified.		
2		Ports and interfaces		
	a.	Sample tube vent port, Pressure relief valve ports.		
	b.	Electrical feed through: 50 pin connector, 10 Amps rating minimum -2 Nos, Type: Through & through		
	c.	Temperature sensor (mounted on test article) feed through ports.		
	d.	Pressure line: Seamless tube of cryo compatible material having ID 6 mm & OD 10 mm (meant for pressurization of test specimen during environmental exposure)		
	e.	Temperature sensor (mounted on test article) feed through ports.		
	f.	Dummy port of NW 25 with closure-2 no.		
	g.	Blank NW 50 with closure -1 no.		
	h.	Vacuum port ISO KF60 -2 no.		
3		**Specialprovision:** Anchoring points for radiation shield such as mounting lugs and other supports.		
4		**Permissible Leak rates**		
	1	**Leak tightness:** Individual leak rate shall be better than 5x 10^{-9} mbar l/s &total leak rate (sum of all leaks) into the chamber shall be better than 1x 10^{-7} mbar l/s before and after cold soak.		
	2	All weld joints, 'O' ring seals and any other joint used on pressure /vacuum interface shall have individual leak rate better than 1.0x10^{-8}mbar.l/s.		

2.3 Vacuum System

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	All vacuum pumping system and vacuum control shall be integrated through a common console.		
2	Vacuumjacket evacuation: Vacuum level 10^{-5}mbar or better for operational requirement.		
3	Total pump down time shall be less than 60minutes from ambient to ultimate vacuum of 10^{-5} mbar .		
4	Pumping system shall have adequate pumping capacity for continuous operation up to 240 hrs.		

2.4 Vacuum System sizing

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Conductance loss calculation and estimation of effective pumping speeds at the pumping ports to be submitted along PDR.		
2	Evacuation time calculation for total pumping system		
3	Provision for manual override of Dry scroll pump & turbo pump.		
4	Real time vacuum gauge readouts.		

3.0 THERMAL SYSTEM

1		Cooling method: Vapor helium/LHe		
	a.	Cooling & heating meet the requirements of both heating as well as temperature maintenance of helium vapour/Liquid Helium.		
	b.	Cooling & heating modes and temperature should be controlled through PLC/SCADA		

2	a.	**Sample space cooling/heating** **Open loop cycle**		
	b.	Cooling method: Vapor helium		
	c.	Input refrigerant: LHe		
		Heaters: Should meet the requirements of both heating as well as temperature maintenance of helium vapor, No. of heaters and wattage shall be selected based on heating & cooling requirement.		
3	a.	**Radiation shield cooling/heating** **Closed loop cycle** Cooling method: Vapor helium/Cold head type		
	b.	Input refrigerant: GHe.		
	c.	Heaters: Should provide to meet the requirements of both heating as well as temperature maintenance of radiation shieldand two nos. of spares.		
5	a.	**Radiation shield**		
	b.	**Structural requirement :** Shall have adequate stiffness.		
	c.	**Surface Finish :** Suitable surface finish shall be adapted.		
	e.	**Surface coating :** Suitable coating to minimize the radiation losses.		
	f.	**Cooling method :** Cold head or Vapor helium , Vapor helium system structural capability shall be ensured and proofed to 1.5 times operating pressure.		
	g.	**Uniformity of temperature across height:** a) ±10 K (on stabilization) b) ± 20 K (during transition)		

	h.	**Temperature Monitoring :** Through Cernox RTD, top and bottom, two nos. each, shall be offset by 90 deg. Between top and bottom sensors.		
6	a.	**Temperature sensor** Type: Cernox RTD or equivalent.		
	b.	Temperature range : 0.10 K to 350 K		

4.0 CONTROL SYSTEM

Sl No	Activity /Description	Compliance (yes/No)	Remarks
1	Cryostat control system shall be designed and configured to provide control and to implement sub-system level interlock and sequencing logic, to ensure the safety of operating personnel, test object and facility equipment.		
	a. Closed loop cycle : Fully automated mode		
	b. Open loop cycle: Semi automated, provision shall be available for fully manual mode operation.		
2	Programmable Logic Controller (PLC/SCADA) shall: Acquire reference temperature from vaporizer mounted on sample mount and bottom of isothermal zone.		
3	As multiple test articles are mounted & exposed to 20 K in single go,count soaking start time only when both reference temperature reach 20K.		
4	Facility shall be controllable from the Desktop Computer/Laptop,the process shall proceed automatically .		
5	Test profile input shall be accepted through the PC / PLC and process , control the connected systems to complete the test as per the input.		

6	Provision for the selection of operation mode, ie, open loop or closed loop, through GUI and appropriate control system initiation.			
7	a	Instrumentation, control, data logging & display of test parameters: Real time display, logging of temperature data & plotting of time vs temperature graph of all RTDs.		
	b	DAQ system(PLC/SCADA) software appropriate to the equipment shall be provided and shall have lifelong licence.		
	c	The software shall be installed in the industrial grade PC sourced from Indian market.		
	d	Control logic shall be device based on reference temperature measured at sample mount and bottom of isothermal zone.		
	e	Test time shall be counted when the specified temperature homogeneity reached.		
	f	Cooling and heating ramp rate assumed for design and operation shall be settable through GUI between minimum and maximum value. Alarm shall be raised if bounds are exceeded.		
8	a	**Helium flow control** In close loop system, low temperature vapour flow shall be controlled through appropriate flow meters with feedback provision.		
	b	In open loop system, liquid helium flow shall be controlled through manual metering valve. Design shall take care of flow rate requirement for extreme conditions of thermal mass and test temperature.		
9	a	**Vacuum control** Vacuum pump operations: Independent operation of rotary & turbo pumps with manual override.		
	b	Vacuum isolation valve operations (Pneumatic valves)		

	c	Vacuum gauge ON/OFF operations		
	d	Real time vacuum gauge readouts		
	e	Vacuum pump sequencing and operation shall be integrated to and controlled through remote console.		
	f	During power failure, the vacuum system shall be in fail-safe mode.		
10		Sampling Rate		
	a	Sampling rate of acquisition shall be as follows Sample monitoring : 2-4 Nos sensors ,5 Samples per second.		
	b c	Radiation shield control : 2-4 Nos. 5 Samples per second. Test article temperature (for monitoring) : 10 samples/s (all sensors)		
11	a	The basic configuration of external industrial PC shall be as follows: Processer type: Intel core i7-880 processer or advanced.		
	b	RAM : Minimum 8GB.		
	c	Hard disk : 2TB		
	d	Monitor : LED 32"		
	e	OS : Windows based.		
	f	Colour laser jet printer : Required for printing/plotting of data.		
12	a	**Design Guideline** Hardware used for data acquisition and control shall preferably be designed with following features: Plug & Use' type with software configurable settings with address.		
	b	Hardware shall have sufficient protection against over voltage, over heating etc with good stability.		
	c	PLC design requirements in terms of high electrical noise immunity, compatible to harsh environmental conditions and rugged		

		construction.		
	d	Built-in self-diagnostic features like logic error, alarms, communication failure etc.		
	e	Future expansion capabilities in terms of hardware and software.		
	f	User friendly PLC software / Programming interface with good documentation.		
	g	Graphic User Interface for test profile input/edit.		
	h	Provision for real time modification of test profile.		
14		Overall system design shall have adequate redundancy to reduce downtime during failures.		
15	i.	1. All software shall have lifelong license. 2. The software shall be installed in the industrial PC supplied by vendor. 3. A copy of all necessary software shall be provided for re-loading in case the pre-loaded software is corrupted.		

5.0 QUALITY ASSURANCE

Sl No	Activity /Description		Compliance (yes/No)	Remarks
1	**Documentation** The following documents shall be offered for review by VSSC/TPIA.			
	a	Specification, design & analysis documents		
	b	Design drawings		
	c	Fabrication drawings		
	d	Fabrication process plan		
	e	QC/QA plans		
	f	Material test certificates		
	g	Inspection reports		
	h	Non-conformance reports		

	i	Handling, packing, transportation procedure documents		
	j	Assembly procedure documents		
	k	Integration documents		
	l	Facility operation procedure		
	m	Qualification test plan		
	n	Acceptance test plan		
	o	Comprehensive technical descriptions of the critical items		
	p	All control diagrams		
	q	Operation & maintenance manual for all brought out equipment		
	r	Calibration reports of all measuring & monitoring devices deployed as well as supplied as spares.		
2	a	**Design reviews** Preliminary design review shall be offered for review to assess the adequacy and validity of system definitions.		
	b	Final design reviews will be done to ensure that the design meets all input requirements.		
	c	The detailed design drawings, process plan and QC plan incorporating the operational details shall be generated and supplied to VSSC for approval.		
3	a	**Acceptance and delivery** **Inspection & quality control requirements** All materials must be tested at source for composition and strength values prior to use and shall becertified.		
	b	Strict quality control and approvedthird party inspection must be implemented.		
	c	Welding procedure qualification and welder qualification shall be done as per ASME section IX.		
	d	Non-destructive testing like DP Test, Ultrasonic examination &Radiography shall be carried out as per applicable standards		
	e	Supplier shall generate acceptance plan to assess/demonstrate the capability of the supplied Cryostat system against the		

		specification/ requirements.		
		Acceptance test shall be carried out with dummy mass and as per the test profile provided by VSSC and mutually accepted test plan.		

6.0 SAFETY REQUIREMENTS

Sl No		Activity /Description	Compliance (yes/No)	Remarks
1		**Test chamber** Appropriate relief systems with redundancy shall be incorporated. While operating an open loop system, the exhaust generated shall be vented outside safely above building height of 5 meters.		
2		**Vacuum system** Exhaust plumbing lines of vacuum pumps shall be designed properly for easy dispersion of exhaust gases outside the building. In case of power failure, the system shall be in fail- safe mode.		
3		**Thermal System** Temperature overshoot shall be maintained with in the specified limit. All venting lines shall be designed properly for easy dispersion of exhausts outside the building.		
4		**Control system** Control systems have all necessary safety interlocks. In case of power failure, the entire system shall be in fail safe mode.		
5		**General safety features**		
	a	The Design requirements shall conform to approved codes and standards.		
	b	Manufacturing and inspection shall be as per the approved procedures.		
	c	Electrical safe guarding shall be done as per approved procedures.		
	d	Written down procedures shall be generated for facility operations& maintenance.		
	e	Do's and Don'ts shall be generated for facility operations.		

COMMERCIAL CONDITIONS

1. The price of main equipment, sub-systems, accessories, essential spares etc., shall be indicated separately in the price bid alone.

2. Annual Maintenance Contract (AMC): The vendor must undertake Non-Comprehensive AMC for minimum 5 years beyond warranty period. Cost of AMC per year shall be mentioned separately in the Price Bid. The same shall be considered for evaluation.

3. Acceptance of EMD (if applicable), SD, PBG and LD as mentioned below is mandatory for evaluation of the bids.

GENERAL TERMS AND CONDITIONS

1. Please submit the Technical Details / Catalogue / Data Sheets.

2. Please keep and confirm the offer validity minimum 180 days [120 days for Part-I & 60 days for Part-II] from the date of opening of tender.

3. **Please send the quotations ONLY in 'SEALED COVER' indicating our tender enquiry No. and due date by speed post so as to reach us on or before the due date & time. VSSC will not be responsible for any postal delays. Detailed Instructions given in Separate Annexure. E-mail/ fax quotations 'WILL NOT BE ACCEPTED'.**

4. **For Indigenous tenders,**

Please quote applicable GST separately.

(a) We are eligible for partial exemption of IGST vide Notification No: 47/2017-Integrated Tax (Rate) dtd 14/11/2017 and 45/2017-Central Tax (Rate) dtd 14/11/2017 issued by Dept. of Revenue, Ministry of Finance. Necessary Exemption Certificates will be issued on demand.

(b) We are eligible for partial exemption of CGST and SGST vide Notification No: 45/2017 dtd 14/11/2017 and No: 169/2017/TAXES dtd 15/11/2017 respectively. Necessary Exemption Certificates will be issued on demand.

5. As per Notification No. 50/2017-Customs dated 30.06.2017 as amended by Notification No. 5/2018-CUSTOMS DTD. 25/01/2018, we are eligible for concessional payment of customs duty and IGST. The necessary Customs Duty Exemption Certificate shall be provided by VSSC for availing CD Exemption. Tenderers are requested to take note of the CD Exemption available to ISRO/VSSC and accordingly submit the offer without Customs Duty (applicable only in the case of imported items).

6. PAYMENT**:** Our standard payment term is 100% within 30 days on after receipt & acceptance of the item at our site for Indigenous orders and Sight Draft for foreign orders.

7. **In case if any Bidder is submitting their Offer on HIGH SEA SALES BASIS:** then the Indian Trader shall submit the following documents **mandatorily along with their offer.**
    a. The Import Export Code of the Indian Trader
    b. Bank Authorization Code of the Indian Trader
    c. GSTIN of the Indian Trader<

Likewise, while executing the Purchase Order/Contract; the Indian Trader shall mandatorily submit the following:

a. High Sea Sale Agreement.
b. Invoice pertaining to the Indian Trader in INR and the invoice of the foreign vendor in foreign currency.

8. **In case of Foreign/Import Tenders:**
    a. The bidder shall clearly mention the full ordering address in capital letters.
    b. The bidder shall clearly mention their banker's address including their SWIFT code compulsorily.
    c. Any change of address shall be compulsorily supported by Documentary proof issued either by Governmental agencies or by Chamber of Commerce.
    d. Foreign Principal's Proforma Invoice/quote indicating the Agency Commission payable to the Indian Agent and the nature of after sales service to be rendered by the Indian Agent.
    e. Copy of the Agency Agreement between the Foreign Principal and the Indian Agent, and the precise relationship between them their mutual interest in the business.
    f. Registration and Item empanelment of the Indian Agent.

9. **Where agents participate in a tender;**
    (a) Either the Indian agent on behalf of the Principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for the same item/product in the same tender.
    (b) If an agent submits bid on behalf of the Principal/OEM, the same agent shall not submit a bid on behalf of another Principal/OEM in the same tender for the same item/product.

10. VSSC has a right to cancel the tender without assigning any reason etc.

11. **Delivery Terms (normal):** FOR Destination (for Indigenous cases) & FOB/ FCA or Ex-works (for Import cases). Packing and Forwarding Charges, FCA Charges extra, if any, shall be mentioned separately in the price bid.

12. **Earnest Money Deposit (EMD)** ***(Mandatory):***The vendors who are not registered with VSSC, shall submit an EMD(Earnest Money Deposit) or Bid Security in the form of DD/Banker's Cheque/Fixed Deposit Receipt for **Rs. 5.00 Lakhs (Rs. Five Lakhs only).** The EMD of the unsuccessful vendor will be returned without any interest within 30 days from the date of finalization. ***Foreign vendors, registered vendors or vendors who have already applied for renewal of registration, Central PSUs/PSEs/Autonomous Bodies/MSMEs etc., shall be exempted from payment of EMD. Vendors seeking exemption from payment of EMD shall submit necessary proof like registration number(vendor code), etc***. The quotation submitted by unregistered vendor without EMD will not be considered. The EMD submitted by unregistered vendors will be forfeited in the case of withdrawal of quotation or amendments in quotation or any such deviation in a later period.

13. **Liquidated Damages** ***(mandatory compliance required)*** - the delivery and Installation period mentioned in the order will be the essence of the order /Contract. In case of delay in delivery/Installation of material as per the delivery schedule mutually agreed and stipulated in the order, Liquidated Damages@0.5% per week or part thereof on the undelivered portion subject to a maximum of 10% of the contract value shall be levied. Hence delivery date mentioned in the quotation shall be realistic. Failure to comply shall lead to the rejection of offer.

14. **Security Deposit** ***(mandatory compliance required)*****:** In the event of placement of order, you should submit Security Deposit at 10% of the order value of the P.O. The Security Deposit shall valid for a period of 60 days beyond the date of completion and acceptance of P.O/Contract. The Security Deposit will be discharged without any interest after completion and acceptance of the Contractual obligations. In case if contractor fails to execute the order after submission of SD, then SD shall be forfeited.

15. **Performance Bank Guarantee** ***(mandatory compliance required)*****:** Wherever products offered carry warranty, please confirm submission of Performance Bank Guarantee. The Performance Bank Guarantee should be for 10% of the order value covering the warranty period obtained from any Scheduled Bank on Rs.200/- Non Judicial Stamp Paper and should be valid beyond 2 months from the completion of the warranty period. Alternately vendors can request for withholding 10% payment till completion of the warranty period.

Note:

1. In order to avail of the benefits extended by Government of India to the Micro and Small sectors, please submit attested copy of the valid Entrepreneur Memorandum Part-II signed by the General manager, District Industries Centre or NSIC or MSME Registration Certificate along with your offer. **(Note: MSME/NSIC vendors are not exempted from the payment of Security Deposit/Performance Bank Guarantee).**

2. Form No. 20&22 attached herewith are Standard forms. Wherever there is a conflict occurs between the conditions of Form No. 20/22and COMMERCIAL CONDITIONS, the conditions in the COMMERCIAL CONDITIONS shall prevail.

3. **For Advertised Tenders in Newspapers/ Hosted in ISRO/VSSC Websites (Public Tenders) only: Technical Bids will be opened at the scheduled due date & time. No further intimation will be sent to you in this regard. Interested parties can attend the Technical Bid opening at their own cost to know the tender details.**

Annexure-IV

SPECIAL CONDITIONS IN RESPECT OF TWO-PART TENDERS

I.PART-1-TECHNICAL AND COMMERCIAL BID (in duplicate) in one cover.

Technical and Commercial Part should clearly indicate the technical details, scope of supply, payment terms, delivery terms, [FOB/FOR/Ex-Works] delivery period, taxes and duties, warranty, guarantee, security deposit, performance bank guarantee, etc. under separate heads. **Please not that the price should NOT be indicated in the Technical and Commercial Offer.**

Complete literature/leaflets/catalogues or brochures relevant to the offered models are to be enclosed with the Technical and Commercial Part of the Tender.

The cover should clearly be super scribed **"Technical and Commercial Bid"**. The Tender Number-Due Date and Time should also be indicated on the cover.

COPY OF PRICE BID WITHOUT PRICE SHALL BE ENCLOSED WITH TECHNICAL BID TO KNOW THE PATTERN OF QUOTE.[ENSURE NOT TO MENTION ANY PRICE,OTHERWISE THE QUOTE WILL BE INVALID.

II. PART II –PRICE BID in one cover:-

Price alone should be indicated (in duplicate). Wherever installation commissioning is involved, such charges any be indicated separately in the Price Bid.

The cover should clearly be superscribed "Price Bid". The Tender Number- Due Date and Time should also be indicated on the cover.

III. The "Technical and Commercial Bid" and the "Price Bid" are to be in separate sealed covers and they should be put into a single envelope superscribed with the **Tender Number, Due Date and Time.** The cover thus prepared should be sent to the following address so as to reach us on or before the due date and time specified in the tender form.

Sr. Purchase & Stores Officer
Purchase Unit No.III
Vikram Sarabhai Space Centre
ISRO PO
Trivandrum –695 022

IV.Tenders any be hand delivered or sent by post or through couriers. Levels of responsibility and reliability among couriers with respect to the delivery to VSSC are not entirely satisfactory and tenderers shall therefore choose the couriers with particular care.

V. The offer should be valid for a minimum period of 180 days from the due date (120 days for technical bid and 60 days for price bid).

VI. **TENDER OPENING**. The Technical and Commercial Bid will be opened on the specified day and in case any further clarifications/discussions are required, such clarifications/discussions shall be called for before opening the Price Bid.

VII. Late and Delayed Tenders will not be considered. Therefore, please ensure that your tender is posted well in time to reach us before the due date and time.

VIII. Tenders, which are not prepared in terms of these instructions, are liable to be rejected.

IX. Fax/Email offers will not be considered.
X. All the pages of your offer should be signed/initialed by competent authority and affixed with your Company's Seal.

,

DEPARTMENT OF SPACE
VIKRAM SARABHAI SPACE CENTRE
PURCHASE UNIT-III
PRSO PURCHASE,
RFF AREA, ISRO P.O.,
THIRUVANANTHAPURAM- 695 022

Tele No: 0471-256 3775, 3617, 3609 Fax No: 0471-256 2105
E-Mail ID: spso_prso@vssc,gov.in

INSTRUCTIONS TO TENDERERS

1. Tenders should be sent in sealed envelopes superscribing the relevant tender No, and the due date of opening. Only one tender should be sent in each envelope.
2. Late tenders and delayed tenders will not be considered.
3. Sales Tax and/or other duties/levies legally leviable and intended to be claimed should be distinctly shown separately in the tender.
4. As a Government of India Department, this office is exempted from payment of Octroi and similar local levies. Tenderers shall ensure that necessary Exemption Certificates are obtained by them from the Purchase Officer concerned to avoid any payment of such levies.
5. a) Your quotation should be valid for 90 days from the date of opening of the tender.
   b) Prices are required to be quoted according to the units indicated in the annexed tender form. When quotations are given in terms of units other than those specified in the tender form, relationship between the two sets of units must be furnished.
6. Preference will be given to those tenders offering supplies from ready stocks and on the basis of FOR destination/delivery at site.
7. (a) All available technical literature, catalogues and other data in support of the specifications and details of the items should be furnished along with the offer.
   (b) Samples, if called for, should be submitted free of all charges by the tenderer and the Purchaser shall not be responsible for any loss or damage thereof due to any reason whatsoever. In the event of nonacceptance of tender, the tenderer will have to remove the samples at his own expense.
   (c) Approximate net and gross weight of the items offered shall be indicated in your offer. If dimensional details are available the same should also be indicated in your offer.
   (d) **Specifications**: Stores offered should strictly confirm to our specifications. Deviations, if any, should be clearly indicated by the tenderer in his quotation. The tenderer should also indicate the Make/Type number of the stores offered and provide catalogues, technical literature and samples, wherever necessary, along with the quotations. Test Certificates, wherever necessary, should be forwarded along with supplies. Wherever options have been called for in our specifications, the tenderer should address all such options. Wherever specifically mentioned by us, the tenderer could suggest changes to specifications with appropriate response for the same.
8. The purchaser shall be under no obligation to accept the lowest or any tender and reserves the right of acceptance of the whole or any part of the tender or portions of the quantity offered and the tenderers shall supply the same at the rates quoted.
9. Corrections, if any, must be attested. All amounts shall be indicated both in words as well as in figures. Where there is difference between amount quoted in words and figures, amount quoted in words shall prevail.
10. The tenderer should supply along with his tender, the name of his bankers as well as the latest Income- Tax clearance certificate duly countersigned by the Income-Tax Officer of the Circle concerned under the seal of his office, if required by the Purchaser.
11. The Purchaser reserves the right to place order on the successful tenderer for additional quantity up to 25% of the quantity offered by them at the rates quoted.
12. The authority of the person signing the tender, if called for, should be produced.

TERMS & CONDITIONS OF TENDER

1. DEFINITIONS:

(a) The term 'Purchaser' shall mean the President of India or his successors or assigns.

(b) The term 'Contractor' shall mean, the person, firm or company with whom or with which the order for the supply of stores is placed and shall be deemed to include the Contractor's successors, representative, heirs, executors and administrators unless excluded by the Contract.

c) The term 'Stores' shall mean what the Contractor agrees to supply under the Contract as specified in the Purchase Order including erection of plants & machinery and subsequent testing, should such a condition is included in the Purchase Order.

d) The term 'Purchase Order' shall mean the communication signed on behalf of the Purchaser by an Officer duly authorised intimating the acceptance on behalf of the Purchaser on the terms and conditions mentioned or referred to in the said communication accepting the tender or offer of the Contractor for supply of stores or plant, machinery or equipment or part thereof.

2. PRICES**:**

Tender offering firm prices will be preferred. Where a price variation clause is insisted upon by a tenderer, quotation with a reasonable ceiling should be submitted. Such offers should invariably be supported by the base price taken into account at the time of tendering and also the formula for any such variation/s.

3. SECURITY DEPOSIT:

On acceptance of the tender, the Contractor shall, at the option of the Purchaser and within the period specified by him, deposit with him, in cash or in any other form as the Purchaser may determine, security deposit not exceeding ten percent of the value of the Contract as the Purchaser shall specify. If the Contractor is called upon by the Purchaser to deposit, 'Security' and the Contractor fails to provide the security within the period specified, such failure shall constitute a breach of the Contract, and the Purchaser shall be entitled to make other arrangements for the re-purchase of the stores Contracted at the risk of the Contractor in terms of Sub-Clause (ii) and (iii) of clause 10(b) hereof and/or to recover from the Contractor, damages arising from such cancellation.

4. GUARANTEE & REPLACEMENT:

(a) The Contractor shall guarantee that the stores supplied shall comply fully with the specifications laid down, for material, workmanship and performance.

(b) For a period of twelve months after the acceptance of the stores, if any defects are discovered therein or any defects therein found to have developed under proper use, arising from faulty stores design or workmanship, the Contractor shall remedy such defects at his own cost provided he is called upon to do so within a period of 14 months from the date of acceptance thereof by the purchaser who shall state in writing in what respect the stores or any part thereof are faulty.

(c) If, in the opinion of the purchaser, it becomes necessary to replace or renew any defective stores such replacement or renewal shall be made by the Contractor free of all costs to the purchaser, provided the notice informing the Contractor of the defect is given by the purchaser in this regard within the said period of 14 months from the date of acceptance thereof.

(d) Should the Contractor fail to rectify the defects, the purchaser shall have the right to reject or repair or replace at the cost of the Contractor the whole or any portion of the defective stores.

(e) The decision of the purchaser notwithstanding any prior approval or acceptance or inspection thereof on behalf of the purchaser, as to whether or not the stores supplied by the Contractor are defective or any defect has developed within the said period of 12 months or as to whether the nature of the defects requires renewal or replacement, shall be final, conclusive and binding on the Contractor.

(f) To fulfil guarantee conditions outlined in clause 4 (a) to (e) above, the Contractor shall, at the option of the purchaser, furnish a Bank Guarantee (as prescribed by the purchaser) from a Bank approved by the purchaser for an amount equivalent to 10% of the value of the Contract along with first shipment documents. On the performance and completion of the Contract in all respects, the Bank Guarantee will be returned to the Contractor without any interest.

(g) All the replacement stores shall also be guaranteed for a period of 12 months from the date of arrival of the stores at purchaser's site.

(h) Even while the 12 months guarantee applies to all stores, in case where a greater period is called for by our specifications then such a specification shall apply in such cases the period of 14 months referred to in para 4 (b) & (c) shall be the 'asked for' guarantee period plus two months.

5. PACKING FORWARDING & INSURANCE:

The Contractor will be held responsible for the stores being sufficiently and properly packed for transport by rail, road, sea or air to withstand transit hazards and ensure safe arrival at the destination. The packing and marking of packages shall be done by and at the expense of the Contractor. The purchaser will not pay separately for transit insurance, all risks in transit being exclusively of the Contractor and the Purchaser shall pay only for such stores as are actually received in good condition in accordance with the Contract.

6. DESPATCH:

The Contractor is responsible for obtaining a clear receipt from the Transport Authorities specifying the goods despatched. The consignment should be despatched with clear Railway Receipt/Lorry Receipt. If sent in any other mode, it shall be at the risk of the Contractor. Purchaser will take no responsibility for short deliveries or wrong supply of goods when the same are booked on 'said to contain' basis. Purchaser shall pay for only such stores as are actually received by them in accordance with the Contract.

7. TEST CERTIFICATE:

Wherever required, test certificates should be sent along with the despatch documents.

8. ACCEPTANCE OF STORES:

(a) The stores shall be tendered by the Contractor for inspection at such places as may be specified by the purchaser at the Contractor's own risk, expense and cost.

(b) It is expressly agreed that the acceptance of the stores Contracted for, is subject to final approval by the purchaser, whose decision shall be final.

(c) If, in the opinion of the purchaser, all or any of the stores do not meet the performance or quality requirements specified in the Purchase Order, they may be either rejected or accepted at a price to be fixed by the purchaser and his decision as to rejection and the prices to be fixed shall be final and binding on the Contractor.

(d) If the whole or any part of the stores supplied are rejected in accordance with Clause No. 8 (c) above, the purchaser shall be at liberty, with or without notice to the Contractor, to purchase in the open market at the expense of the Contractor stores meeting the necessary performance and quality Contracted for in place of those rejected, provided that either the purchase, or the agreement to purchase, from another supplier is made within six months from the date of rejection of the stores as aforesaid.

9. REJECTED STORES:

Rejected stores will remain at destination at the Contractor's risk and responsibility. If instructions for their disposal are not received from the Contractor within a period of 14 days from the date of receipt of the advice of rejection, the purchaser or his representative has, at his discretion, the right to scrap or sell or consign the rejected stores to Contractor's address at the Contractor's entire risk and expense, freight being payable by the Contractor at actuals.

10. DELIVERY**:**

(a) The time for and the date of delivery of the stores stipulated in the Purchase Order shall be deemed to be the essence of the Contract and delivery must be completed on or before the specified dates.

(b) Should the Contractor fail to deliver the stores or any consignment thereof within the period prescribed for such delivery, the purchaser shall be entitled at his option either.

(i) to recover from the Contractor as agreed liquidated damages and not by way of penalty, a sum of 0.5% per week of the price of any stores which the Contractor has failed to deliver as aforesaid or during which the delivery of such store may be in arrears subject to a minimum of 10%, or

(ii) to purchase from elsewhere, without notice to the Contractor on the account and at the risk of the Contractor, the stores not delivered or others of a similar description (where others exactly complying with the particulars, are not, in the opinion of the purchaser, readily procurable, such opinion being final) without cancelling the Contract in respect of the consignment (s) not yet due for delivery, or

(iii) to cancel the Contract or a portion thereof and if so desired to purchase or authorise the purchase of stores not so delivered or others of a similar description (where others exactly if complying with the particulars are not, in the opinion of the purchaser, readily procurable, such opinion final) at the risk and cost of the Contractor.

In the event of action being taken under sub-clause (ii) & (iii) of clause 10 (b) above, the Contractor shall be liable for any loss which the purchaser may sustain on that account, provided that the re-purchase or if there is an agreement to repurchase then such agreement is made within six months from the date of such failure. But the Contractor shall not be entitled to any gain on such re-purchase made against default. The manner and method of such re-purchase shall be at the discretion of the purchaser, whose decision shall be final. It shall not be necessary for the purchaser to serve a notice of such re-purchase on the defaulting Contractor. This right shall be without prejudice to the right of the purchaser to recover damages for breach of Contract by the Contractor.

11. EXTENSION OF TIME:

As soon as it is apparent that the Contract dates cannot be adhered to, an application shall be sent by the Contractor to the purchaser. If failure, on the part of the Contractor, to deliver the stores in proper time shall have arisen from any cause which the purchaser may admit as reasonable ground for an extension of the time (and his decision shall be final) he may allow such additional time as he considers it to be justified by circumstances, of the case without prejudice to the purchaser's right to recover liquidated damages under clause 10 thereof.

12. ERECTION OF PLANT & MACHINERY:

Wherever erection of a plant or machinery is the responsibility of the Contractor as per the terms of the Contract and in case the Contractor fails to carry out the erection as and when called upon to do so within the period specified by the purchaser, the purchaser shall have the right to get the erection done through any source of his choice. In such an event, the Contractor shall be liable to bear any additional expenditure that the purchaser is liable to incur towards erection. The Contractor shall, however, not be entitled to any gain due to such an action by the purchaser.

13. PAYMENT:

Contractor's bill will be passed for payment only after the stores have been received, inspected and accepted by the Purchaser.

14. MODE OF PAYMENT:

Normally payment will be made for the accepted stores within 30 days from the date of receipt of the materials.

15. RECOVERY OF SUM DUE:

Whenever any claim for the payment of, whether liquidated or not, money arising out of or under this Contract against the Contractor, the purchaser shall be entitled to recover such sum by appropriating in part or whole, the security deposited by the Contractor, if a security is taken against the Contract. In the event of the security being insufficient or if no security has been taken from the Contractor, then the balance or the total sum recoverable as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due to the Contractor under this or any other Contract with the purchaser. Should this sum be not sufficient to cover the full amount recoverable, the Contractor shall pay to the purchaser on demand the remaining balance due. Similarly, if the purchaser has or makes any claim, whether liquidated or not, against the Contractor under any other Contract with the purchaser, the payment of all moneys payable under the Contract to the Contractor including the security deposit shall be withheld till such claims of the purchaser are finally adjudicated upon and paid by the Contractor.

16. INDEMNITY:

The Contractor shall warrant and be deemed to have warranted that all stores supplied against this Contract are free and clean of infringement of any Patent, Copyright or Trademark, and shall at all times indemnify the purchaser against all claims which may be made in respect of the stores for infringement of any right protected by Patent Registration of design or Trade mark and shall take all risk of accidents or damage which may cause a failure of the supply from whatever cause arising and the entire responsibility for sufficiency of all means used by him for the fulfilment of the contract.

17. ARBITRATION:

In the event of any question, dispute or difference arising under these conditions or any conditions contained in the Purchase Order or in connection with this Contract (except as to any matter the decision of which is specially provided for by these conditions), the same shall be referred to the sole arbitration of the Head of the Purchase office or some other person appointed by him. It will be no objection that the arbitrator is a Government servant, that he had to deal with matter to which the Contract relates or that in the course of his duties as Government servant he has expressed views on all or any other matters in dispute or difference. The award of the arbitrator shall be final and binding on the parties of this Contract.

If the arbitrator be the Head of the Centre/Unit –

(i) In the event of his being transferred or vacating his office by resignation or otherwise, it shall be lawful for his successor-in-office either to proceed with reference himself, or to appoint another person as arbitrator, or

(ii) In the event of his being unwilling or unable to act for any reason, it shall be lawful for the Head of the Centre/Unit to appoint another person as arbitrator.

If the arbitrator be a person appointed by the Head of the Purchase Office –

In the event of his dying, neglecting or refusing to act or resigning or being unable to act, for any reason, it shall be lawful for the Head of the Centre/Unit either to proceed with the reference himself or appoint another person as arbitrator in place of the outgoing arbitrator.

Subject as aforesaid the Arbitration & Conciliation Act 1996 and the rules thereunder and any statutory modifications thereof for the time being in force shall be deemed to apply to the arbitration proceedings under this Clause. The Arbitrator shall have the power to extend with the consent of the purchaser and the Contractor the time for making and publishing the award. The venue of arbitration shall be the place as purchaser in his absolute discretion may determine. Work under the Contract shall, if reasonably possible, continue during arbitration proceedings.

In the event of any dispute or difference relating to the interpretation and application for the provisions of the Contracts, such dispute or difference shall be referred by either party to Arbitration of one of the Arbitrations in the Department of Public Enterprises. The Arbitration Act 1996 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute provided however any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs. Ministry of Law & Justice, Govt. of India. The parties to the dispute will share equally, the cost of arbitration as intimated by Arbitrator.

18. COUNTER TERMS AND CONDITION OF SUPPLIERS:

Where counter terms and conditions printed or cyclostyled conditions have been offered by the supplier, the same shall not be deemed to have been accepted by the Purchaser, unless specific written acceptance thereof is obtained.

19. SECURITY FOR PURCHASE OF MATERIALS:

Successful tenderer will have to furnish in the form of a bank guarantee or any other form as called for by the purchaser towards adequate security for the materials and properties provided by the Purchaser for the due execution of the Contract.

****

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
VIKARM SARABHAI SPACE CENTRE
PURCHASE UNIT III
RFF AREA
ISRO P.O, Thiruvananthapuram 695 022

Ph No. 0471-2563775,3609,3617
Fax: 0471-2562105
Email : spso_ prso@vssc.gov.in

INSTRUCTIONS TO TENDERERS AND TERMS & CONDITIONS (Foreign)

1. The Tenderers should submit quotations in duplicate in a sealed envelope, superscribing the Tender No. and due date of opening and complete in all respects with technical specifications, including pamphlets and catalogues.
2. A Proforma Invoice may also be given which should contain the following information:
a) The FOB/FCA value, the C & F value for import by Sea freight / Air freight up to and for air parcel post up to ..... should be separately indicated.
b) **Agency Commission**: The amount of commission included in the price and payable to the Indian Agent of the Contractor shall be paid directly to the Indian Agent by the Purchaser in equivalent Indian Rupees on the basis of an Invoice from him applying T.T. buying rate of exchange ruling on the date of placement of the Purchase Order and which shall not be subject to any further exchange variations. This payment will be released to the Indian Agent immediately after Customs clearance of the goods in India.
c) The Contractor shall invoice only for the net amount payable to him, after deducting the amount of Agency Commission included in the invoice which will be paid to the Indian Agent directly by the Purchaser. However, the Contractor's invoice should separately reflect the amount of commission payable to his Indian Agent.
d) The earliest delivery period and country of origin of the Stores.
e) Banker's name, address, telephone/fax Nos. & e-Mail ID of the Contractor.
f) The approximate net and gross weight and dimensions of packages / cases.
g) Recommended spares for satisfactory operation for a minimum period of one year.
h) Details of any technical service, if required for erection, assembly, commissioning and demonstration.
3. The FOB/FCA and C & F prices quoted should be inclusive of all taxes, levies,duties arising in the tenderer's country.
4. The offer should be valid for a minimum period of 120 days from the due date of opening of the tender.
5. Samples, if called for, should be sent free of all charges.
6. Late and delayed tenders will not be considered. Quotations by cable must be followed by detailed offers.
7. Offers made by Indian Agents on behalf of their Principals, should be supported by the proforma invoice of their Principals.
8. The details of Import Licence will be furnished in the Purchase Order.
9. The authority of person signing the tender, if called for, shall be produced.
10. Instructions / Operation Manual containing all assembly details including wiring diagrams should be sent wherever necessary in duplicate. All documents / correspondence should be in English language only.
11. The Purchaser reserves the right to accept or reject the lowest or any offer in whole or part without assigning any reason.
12. It is expressly agreed that the acceptance of the Stores Contracted for is subject to final approval in writing by the Purchaser.
13. a) Part shipment is not allowed unless specifically agreed to by us.
b) As far as possible stores should be despatched by Indian Flag Vessels / Air India through any Agency nominated by us.
14. Inspection / Test Certificate should be provided for the goods after testing it thoroughly at the Contractor's works. If any Inspection by Lloyds or any other testing agency is considered necessary, it shall be arranged by Contractors.
15. Where erection or assembly or commissioning is a part of the Contract, it should be done immediately on notification. The Contractor shall be responsible for any loss/damage sustained due to delay in fulfilling this responsibility.
16. For items having shelf life, those with maximum shelf life should be supplied if order is placed.

II. TERMS AND CONDITIONS

1. DEFINITIONS:
(a) The term 'Purchaser' shall mean the President of India or his successors or assignees.
(b) The term 'Contractor' shall mean, the person, firm or company with whom or with which the order for the supply of stores is placed and shall be deemed to include the Contractor's Successors, representatives, heirs, executors and administrators unless excluded by the Contract.
(c) The term 'Purchase Order' shall mean the communication signed on behalf of the Purchaser by an officer duly authorised intimating the acceptance on behalf of the Purchaser on the terms and conditions mentioned or referred to in the said communication accepting the Tender or offer of the Contractor for supply of stores of plant, machinery or equipment of part thereof.
(d) The term 'Stores' shall mean what the Contractor agrees to supply under the Contract as specified in the Purchase Order.
2. PRICES:
Tenders offering firm prices will be preferred. Where a price variation clause is insisted upon by a tenderer, quotations with a reasonable ceiling should be submitted. Such offers should invariably be supported by the base price taken into account at the time of tendering and also the formula for any such variations.
3. TERMS OF PAYMENT:
3.1 Being a Department of the Government of India, the normal terms of payment are by Sight Draft. However other terms of payment like establishment of Letter of Credit may be considered by the Purchaser on such terms and conditions as may be agreed upon.

Contd....2

3.2 The Sight Draft / Letter of Credit will be operative on presentation of the undermentioned documents:
a) Original Bill of Lading / Airway Bill
b) Commercially certified invoices describing the stores delivered, quantity, unit rate and their total value, in triplicate. The invoice should indicate the discounts, if any, and Agency Commission separately.
c) Packing List showing individual dimensions and weight of packages.
d) Country of Origin Certificate in duplicate.
e) Test Certificate.
f) Declaration by the Seller that the contents in each case are not less than those entered in the invoices and the quality of the Stores are guaranteed as per the specifications asked for by the Purchaser.
g) Warrantee and guarantee Certificate/s vide Clause 20 herein below
4. IMPORTANT LICENCE:
Reference to Import License No. & date and Contract number & date shall be prominently indicated in all the documents vide para 3.2
5. DEMURRAGE:
Supplier shall bear demurrage charges, if any, incurred by the purchaser due to delayed presentation of shipping documents as prescribed in para 3.2 to the bankers within a reasonable time (say within 10-12 days) from the date of bill of lading for sea consignments and within 3-4 days from the date of Air Way Bill for air consignments.
6. ADDRESS OF INDIAN AGENTS:
…….
7. GUARANTEED TIME DELIVERY:
The time for and the date of delivery stipulated in the Purchase Order shall be deemed to be the essence of the Contract. Delivery must be completed within the date specified therein.
8. INSPECTION AND ACCEPTANCE TEST:
8.1 The Purchaser's representatives shall also be entitled at all reasonable times during manufacture to inspect, examine and test on the Contractor's premises the material and workmanship of all stores to be supplied under this Contract and if part of the said stores is being manufactured on other premises, the Contractor shall obtain for the purchaser's representative permission to inspect, examine and test as if the equipment were being manufactured on the Contractor's premises. Such inspection, examination and testing shall not release the Contractor from the obligations under this Contract.
8.2 For tests on the premises of the Contractor or of any of his sub- Contractors, the Contractor shall provide free of cost assistance, labour, material, electricity, fuel and instruments as may be required or as may be reasonably needed by the purchaser's representative to carry out the tests efficiently.
8.3 When the stores have passed the specified test, the purchaser's representative shall furnish a certificate to the effect in writing to the Contractor. The Contractor shall provide copies of the test/s certificates to the purchaser as may be required.
9. MODE OF DESPATCH:
Generally, stores should be despatched through Indian Flagged Vessel / Air India or through any other Agency nominated by the purchaser. A copy of the invoice and packing list should invariably be kept inside each of the packages.
10. PORT OF ENTRY:
Thiruvananthapuram/Chennai/Mumbai/Hyderabad/Bangalore/……
……..
11. CONSIGNEE:
Purchase & Stores Officer, Stores, _____,
12. SHIPPING MARKS.
The mark on the shipping documents such as invoice, bill of lading and on the
packages should be as follow:
PURCHASE ORDER NO. ……..
DATED …….
GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
..... (name of the Centre/Unit)
Destination: ..... &
Port of Entry: .....
13. INSURANCE OF THE STORES:
The necessity or otherwise of insurance will be as indicated in the Purchase Order.
14. CONTRACTOR'S DEFAULT LIABILITY:
14.1 The purchaser may upon written notice of default to the Contractor terminate the Contract in whole or in part in circumstances detailed hereunder:
a) If in the judgement of the Purchaser the Contractor fails to make delivery of Stores within the time specified in the Contract/agreement or within the period for which extension has been granted by the Purchaser to the Contractor.
b) If in the judgment of the Purchaser the Contractor fails to comply with any of the other provisions of this Contract.
15. In the event the Purchaser terminates the Contract in whole or in part as provided in Clause 14 the Purchaser reserves the right to Purchase, upon such terms and in such a manner as he may deem appropriate, stores similar to that terminated and the Contractor shall be liable to the Purchaser for any additional costs for such similar stores and/or for liquidated damages for delay as defined in Clause 19 until such reasonable time as may be required for the final supply of stores.
15.1 If this Contract is terminated as provided in Clause 14 the Purchaser in addition to any other rights provided in this Article, may require the Contractor to transfer title and deliver to the Purchaser under any of the following clauses in the manner and as directed by the Purchaser:

Contd....3

a) Any completed stores.

b) Such partially completed stores, drawing, information and Contract rights (hereinafter called manufacturing material) as the Contractor has specifically produced or acquired for the performance of the Contract as terminated. The Purchaser shall pay to the Contractor the Contract price for completed stores delivered to and accepted, by the purchaser and for manufacturing material delivered and accepted.

15.2 In the event the Purchaser does not terminate the Contract as provided in Clause 14, the Contractor shall continue the performance of the Contract in which case he shall be liable to the purchaser for liquidated damages for delay as set out in Clause 19 until the stores are accepted.

16. REPLACEMENT:

If the stores or any portion thereof is damaged or lost during transit, the Purchaser shall give notice to the Contractor setting forth particulars of such stores damaged or lost during transit. The replacement of such stores shall be effected by the Contractor within a reasonable time to avoid unnecessary delay in the intended usage of the Stores. In case the purchaser agrees, the price towards replacement items shall be paid by the purchaser on the basis of
original price quoted in the tender or as reasonably worked out from the tender.

17. REJECTION :

In the event that any of the stores supplied by the Contractor is found defective in material or workmanship or otherwise not in conformity with the requirements of the Contract specifications, the purchaser shall either reject the stores or request the Contractor, in writing, to rectify the same. The Contractor, on receipt of such notification, shall either rectify or replace the defective stores free of cost to the purchaser. If the Contractor fails to do so,
the purchaser may at his option either –

a) replace or rectify such defective stores and recover the extra cost so involved from the Contractor, or

b) terminate the Contract for default as provided under clause 14 above, or

c) acquire the defective stores at a reduced price considered equitable under the circumstances. The provision of this article shall not prejudice the Purchaser's rights under clause 19.

18. EXTENSION OF TIME:

If the completion of supply of stores is delayed due to reason of *force majeure*such as acts of god, acts of public enemy, acts of Government, fires, floods,epidemics, quarantine restriction, strikes, freight embargoes, etc., the Contractor shall give notice within 15 days to the purchaser in writing of his claim for an extension of time. The purchaser on receipt of such notice after verification, if necessary, may agree to extend the Contract delivery date as
may be reasonable but without prejudice to other terms and conditions of the Contract.

19. DELAY IN COMPLETION / LIQUIDATED DAMAGES:

If the Contractor fails to deliver the stores within the time specified in the Contract or any extension thereof, the purchaser shall recover from the Contractor as liquidated damages a sum of one-half of one percent (0.5 percent) of the Contract price of the undelivered stores for each calendar week of delay. The total liquidated damages shall not exceed ten percent (10 percent) of the Contract price of the unit or units so delayed. Stores will be deemed to have been delivered only when all their component parts are also delivered. If certain components are not delivered in time, the stores will be considered as delayed until such time as the missing parts are delivered.

20. GUARANTEE & REPLACEMENT:

a) The Contractor shall guarantee that the stores supplied shall comply fully with the specifications laid down for material, workmanship and performance.

b) For a period of twelve months after the acceptance of the stores, if any defects are discovered therein or any defects therein are found to have developed under proper use arising from faulty materials, design or workmanship, the Contractor shall remedy such defects at his own cost provided he is called upon to do so within a period of 14 months from the date of acceptance thereof by the Purchaser who shall state in writing in what respect the stores or any parts thereof are faulty.

c) If in the opinion of the purchaser it becomes necessary to replace or renew any defective stores, such replacements or renewals shall be made by the Contractor free of all costs to the purchaser provided the notice informing the Contractor of the defect is given by the purchaser in this regard within the said period of 14 months from the date of acceptance thereof.

d) Should the Contractor fail to rectify the defects, the purchaser shall have the right to reject or repair or replace at the cost of the Contractor the whole or any portion of the defective stores.

e) The decision of the Purchaser, notwithstanding any prior approval or acceptance or inspection thereof on behalf of the purchaser, as to whether or not the stores supplied by the Contractor are defective or any defects has developed within the said period of 12 months or as to whether the nature of the defects requires renewal or replacement shall be final, conclusive and binding on the Contractor.

f) To fulfill guarantee conditions outlined in Clause 20 (a) to (e) above, the Contractor shall, at the option of the purchaser, furnish a Bank Guarantee (as prescribed by the purchaser - Bank Guarantee format enclosed) from a Bank approved by the purchaser for an amount equivalent to 10% of the value of the Contract along with first shipment documents. On the performance and completion of the Contract in all respects, the Bank Guarantee will be returned to the Contractor without any interest.

g) All the replacement stores shall also be guaranteed for a period of 12 months from the date of arrival of stores at purchaser's site.

h) Even while the 12 months guarantee applies to all stores, in case where a greater period is called for by our specifications, then such a specification shall apply, and in such cases, the period of 14 months referred to in Clause 20 (b) and (c) shall be asked for guarantee period plus two months.

21 REQUIREMENT OF ADDITIONAL NUMBERS OF THE STORES/SPARE PARTS ORDERED:

The Contractor shall also undertake the supply of additional number of items covered by the order as considered necessary by the purchaser at a later date, the actual price to be paid shall be mutually agreed to after negotiations.

Contd....4

22. PACKING:

a) The Contractor wherever applicable shall pack and crate all stores for sea /air shipment as applicable in a manner suitable for export to a tropical humid climate, in accordance with internationally accepted export practices and in such a manner so as to protect it from damage and deterioration in transit by road, rail or sea for space qualified stores. The Contractors shall be held responsible for all damages due to improper packing.

b) The Contractor shall ensure that each box / unit of shipment is legible and properly marked for correct identification. The failure to comply with this requirement shall make the Contractor liable for additional expenses involved.

c) The Contractor shall notify the purchaser of the date of shipment from the port of embarkation as well as the expected date of arrival of such shipment at the designated port of arrival.

d) The Contractor shall give complete shipment information concerning the weight, size, content of each packages, etc.

e) Transshipment of equipment shall not be permitted except with the written permission of the purchaser.

f) Apart from the despatch documents negotiated through Bank, the following documents shall also be airmailed to the purchaser within 7 days from the date of shipment by sea and within 3 days in case of air-consignments:

a) Commercial Bill of Lading / Air Way Bill / Post parcel Receipt. (Two non-negotiable copies)

b) Invoice (3 copies)

c) Packing List (3 copies)

d) Test Certificate (3 copies)

e) Certificate of Origin.

The Contractor shall also ensure that one copy of the packing list is enclosed in each case.

23. ARBITRATION:

If at any time any question, dispute or difference whatsoever shall arise between the purchaser and the Contractor upon or in connection with this Contract, either party may forthwith give to the other notice in writing of the existence of such question, dispute or difference and the same shall be referred to the adjudication of two arbitrators, one to be nominated by purchaser, other by a Contractor and in the event of any difference of opinion,

the arbitrators will refer the matter to the umpire. The arbitration shall be conducted in accordance with the rules and procedure for arbitration of the International Chamber of Commerce at Paris. The expenses of the arbitrators and umpire shall be paid as may be determined by them. However, the venue of such arbitration should be in India.

24. LANGUAGE AND MEASURES:

All documents pertaining to the Contract including specification, schedule, notice, correspondence, operating and maintenance instructions, drawings or any other writings shall be written in English language. The metric system of measurement shall be used exclusively in the Contract.

25. INDEMNITY:

The Contractor shall warrant and be deemed to have warranted that all Stores supplied against this Contract are free and clean of infringement of any patent,copyright or trade mark and shall at all times indemnify the purchaser against all claims which may be made in respect of stores for infringement of any right protected by Patent, Registration of design or Trade Mark, and shall take all risk of accident or damage which may cause a failure of the supply from whatever cause arising and the entire responsibility for the sufficiency of all the means used by him for the fulfillment of the Contract.

26. COUNTER TERMS AND CONDITIONS OF SUPPLIERS:

Where counter terms and conditions/printed or cyclostyled conditions have been offered by the supplier, the same shall not be deemed to have been accepted by the purchaser unless specific written acceptance thereof is obtained.

27. SECURITY INTEREST:

On each item to be delivered under this Contract, including an item of work in progress in respect of which payments have been made in accordance with the terms of the Contract, purchaser shall have a security interest in such items which shall be deemed to be released only at the time when the applicable deliverable item is finally accepted and delivered to the purchaser in accordance with the terms of the Contract. Such security interest of the

purchaser shall constitute a prior charge as against any other charge or interest created in respect of such items by any entity.

28. BANK CHARGES:

While the purchaser shall bear the bank charge payable to his Bankers (State Bank of India), the Contractor shall bear the Bank charges payable to his Bankers including the cheques towards advising amendment commissions.

29. TRAINING:

The Contractor shall, if required by the purchaser, provide facilities for the practical training of Purchaser's engineering / technical personnel from India and for their active association on the manufacturing processes throughout the manufacturing period of the Contract / stores, number of such personnel to be mutually agreed upon.

30. APPLICABLE LAW:

The Contract shall be interpreted, construed and governed by the laws of India.

---

2. E-Tenders are invited for **Revamping of 3 Axis Filament Winding Machine** listed below. The Bids are to be prepared and submitted in specified Templates online, by logging into the portal https://eprocure.isro.gov.in. Submission of Bids involves two stages to be performed by Vendors – Submission of Bids and Open Authorization. The Bids remain encrypted with the bidders's public key, until the Open Authorization stage. All those Bids where Open Authorization is not given, are automatically disqualified. Such Bids will not be openable and will not be considered for further processing. The Vendors are advised to submit the Bids much before the Closing Time to avoid last minute problems.

E-Procurement No. VSSC/CMSEPUR/2020E2006001 Dt. 08.05.2020 and Print Media Advertisement ref. No. VSSC/P/ADVT/300/2020 Dt. 21.05.2020. E-Tenders are invited for **Revamping of 3 Axis Filament Winding Machine** through our E-procurement site https://eprocure.isro.gov.in. Tender documents can be downloaded **upto 22.06.2020 [17:00 Hrs.], Tender Opening date : 30.06.2020 [10:00 Hrs.].**

Only online tenders will be accepted. No manual / Postal / e-mail / fax offers will be entertained. No manual tender document will be issued. Parties interested to participate in this e-Tender are required to register themselves as vendors, if not already registered, in our e-procurement portal https://eprocure.isro.gov.in by downloading plugins and help demos listed on the home page of the e-procurement link mentioned above to complete the vendor registration process. They can seek help from help desk 080 6780 7786 also as provided in the home page of e-procurement portal in case of any problem for registration and subsequent process. Vendors may please note that without registering in our e-procurement portal, they will not be able to quote for this e-tender.

Important Notice : Tender shall be opened on the first day of the schedule **[ie. 30.06.2020 [10:00 Hrs.]**. If the tender could not be opened on the first day due to any technical snag, it will be opened on the subsequent day as per the schedule. Bidders who are desirous of attending the tender opening may make arrangements for attending the tender opening at their cost.

This is a two part tender, Technical & Commercial part (Part I) and Price Part (Part II) shall be submitted separately. The tenderers should not attach any documents containing Price information along with Technical & Commercial Bid (Part I). We do not open PART II (Price Bid), if PART-I (Technical & Commercial offer) does not meet with our technical specification requirements. Cost split up, other price details etc. shall be uploaded as a separate document under COMMERCIAL DOCUMENTS FROM VENDOR tab.

THE TECHNICAL DOCUMENTS NEED TO BE ATTACHED ONLINE AS A SINGLE PDF FILE WITHOUT ANY PRICE INFORMATION, TECHNICAL BID CONTAINING PRICE DETAILS WILL BE TREATED AS REJECTED.