भारत सरकार/Government of India
अंतरिक्ष विभाग/Department of Space
द्रव नोदन प्रणाली केंद्र
LIQUID PROPULSION SYSTEMS CENTRE
एच ए एल II स्टेज, 80 फीट रोड
HAL II STAGE, 80 FEET ROAD,
बेंगलूरु/BANGALORE-560 008.
फोन सं./Phone No.080 25037171
ई-मेल/Email: purchase@lpscb.gov.in

दिनांक/Date: 04.02.2026

**लोक निविदा सूचना सं. 03BB 202500011531-01 दिनांक 04.02.2026**

**PUBLIC TENDER NOTICE NO. 03BB 202500011531-01 DATED 04.02.2026**

आईटीपीएफ सुविधा का प्रचालन एवं अनुरक्षण
**Operation and maintenance of ITPF facility**

**निविदा वर्गीकरण/Tender Classification : लोक निविदा / PUBLIC TENDER**

## निविदा की निर्धारित तिथियाँ/TENDER SCHEDULE

| | | |
|---|---|---|
| बोली प्रस्तुति की आरंभिक तिथि/Bid Submission Start Date | : | 04.02.2026 17:00 |
| बोली स्पष्टीकरण की नियत तिथि/Bid Clarification Due Date | : | 18.02.2026 17:00 |
| बोली प्रस्तुतीकरण की नियत तिथि/Bid Submission Due Date | : | 24.02.2026 14:00 |
| बोली खुलने की तिथि/Bid Opening Date | : | 24.02.2026 14:30 |
| मूल्य बोली खुलने की तिथि / Price Bid Opening Date | : | 10.03.2025 14:00 |

मूल निविदा की अन्य सभी निबंधन एवं शर्तें अपरिवर्तित रहेंगी।
**All other terms and conditions of the original tender notice shall remain unchanged.**

निविदा दस्तावेज़ https://www.isro.gov.in/ OR https://eproc.vssc.gov.in या इसरो ई-प्रापण पोर्टल से डाउनलोड किए जा सकते हैं। **Tender documents can be downloaded from** https://www.isro.gov.in/ OR https://eproc.vssc.gov.in **or ISRO E-Procurement Portal.**

हस्ताक्षरित/Signed
क्रय व भंडार अधिकारी/Purchase & Stores Officer

भारत सरकार
अंतरिक्ष विभाग (अं.वि.)

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE (DOS)

PURCHASE & STORES

फोन नं Ph No. / Fax. / ईमेल e-mail:

# INVITATION TO TENDER
निविदा आमंत्रण

M/s
मैसर्स 00000

Our Ref. No. 03BB 2025-011531-01
हमारी संदर्भ सं

Tender Due at 14:00 hrs IST on 24/02/2026
निविदा अंतिम तिथि

महोदय

Dear Sirs,

कृपया निम्नलिखित मदों की आपूर्ति के लिए अनुलग्नक (फार्म सं. संलग्न ) में उल्लिखित निबंधन एवं शर्तों के अनुसार संलग्न निविदा प्रपत्र में वर्णनात्मक सूचीपत्र/पैम्फलेट/साहित्य सहित हमारी संदर्भ सं. एवं अंतिम तिथि (मोटे अक्षरों में) ऊपर लिखते हुए अपनी मुहरबंद निविदा प्रस्तुत करें।

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. AS ENCLOSED )

| क्र.सं. Sl. No. | विनिर्देशों सहित मद का विवरण Description of items with Specifications | इकाई Unit | मात्रा Quantity |
|---|---|---|---|
| 1 | OPERATION & MAINTENANCE OF ITPF FACILITY FOR MACHINING, ASSEMBLY, TESTING AND SUPPLY OF TITANIUM PROPELLANT TANKS AS PER ANNEXURE | LOT | 1 |

सुपुर्दगी स्थल
**Delivery At** ITPF, LPSC TUMAKURU

प्रेषण की विधि
**Mode of Despatch** ~~BY ROAD~~ Onsite

शुल्क छूट
**Duty Exemptions** NA

विशेष अनुदेश
**Special Instructions** NIL

विशेष निबंधन
**Specific Terms** AS ENCLOSED

निविदाकारों को अनुदेश
**Instructions to Tenderers**

(1) Maintenance of ITPF facility enclosed as Annexure-I.

(2) RFP document enclosed as Annexure-II

(3) Email/ Fax/ Unsigned quotations will not be considered.

(4) Vendor details are attached here with. You are requested to fill and forward the same along with the quotation regarding bank details for making payment.

R

04/02/26

ANILKUMAR H R
PURCHASE & STORES OFFICER
भारत के राष्ट्रपति के लिए एवं ओर से
For and on behalf of the President of India
क्रेता / The Purchaser

# REQUEST-FOR-PROPOSAL
# (RFP)

## FOR OPERATION & MAINTENANCE OF INTEGRATED TITANIUM ALLOY TANK PRODUCTION FACILITY (ITPF)

## AT
## LIQUID PROPULSION SYSTEMS CENTRE, TUMAKURU

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Liquid Propulsion Systems Centre, Bangalore

Jan 2026

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| # | Document description |
|---|---|
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| 30 | PAS Flow test procedure document |
| 31 | PAS Vibration test procedure document |
| 32 | PAS Handling and storage procedure document |
| 33 | PAS Test plan procedure document |

**ABBREVIATIONS**

| | | |
|---|---|---|
| ***ASB*** | - | *Anti Slosh Baffles* |
| ***CMC*** | - | *Contract Management Committee* |
| ***TAC*** | - | *Tank Acceptance Committee* |
| ***CNC*** | - | *Computer Numerical Control* |
| ***DD*** | - | *Draining Device* |
| ***DWF*** | - | *Digital Work Flow* |
| ***EBW*** | - | *Electron Beam Welding* |
| ***FIM*** | - | *Free-Issue-Material* |
| ***FPI*** | - | *Fluorescent Penetrant Inspection* |
| ***GEOSAT*** | - | *Geosynchronous Satellite* |
| ***ISRO*** | - | *Indian Space Research Organization* |
| ***ITPF*** | - | *Integrated Titanium alloy tank Production Facility* |
| ***IRS*** | - | *Indian Remote Sensing Satellite* |
| ***LPSC*** | - | *Liquid Propulsion Systems Centre* |
| ***LSC*** | - | *Local Salvage Committee* |
| ***LD*** | - | *Liquidated Damages* |
| ***MEOP*** | - | *Maximum expected operating pressure* |
| ***NCR*** | - | *Non-Conformance Report* |
| ***NDI*** | - | *Non-Destructive Inspection* |
| ***PMD*** | - | *Propellant Management Device* |
| ***PAS*** | - | *Propellant Acquisition System* |
| ***PSLV*** | - | *Polar Satellite Launch vehicle* |
| ***VTMC*** | - | *Vertical Turn Mill Centre* |
| ***CBH*** | - | *Common Bulk Head (referred as PS4 tank)* |
| ***NDA*** | - | *Non Disclosure Agreement* |

# 1. INTRODUCTION

LPSC, Bangalore has expertise in design, manufacturing, assembly, testing and evaluation of Titanium alloy propellant tanks for various satellite & launch vehicle programs of ISRO.

In order to build additional capacity to meet increased demand for satellite & Launch Vehicle programs of ISRO, LPSC-Bangalore is in the process of establishing a dedicated Integrated Titanium alloy tank Production Facility (ITPF) for machining, assembly, testing, evaluation and delivery of the titanium alloy spacecraft propellant tank & Common Bulk Head (CBH) propellant tanks (Previously referred as PS4) along with Propellant Acquisition System (PAS) for MMH & MON3.

ITPF has installed annual production capacity of 22 nos. of Spacecraft propellant tanks and 06 nos. of CBH Propellant tanks along with 06 sets of PAS (MMH & MON3).

The spacecraft propellant tanks have volumes varying from about 30 litres to 1,500 litres. The diameters vary from about 400 mm up to 1,400 mm. Thin walled, machined hemispheres along with propellant management devices (PMDs) are electron beam welded for realizing the propellant tanks. Additional central cylinders are added to obtain higher volume propellant tanks as variants. In certain cases Cassini shaped end domes are used in place of hemispheres.

The volumes of CBH propellant tank varies from about 1,600 litres to 3,000 litres. The diameter is about 1,380 mm. This is a Bi-compartmental propellant tank with propellant acquisition system (PAS) sub-assembly. In this case also the thin walled, machined end dome is electron beam welded to realize the propellant tanks. After separate Assembly and Testing of 01 set of PAS (MMH & MON3), the same will be assembled to CBH tank to realize one CBH propellant tank.

This Request-for-Proposal (RFP) is to entrust the scope of operation & maintenance of the dedicated ITPF facility by an INDUSTRY for machining, inspection, assembly, testing, evaluation and delivery of spacecraft & CBH propellant tanks and other sub assemblies for a period of 5 years including initial training at DEPARTMENT facilities. The training will be imparted in the selected areas of assembly & testing of propellant tanks and PAS.

After successful completion of initial training in the selected areas of hardware realization process, the industry shall carry out machining, assembly, testing and delivery of envisaged deliverables using free-issue of material (FIM) issued by the DEPARTMENT. The FIM comprises of Titanium alloy forgings, machined parts for PAS, standard parts, Draining Devices (DDs), Anti Slosh Baffles (ASB), consumables etc. The Contract will have provision for constitution of a Contract Management Committee comprising of members from the DEPARTMENT & the INDUSTRY. The Contract Management constituted will decide the deliverable quantity for each year.

The annual work-load is based on anticipated nominal project requirements. However, in order to meet dynamic project needs during the course of execution of the contract, flexible provisions embedded to increase or decrease the deliverable quantity. The relative priority among these items would be decided by the CMC from time-to-time based on the project demand. Required raw material will be supplied by Department.

The contract Tenure is likely to be extended based on satisfactory completion of scope.

## 2. DEFINITIONS

Wherever used hereinafter in this Request-for-Proposal, the following expressions shall have meaning as given:

i. **Contract:**

Contract means the terms contained in the proposed Contract document including Annexures herein specified, to be signed and concluded between 'Department' and 'Industry'.

ii. **ISRO:**

Means the Indian Space Research Organisation under the DEPARTMENT OF SPACE.

iii. **Department:**

Means, the President of India or his successors, representatives or assigns, in this case, THE DIRECTOR, LIQUID PROPULSION SYSTEMS CENTRE, BANGALORE 560 008.

iv. **Industry:**

Means the vendor who will finally be assigned this work.

v. **Manufacturing:**

Means gamut of all those processes and activities that converts the parts into components or assemblies.

vi. **Machining:**

Conversion of raw material (Titanium alloy forgings) to finished part (Hemispherical / Ellipsoidal / Cassini shaped dome / Cylindrical ring part) for Spacecraft & CBH tanks.

vii. **Part:**

Individual pieces manufactured as per supplied drawings, processes and procedures.

viii. **Pressure vessel part:**

Machined hemispherical dome, CBH Semi Elliptical tank end domes, Cassini shaped end-domes, cylindrical rings, etc used for assembly of propellant tanks.

ix. **Sub-assembly:**

Two or more parts assembled together either by joining or mechanical assembly to meet specified requirements.

x. **Spacecraft Propellant tank:**

An integrated product of hemispherical / cassini domes, cylindrical shells & PMD component which will ultimately be used in a spacecraft.

xi. **CBH Propellant tank:**

An integrated product of fore-end & aft-end domes, cylindrical shells & PAS sub-assembly.

xii. **Raw material:**

Means a material that has to undergo change in form before it can be used as a part. A typical example is "Titanium alloy (Ti6Al4V) hemispherical, semi elliptical end dome forgings or Cassini shaped domes & cylindrical rings etc".

**xiii. Standard part:**

A finished product, which can be used directly in the assembly with or without any modification.

**xiv. Consumable:**

A substance used during sub-assembly conversion processes, assembly operations or during integration of titanium alloy tanks.

**xv. Free-issue-Material (FIM):**

(i) FIM for machining:

Raw materials issued by the Department as free-issue.

(ii) FIM for assembly & Testing:

Free Issue Materials for assembly & Testing includes Standard parts, consumables, machined / accepted parts / sub-assemblies like Anti-slosh baffles (ASB) for CBH tank and Draining Device (DD) for Spacecraft tank etc. will be issued by Department. Discussed in detail in subsequent clauses.

**xvi. Proto flight testing:**

A demonstration by test, that a set of flight model sub-assemblies or fully assembled tanks to meet performance requirements when subjected to specified qualification tests successfully. This will indirectly qualify the newly established facilities, processes, personnel and vendor per say qualification.

Demonstration by proto flight testing (i.e., test parameters equivalent to Qualification level and the duration equal to Acceptance level) has to be carried out for all variants of propellant tanks.

**xvii. Flight acceptance:**

A demonstration by test that a flight component can meet its performance requirements subjected to its maximum and minimum predicted environmental conditions as per the specified acceptance test requirements.

**xviii. Tooling:**

Any hardware that is necessary for realizing individual parts.

**xix. Fixture:**

Any hardware that is necessary for holding parts or sub-assemblies or propellant tanks at any stage of sub-assembly conversion, assembly, welding, integration or testing.

**xx. Production:**

Means the entire gamut of all processes, activities involved in the following activities

- Converting raw material to machined parts
- Converting machined parts & standard parts to sub-assemblies and final Product which includes assembly, chemical cleaning, intermediate tests, welding, NDT etc.
- Acceptance testing of final product to verify the structural integrity and functional aspects

**xxi. Sub-assembly machining:**

All those metal working processes that requires for finish machining operation for a sub-assembly to suit to further assembly operation.

**xxii. Inspection:**

All those processes that confirm by physical measurements, visual assessment and other means that parts have been produced to specifications.

**xxiii. FCD:**

Acronym for Functional Critical Dimension. These dimensions are very critical dimensions, which affects the functioning of a component.

**xxiv. PCD:**

Acronym for Process critical dimensions. These dimensions are very critical dimensions, which affects the Process of parts realization.

**xxv. ACD:**

Acronym for Assembly Critical Dimensions. These dimensions are very critical dimensions, which affects the Assembly process of tank realization.

**xxvi. ICD:**

Acronym for Interface Control Dimensions. These dimensions are very critical dimensions, which affects during the Integration of the tanks with satellite/CBH stage.

**xxvii. Approval:**

Means documents in the approval category require approval from Department prior to implementation by the INDUSTRY. Approval is understood to mean permission to proceed unlike otherwise specified.

**xxviii. Production Year:**

`PRODUCTION YEAR' for all purpose of Contract execution- "a 12 months period is identified as production year". During this period no escalation is applicable. This production year is neither Calendar year nor financial year.

Table 1 – Production year for all purpose of contract execution

| # | Production year | Period of production year | | Production phase |
|---|---|---|---|---|
| 1 | 1st year | $T_0$ + 6 months | **(Phase-I)** | Pre-production phase (refer clause 7.0) |
| | | $T_0$+ 6 months to 12th month | **(Phase-II)** | |
| 2 | 2nd year | $T_0$+ 13th month to 24th month | | Production phase |
| 3 | 3rd year | $T_0$+ 25th month to 36th month | | |
| 4 | 4th year | $T_0$+ 37th month to 48th month | | |
| 5 | 5th year | $T_0$+ 49th month to 60th month | | |

*$T_0$: Date of deployment of industry personnel.*

## 3. OPERATIONS AND INVOLVED FACIITIES

ITPF is a self contained plant and includes full complement of machining, welding (including Electron Beam Welding), inspection & QC, chemical cleaning, vacuum heat-treatment, non-destructive inspection, assembly clean-rooms and test facilities. The plant also includes captive power supply, UPS back up and utilities such as gas bank with network of distribution lines for various gases such as GN2, GHe, GAr, compressed air, etc. The entire facility will be equipped with computer network for digital workflow.

The bird's eye view of the various facilities & operation and maintenances involved are detailed below.

**Storage:** Receipt and storage of titanium alloy forgings, machined parts, standard parts and consumables at bonded stores. Safe storage of sub-assemblies and finished propellant tanks in respective bonded stores.

**High precision machining:** Machining of hemispherical / ellipsoidal /Cassini shaped domes, cylindrical rings with stringent geometrical & dimensional tolerances are carried out in machining facility. The high precision machine tools used are: Ø 1500 mm class horizontal heavy duty CNC lathe, Ø 600 mm class horizontal CNC lathe, 4 axes mill-turn centre, Ø 1500 mm vertical turn-mill centre, precision lathe, CNC milling machine, general purpose lathe and precision de-burring equipments & tools, etc.

**Inspection & Metrology:** Thorough inspection of machined parts such as thickness mapping of domes, visual and dimensional inspection is carried out in metrology and inspection facility. The high-end metrology inspection equipments used are co-ordinate measuring machine, height measuring instrument, surface finish measuring machine (portable), ultrasonic thickness gauge and other precision measuring instruments. Inspection is required to be carried out at various stages such as part level, sub-assembly level, final assembled propellant tanks, etc.

**Surface treatment:** Chemical cleaning of machined parts, preparation of weld joint surfaces, etc., is carried out in the chemical cleaning facility.

**Pre-assembly operations:** Precision de-burring of machined parts & sub-assemblies under microscope, visual inspection of standard parts, tube bending, matching, etc., are carried out in the pre-assembly area. A separate fitting room is identified for all manual fitting jobs.

**Sub-assembly conversion:** Assembly of machined parts is carried out in clean environment i.e., 1,00,000 Class clean-room. Orbital TIG welding is used to join the tubes of propellant / gas ports, etc. The final tank assembly and cleanliness verification is carried out in 10,000 Class clean room.

**Bubble point test facility:** Sub assembly level Bubble point tests will be carried out in this facility to verify the integrity of Screen/Wire meshes used at various stages of Propellant Acquisition Systems/ Propellant tanks built up.

**Welding & heat treatment:** Joining of machined parts & standard parts using electron beam welding / M. TIG welding processes are carried out in this facility. The machines used are: Electron beam welding machines and MTIG welding machine. The finished Titanium alloy spacecraft propellant tanks are heat treated in vacuum furnace (ageing).

**Non-Destructive Inspection (NDI):** The sub-assemblies and finished propellant tanks are subjected to elaborate non-destructive inspection in individual facilities. The weld joints are subjected to X-ray radiographic inspection, ultrasonic inspection and fluorescent penetrant inspection. Certain parts are inspected by eddy current method including robotic eddy current testing. In addition the spacecraft propellant tank will be subjected to shearograpy inspection through outsourcing.

**Sub-assembly / final machining:** Precision turning, milling and drilling/reaming operation and maintenances are carried out on sub-assembly/finished spacecraft propellant tanks in a special purpose 4 axes mill-turn centre. In addition, riveting is carried-out for fixing plate-nuts. Finally, the tank surfaces are manually polished.

**Testing and facilities:** The sub-assemblies and final assembled propellant tanks are subjected to various tests such as functional tests, pressure test, leak test, vibration test, cleanliness verification test etc.

- The propellant tanks are subjected to hydraulic/pneumatic pressure tests. Separate hydraulic and pneumatic test facilities are employed for this. There is DM water plant production facility for the hydraulic test. The facilities are fully instrumented.
- External leak measurements of the propellant tanks are carried out in dedicated leak test chamber.

- The spacecraft propellant tanks will be subjected to vibration testing with the tanks filled with simulant fluid to simulate mass and under pressure. These tests will be carried out in vibration test facility which has suitable rating vibration shaker along with instrumentation and data acquisition system.
- During the initial phase of operation, vibration facility for higher capacity spacecraft tanks (60 L to 1500 L) is to be outsourced by the party.
- Verification of Interface Control Dimensions (ICD) of the final tank using CMM prior to delivery.
- On-line quality surveillance at all stages of assembly & testing operations.
- Documentation in digital mode, packing & delivery.

**Criticalities involved**

- Machining of high-value Titanium alloy thin walled hemispherical domes / cylinders, etc., with varying surface profile from a stock thickness of 20.0 mm(approx) to varying thicknesses up to 0.8 mm final thickness. Adherence to geometrical tolerances as per drawings for jobs up-to dia. 1500 mm is a challenging work.
- Assembly of high value added thin shells with draining device & PMD parts–in clean environment.
- Electron beam welding of sub-assemblies and assemblies to realise the full propellant tank.
- Advanced NDI of the propellant tanks which include X-ray radiography, ultrasonic inspection, eddy current inspection and shearographic inspection.
- Testing of the propellant tanks which include functional testing (bubble point, flow characterisation, expulsion efficiency) pressure testing, leak testing, vibration testing, etc.
- Safe handling of parts, sub-assemblies, and full propellant tanks during assembly and testing with stipulated safety measures during the realisation process. Ensuring proper storage of these items during work.
- The free-issue-materials (FIM) comprising of Titanium alloy forgings, value added propellant management devices and anti-slosh baffles are long lead & high value items. Rejections at any stage of production in ITPF would impact delivery schedules and have major cost implications.

## 4. GENERAL

Technical conditions and the documents enclosed as **Annexures** forms integral part of this Contract and are complimentary to each other. In case of conflicts of meaning between the documents, the documents shall prevail in the following order.

i. The conditions stipulated herein shall prevail over General Conditions and Clauses.

ii. Contract drawings read in conjunction with technical specification document shall prevail over all earlier drawings, documents, discussions, communications, specifications, etc., during earlier exchange between DEPARTMENT & INDUSTRY.

iii. In respect of any other disputes or conflicts, the Contract shall prevail over all other documents.

No publicity of any kind whatsoever regarding this Contract will be given by the party without prior written approval of DEPARTMENT.

## 5. LOCATION

The ITPF facility is located at the premises of LPSC Tumakuru campus (about 60 kms from Bangalore), Pin Code-572103, Karnataka.

## 6. OVER VIEW & SCOPE OF THE CONTRACT

The scope of contract encompasses Operation & Maintenance of ITPF and delivery of envisaged titanium satellite propellant tanks, CBH propellant tanks along with PAS sub-assemblies using facilities established at ITPF by the DEPARTMENT and utilizing the raw material forgings, standard parts etc issued by the DEPARTMENT as Free-Issue-Materials (FIM). Scope of work includes Operation and Maintenance of ITPF facility, machining, assembly, testing, evaluation & delivery etc.

Brief details of the operations involved in realizing envisaged deliverables are detailed as given below. However, the exact realization procedure to be adopted is as per the technical documents annexed along with the RFP document:

**(i) Storage of FIM:**

Receipt and storage of titanium alloy forgings, machined parts, standard parts and consumables at raw material storage facility. Also, Safe storage of machined forgings, sub-assemblies and finished propellant tanks in finished parts storage facility.

**(ii) Machining of tank parts & Weld test specimens:**

Machining of hemispherical / ellipsoidal / Cassini shaped domes, cylindrical rings with stringent geometrical & dimensional tolerances are carried out in machining facility. The high precision machine tools used are: Ø1500 mm class horizontal heavy duty CNC lathe, Ø600 mm class horizontal CNC lathe, 4 axes mill-turn centre, Ø1500 mm vertical turn-mill centre, precision lathe, CNC milling machine, general purpose lathe and precision de-burring equipments & tools, etc.

Machining of weld test specimens required to prove the weld parameters as per process documents for respective deliverables.

**(iii) Metrology & inspection:**

Inspection of machined parts such as thickness mapping of domes, visual and dimensional inspection is carried out in metrology and inspection facility. The high-end metrology inspection equipment used are co-ordinate measuring machine(CMM), height measuring instrument, surface finish measuring machine (Portable), ultrasonic thickness gauge and other precision measuring instruments. Inspection is required to be carried out at various stages such as part level, sub-assembly level, final assembled propellant tanks, etc.

**(iv) Pre-assembly operation:**

Precision de-burring of machined parts made out of Titanium alloy & sub-assemblies under microscope, visual inspection of standard parts, tube bending, matching, etc., are carried out in the pre-assembly area.

**(v) Sub-assembly realization:**

- Assembly of machined parts is carried out in clean environment i.e., 1,00,000 Class Clean-room. Orbital TIG welding is used to join the tubes of propellant / gas ports, etc. The final cleaning and cleanliness verification is carried out in 10,000 class clean room.
- Chemical cleaning of machined parts, preparation of weld joint surfaces, etc., is carried out in the chemical cleaning facility.
- Joining of cleared machined parts & standard parts using electron beam welding / TIG welding processes are carried out in this facility.
- The machines used are: Electron beam welding machines (35 cu.m/60 kV, 30 & 10 cu.m/150 kV, 1 cu.ft/60 kV) and MTIG welding machine. The finished Titanium alloy spacecraft propellant tanks are heat treated in vacuum furnace (ageing).

**(vi) Non-Destructive-Inspection (NDI):**

Visual inspection, X-ray radiography, Fluorescent penetrant tests, Ultrasonic testing, Eddy current testing, Shearography etc.

**(vii) Sub-assembly level testing:**

Flow test, MEOP, proof pressure test, bubble point test, cleanliness test and leak test.

**(viii) Final assembly:**

Final assembly in clean room class 10000, 100000 & AC room as applicable.

**(ix) Environmental testing:**

Vibration tests and data acquisition.

**(x) Acceptance tests:**

Similar to functional checks viz., leak, flow at various stages, that is, after assembly, proof-pressure tests & environmental tests (only for space craft tanks) after one-time proto flight testing of the propellant tanks.

Final assembly as specified followed by functional tests viz., flow test, leak test, electrical test, high pressure test and data acquisition.

- ✓ Verification of Interface Control Dimension (ICD).
- ✓ On-line quality control at all stages of assembly & testing operations by the INDUSTRY and overseeing by the DEPARTMENT.
- ✓ Delivery of certified deliverables with documentation.
- ✓ Complying the quality clauses as given in the technical documents.
- ✓ Complying with all safety and security regulations of the DEPARTMENT.
- ✓ Reporting of technical data for each hardware as per the stipulated formats issued by Department.

**(xi) ITPF Maintenance:**

Industry is entrusted with maintenance of ITPF facility. This includes maintenance of following:

- ✓ Equipment maintenance (day to day maintenance, AMC, facility Up keeping etc.)
- ✓ Utilities (Electricity, Water, AC, Cranes etc.)

## 7. SCOPE OF WORK:

### 7.1. Brief description on scope of work

(i) Operation and Maintenance of ITPF facility.

(ii) Machining, Assembly & Testing of "Satellite, CBH propellant tanks and Assembly & Testing of Propellant Acquisition System (PAS-MON3 & MMH)" as specified in clause no. 6.

(iii) The scope-of-work encompasses executing the Contract in TWO PHASES at ITPF i.e Pre-production phase & Production phase.

Table 2 – Brief description on Scope of Work

| Activity | | Pre-production phase ($1^{st}$ year) | | Production phase ($2^{nd}$ to $5^{th}$ year) |
|---|---|---|---|---|
| | | Phase-I | Phase-II | $T_0$ + $13^{th}$ to $60^{th}$ months (48 months) |
| | | $T_0$ to $T_0$+6 month (6 months) | $T_0$+$7^{th}$ to $12^{th}$ month (6 months) | |
| **1** | **SPACECRAFT PROPELLANT TANKS** | | | |
| a) | Machining | Qualification of Industry personnel. Machining of tank parts at ITPF for proto fight hardware. | Machining of identified tank parts at ITPF for flight hardware. | End-to-end Production of envisaged deliverables by Industry team at ITPF. |
| b) | Assembly & testing | Training to the Industry team. Qualification of Industry personnel. | Realisation of identified proto hardware at ITPF by Industry team with DEPARTMENT supervision. | |
| **2** | **CBH PROPELLANT TANKS** | | | |
| a) | Machining & assembly of CBH tank | Machining of Titanium alloy tank parts at ITPF for proto hardware. Training to the Industry team on CBH assembly & testing. Qualification of Industry personnel. | Machining of tank parts at ITPF for flight hardware. Realisation of proto hardware at ITPF by Industry team with DEPARTMENT supervision. | End-to-end Production of CBH propellant tank and assembly & testing of PAS sub-assemblies at ITPF. |
| b) | Assembly & testing of PAS (MMH & MON3). | Training to the Industry team on PAS sub-assembly. Qualification of Industry personnel. | Realisation of proto hardware at ITPF by Industry team with DEPARTMENT supervision. | |

**Note:**

(i) $T_0$: Date of deployment of industry personnel.

(ii) Familiarization for the period of 3 weeks during module-I for "Facilities at ITPF establishment" will be arranged by the department. Industry should deploy identified manpower based on the Indicative manpower requirement as specified in Table no.3 for pre production phase.

### 7.2. Pre-production phase (T0 + 12 months) i.e 1st year of the contract

(i) During this phase, Industry should identify and deploy suitable required man power.

(ii) Industry manpower will be undergoing structured training in the area of assembly & testing of propellant tanks/PAS as per the clause 6.0 & 10.0 at department facilities for period of six months (module-I of pre-production phase) period.

(iii) After successful completion of structured training during Pre Production Phase I, Industry team will carry out assembly & testing activities independently and produce proto flight hardware at ITPF facility under the supervision of Department for the next six months i.e during Pre Production Phase II of pre-production phase.

(iv) Party can deploy the manpower in a staggered manner as operations will happen sequentially. The indicative estimated manpower for the pre-production phase is given in Table 3 below.

Table 3 – Indicative manpower anticipated for pre production phase

| Sl. No. | Facility | Industry Man power | | |
|---|---|---|---|---|
| | | ITI | Diploma | Engineer |
| 1 | Machining Facility | 8 | 2 | 1 |
| 2 | Chemical Cleaning Facility | 2 | 1 | 1 |
| 3 | Assembly Facility | 3 | 2 | 1 |
| 4 | Test Facility | 4 | 2 | 1 |
| 5 | Special Process Facility | 3 | 1 | 1 |
| 6 | Metrology & NDI Facility | 7 | 2 | 2 |
| 7 | Quality Assurance Team | 0 | 4 | 1 |
| 8 | Storage Facility | 1 | 0 | 0 |
| 9 | Facility Maintenance | 3 | 1 | 1 |
| **Sub total** | | **31** | **15** | **9** |
| **Total** | | **55** | | |

(v) No training is contemplated for machining operation during pre-production phase. However, familiarization will be given towards the machining process and fixturing methodology based on the established process plans.

(vi) After successful realization of proto flight hardware, party has to generate machining process plan for applicable deliverables and obtain the approval from DEPARTMENT.

(vii) Towards machining operation, experienced personnel in machining of parts using Dia.1500 mm class heavy duty horizontal lathe / VTMC is contemplated.

(viii) The quantity of proto-flight hardware and other tank variants to be realized by Industry during this pre-production phase will be finalized by CMC.

### 7.3. Production phase (T0 + 13 to T0 + 60 months – 2nd, 3rd, 4th & 5th production years)

During this production phase

(i) The quantity, variants and the priority of realization will be finalized by the CMC before the start of each production year

(ii) Industry team will independently carryout production planning, machining of tank parts, assembly, testing and delivery of all the deliverables finalized by CMC.

(iii) Accordingly, DEPARTMENT will segregate all raw material forgings, finished machined parts for PAS, standard parts and associated sub-assemblies and issue as Free-Issue-Material to industry team at the beginning of each production year.

### 7.4. Maintenance of ITPF facility

Equipment's in the facility is an important resource which is constantly used for adding value to products. So, it must be kept at the best operating condition. Otherwise, there will be excessive down time, interruption of production which will affect the production line. Poor working of equipment's will lead to quality related problems. Hence it is an absolute necessity to maintain the equipment in good operating conditions.

ITPF houses complex expensive machining, assembly & testing equipment's and other support systems for realization of spacecraft and CBH propellant tanks along with PAS sub assembly. These facilities require continuous monitoring to have continuous smooth operations.

The Operation and Maintenance envisages all the required tasks to ensure

i. Maximum system availability.
ii. Most efficient, effective and optimum usage of facilities.
iii. Trouble free service and output at rated capacity.
iv. Down time is minimized.
v. Enhance the life expectancy of equipment's.
vi. Regular operation and maintenance of equipment's.
vii. Compliance of safety rules and regulations.
viii. Preventive maintenance/scheduled maintenance.
ix. Breakdown maintenance.
x. Maintenance of proper records of operation and maintenance (Log book, registers, check list etc.).

### 7.5. Equipment Maintenance by Industry

Routine, preventive and breakdown maintenance of the equipments listed below is the responsibility of the Industry. Industry may decide whether In-House maintenance team will cater to this requirement or through respective Original Equipment Manufacturers (OEM). In case of maintenance through In-House Maintenance team, Infrastructure & Equipment maintenance committee shall review the capability of the Industry maintenance team and subsequently approved by CMC. In case if the technical capability of the In-House maintenance team does not meet the expectations of the committee, Industry should undertake maintenance of the facilities/equipments through authorized

OEM only. Details of the major equipments/facilities with approximate price are given below.

**(i) List of all major equipment's/facilities at ITPF**

Table 4 – List of all major equipment's at ITPF

| # | Equipment/Facility | Qty | Cost in Lakhs, Rs. |
|---|---|---|---|
| 1 | Heavy Duty CNC Lathe | 1 | 493.60 |
| 2 | Dia 600mm Horizontal CNC Lathe | 1 | 326.62 |
| 3 | Heavy duty hydrostatic CNC Lathe | 2 | 1939.76 |
| 4 | Portable EDM Machine | 1 | 10.75 |
| 5 | Special Purpose Machine | 1 | 1242.06 |
| 6 | Precision Tool Room LATHE(Ø250) | 1 | 130.60 |
| 7 | VTMCS (Ø1500MM) (4-AXIS) & Angular Head for VTL | 1 | 2276.74 |
| 8 | VTMCS (Ø1500MM) (3-AXIS) | 3 | 5232.18 |
| 9 | Hand Held Ultrasonic Flaw Detector | 2 | 23.66 |
| 10 | 225KV X-Ray System | 2 | 79.44 |
| 11 | Automatic X-Ray Film Processors | 2 | 17.33 |
| 12 | Eddy Current Flaw Detector & Accessories | 1 | 70.00 |
| 13 | MSLD | 2 | 65.39 |
| 14 | Ultrasonic Immersion System | 1 | 219.64 |
| 15 | Digital Wireless Measuring Instruments | 2 | 42.27 |
| 16 | Bridge Type Co-ordinate Measuring Machine | 1 | 406.60 |
| 17 | Portable Articulated Arm Type 3D-Coordinate | 1 | 82.42 |
| 18 | Height Measuring System | 2 | 19.74 |
| 19 | Automated Eddy Current Evaluation System | 1 | 900.00 |
| 20 | Chemical Cleaning Facility | 1 | 188.37 |
| 21 | Assembly Equipments | 1 | 520.20 |
| 22 | Functional Fixture & Manipulator | 1 | 360.50 |
| 23 | test consoles (consolidated) | 1 | 224.77 |
| 24 | 4T Electro Dynamic Shaker System | 1 | 238.50 |
| 25 | DM Water Plant | 1 | 67.48 |
| 26 | DATA Acquisition System (DAS) | 4 | 138.46 |
| 27 | 10 CU.M EB Welding Machine | 1 | 1857.52 |
| 28 | 30 CU.M/150KV EB Welding Machine | 1 | 2503.70 |
| 29 | 35 CU.M/60KV EB Welding Machine | 1 | 1759.57 |
| 30 | 1 CU. FT EB Welding Machine | 1 | 526.80 |
| 31 | Vacuum Ageing Furnace, Leak Test Facility | 1 | 249.79 |
| 32 | Chiller for 10 CU M. EB Welding Facility | 1 | 4.89 |
| 33 | Chiller for 30 Cu M. EB Welding facility | 1 | 6.00 |
| 34 | Chiller for 35 CU M. EB Welding Facility | 1 | 6.00 |
| 35 | Security Systems | 1 | 9.27 |
| 36 | AC Units | Details in Annexure | 100.00 |
| 37 | Cranes & Other Mechanical Items | | 100.00 |
| 38 | Electrical units | | 115.00 |

**(ii) General maintenance**

Routine day to day cleaning/maintenance of ITPF equipment's/assets need to be carried out by the industry.

**(iii) Preventive Maintenance**

Preventive maintenance (PM) is the periodical inspection and service activities which are aimed to detect potential failures and perform minor adjustment in repairs which will prevent major operating problems in future. Periodicity shall be finalized by the Infrastructure and Equipment Maintenance Committee. Log Books for preventive maintenance visits of all equipments shall be maintained by the Industry and should be made available for department review. All the log books shall be surrendered to Department after the expiry of the contract.

**(iv) Annual Maintenance Contract**

It is Industry responsibility for maintaining all the equipments/facilities available in ITPF. All equipments/facilities should smoothly operate throughout the contract period. Non Comprehensive Annual Maintenance Contracts if required for preventive maintenance of major equipment's listed in Table no. 4 shall be placed by the industry as per the terms and conditions stipulated by Department. Most of the equipment's are having an embedded AMC clause in their purchase orders and Industry can utilize the same for placing AMC contracts with the OEMs with the same envisaged scope of work. This activity may be undertaken by the Industry In-House maintenance team itself subjected to approval from CMC. Industry is responsible for the replacement of any spare parts required for the smooth functioning of the equipments/facilities.

Industry is responsible for any change in spares required for smooth functioning of the equipment/facility.

**(v) Break down Maintenance**

Breakdown maintenance is totally reactive and maintenance is only activated on breakdowns. The goal of corrective or breakdown maintenance is

- ✓ To restore the faulty equipment to a healthy operating state as promptly as possible,
- ✓ To do this in cost-effective manner.

Industry is responsible for resolving any minor break down. In case of major break down of department assets, Industry shall submit the breakdown maintenance proposal to Infrastructure/Equipment maintenance committee for review and recommendation. Subsequently after obtaining approval from CMC, Industry shall execute the repair work. CMC is empowered to review the cause of breakdown and in case, the Industry manpower is responsible for the break down, Industry should bear the total expenses pertaining to the repair activities.

**(vi) Facility Maintenance**

During the currency of this contract, Industry is responsible for performing maintenance of ITPF Utilities, Sewage treatment facility, laboratories, AC units, Electrical units etc for smooth functioning of the entire ITPF facility. Brief scope of the facility maintenance is as per annexure I.

## 8. DELIVERABLES ENVISAGED IN THE CONTRACT

ITPF facility has installed capacity of realizing 22 nos. of various types of space craft propellant tanks (35 L to 1417 L) and 6 nos. of CBH propellant tanks and 6 sets of PAS sub assembly. The tentative deliverables for the period of 5 years is given in table-5, 6 & 7 below. The realization process of each variant of the hardware is detailed in the corresponding technical documents.

### 8.1. Tentative deliverables during pre-production phase (1st year)

Tentative deliverables envisaged during pre-production phase is given below. However, the exact tank variant and quantity shall be decided by CMC during contract execution.

Table 5 – Tentative deliverables envisaged during pre production phase

| Sl. No. | Tank Description | Tank dia. (mm) | Machining qty. (Sets) | Assembly & testing qty. (Nos.) |
|---|---|---|---|---|
| 1 | 35L Propellant tank | Ø400 | 01 | 01 |
| 2 | 390 L Propellant tank | Ø890 | 01 | 01 |
| 3 | 650 L Propellant tank | Ø890 | 01 | 01 |
| 4 | 769L / 875L | Ø1150 | 01 | 01 |
| 5 | 1212 L/1471 L | Ø1150 | 01 | 01 |
| 6 | CBH Propellant tank (L 2.5 version) | Ø1350 | 01 | 01 |
| 7 | PAS-MMH | - | - | 01 |
| 8 | PAS-MON3 | - | - | 01 |
| **Total deliverable tanks in nos.** | | | **06** | **08** |

### 8.2. Indicative ITPF Production capacity during Production phase (2nd to 5th year)

Tentative deliverable quantity for satellite and CBH propellant tank hardware including PAS at ITPF annually during production phase is given below. However, the exact tank variant and quantity during production phase will be decided by CMC during contract execution.

Table 6 – Tentative Spacecraft propellant tank deliverables envisaged per annum

| Sl. No. | Tank Description | Machining qty. (sets) | Assembly & testing qty. (Nos.) | Technical details (Ref. Technical document) |
|---|---|---|---|---|
| 1 | 35L / 60L Propellant tank | 07 | 07 | Respective technical document details given in clause no.9 |
| 2 | 390L /516L / 650L Propellant tank | 06 | 06 | |
| **Total deliverable tanks in nos.** | | **13 nos** | | |

Table 7 - Tentative CBH propellant tank/PAS deliverables envisaged per annum

| Sl. No. | Tank Description | Machining qty. (sets) | Assembly & testing qty. (Nos.) | Technical details (Ref. Technical document) |
|---|---|---|---|---|
| 1 | CBH propellant tank (L 2.5 version) | 01 | 01 | Respective technical document details given in clause no.9 |
| 2 | PAS (MMH) sub-assembly | - | 01 | |
| 3 | PAS (MON3) sub-assembly | - | 01 | |
| **Total CBH Propellant tanks in nos.** | | **01 nos** | | |

**Note on Deliverables:**

(i) The tentative deliverables per annum is shown in table 6 & 7 above. The quantity indicated is nominal numbers and CMC will finalize the exact tank variants and quantity for each production year.

(ii) The DEPARTMENT reserves the right to increase / decrease the deliverable quantity/variant of the tanks based on dynamic project needs compared to the nominal quantity. CMC will finalize these details for each production year based on the requirement.

(iii) Depends on the requirement, CMC will assign relative priority and delivery schedule.

(iv) For the envisaged deliverables by CMC, FIM such as raw material forgings, standard parts and identified sub-assemblies like Draining device, ASB will be issued. Using this FIM, industry partner shall realize the tank parts, sub-assemblies, full tank, carryout testing and deliver the tank.

(v) For the envisaged deliverables by CMC, accepted machined parts/standard parts will be issued as Free-Issue-Material. Sub-assemblies shall be realized from these as per the technical documents provided for each hardware to the industry partner.

(vi) Contemplated tenure of the Contract is 5 years starts from the date of deployment of manpower to commence pre-production phase.

(vii) Deployment of industry team at ITPF is considered as the start of the Contract period. Further 12 months from this is considered as pre-production year (1$^{st}$ year of the Contract).

(viii) Also, the scope of work for 2$^{nd}$ year (Production phase) onwards shall be finalized by CMC before completion of 1$^{st}$ year scope (pre-production phase) and the applicable FIM will be decided & issued to industry team and the same procedure will be followed for subsequent years.

## 9. APPLICABLE DOCUMENTS FOR MACHINING, WELD TEST SPECIMENS, ASSEMBLY & TESTING OF ENVISAGED DELIEVRABLES

### 9.1. Machining drawings for tank parts of envisaged deliverables.

Table 8 Tank variants with drawing no. & quantity requirement per tank

| Tank Capacity | Part description | Drawing no | Qty. Per tank |
|---|---|---|---|
| 30/35L | Upper Hemisphere | 1 2 01 12 PD 25 0 | 01 |
| | Lower Hemisphere | 1 2 01 12 PD 04 0 | 01 |
| | Retainer Ring | 1 2 01 12 PD 15 0 | 01 |
| | Cylinder | 1 2 01 12 PD 05 0 | 01 |
| 60 L | Upper Hemisphere | 1 3 01 21 PD 03 0 | 01 |
| | Lower Hemisphere | 1 3 01 21 PD 02 0 | 01 |
| 390 L (M) | Upper hemisphere | PT-1010001 | 01 |
| | Lower hemisphere | PT-1040001 | 01 |
| | Intermediate Y ring (90mm) | PT-1032001-A | 01 |
| | Intermediate Bottom | S-3031202-H | 01 |
| | Suspension ring | S-3020000-E | 01 |
| 390 L (B) | Upper hemisphere | S-3010001-C | 01 |
| | Lower hemisphere | S-3050001-D | 01 |

| | | | |
|---|---|---|---|
| | Intermediate Y ring (90mm) | S-9060001-C | 01 |
| | Intermediate Bottom | S-3031202-H | 01 |
| | Suspension ring | S-3020000-E | 01 |
| | Cylinder for MMH catch tank | PU410-2160-0100 -02 | 01 |
| | Hemisphere-MMH catch tank | PU410-2160-0200- 02 | 01 |
| 516 L | Upper hemisphere | S-3010001-C | 01 |
| | Lower hemisphere | S-3050001-D | 01 |
| | Intermediate Y ring (270mm) | S-3031201-G | 01 |
| | Intermediate Bottom | S-3031202-H | 01 |
| | Suspension ring | S-3020000-E | 01 |
| 650 L | Upper hemisphere | S-3010001-C | 01 |
| | Lower hemisphere | S-3050001-D | 01 |
| | Intermediate Y ring (270mm) | S-3031201-G | 01 |
| | Intermediate Bottom | S-3031202-H | 01 |
| | Upper intermediate ring | S-12060000-A | 01 |
| | Suspension ring | S-12020000-B | 01 |
| 769 L | Upper hemisphere | S-7010001-D | 01 |
| | Lower hemisphere | S-7050001-E | 01 |
| | Retainer ring | S-7033001-G | 01 |
| | Suspension ring | S-7020001-D | 01 |
| 875 L | Upper hemisphere | S-7010001-D | 01 |
| | Lower hemisphere | S-7050001-E | 01 |
| | Retainer ring | S-7033001-G | 01 |
| | Suspension ring | S-7020001-D | 01 |
| | Central ring (90mm) | 1.1.01.18.60001.0 | 01 |
| 1212 L- CASSINI Variant I | Cassini upper end dome | 1 1 01 24 PD 01 0 | 01 |
| | Cassini lower end dome | 1 1 01 24 PD 02 0 | 01 |
| | Retainer ring | 1 1 01 24 PD 03 0 | 01 |
| | Suspension ring (Ø10.5 hole) | 1 1 01 24 PD 04 0 | 01 |
| | Central ring (390mm) | 1 1 01 24 PD 05 0 | 01 |
| | Central ring (90mm) | 1 1 01 25 PD 01 0 | 01 |
| 1212 L- CASSINI Variant II | Cassini upper end dome | 1 1 01 24 PD 01 0 | 01 |
| | Cassini lower end dome | 1 1 01 24 PD 02 0 | 01 |
| | Retainer ring | 1 1 01 24 PD 03 0 | 01 |
| | Suspension ring (Ø10.5 hole) | 1 1 01 24 PD 04 0 | 01 |
| | Central ring (290mm) | 1 1 01 24 PD 06 0 | 01 |
| | Central ring (190mm) | 1 1 01 27 PD 01 0 | 01 |
| 1417 L CASSINI | Cassini upper end dome | 1 1 01 24 PD 01 0 | 01 |
| | Cassini lower end dome | 1 1 01 24 PD 02 0 | 01 |
| | Retainer ring | 1 1 01 24 PD 03 0 | 01 |
| | Suspension ring (Ø10.5 hole) | 1 1 01 24 PD 04 0 | 01 |
| | Central ring (290mm) | 1 1 01 24 PD 06 0 | 01 |
| | Central ring (390mm) | 1 1 01 24 PD 05 0 | 01 |
| CBH Propellant tank (L 2.5 version) | Fore end dome | PU411-2104-2100-01 | 01 |
| | Fore end boss | PU411-2104-2300-01 | 01 |
| | Fore end ring | PU410-2104-2200-03 | 01 |
| | CBH dome | PU411-2107-2100-02 | 01 |
| | CBH dome end Boss | PU411-2107-2300-01 | 01 |
| | Middle ring | PU410-2118-0140-06 | 01 |
| | Aft end dome | PU411-2104-2100-01 | 01 |
| | Aft end Boss | PU411-2103-3300-01 | 01 |
| | Aft end ring | PU410-2103-3200-04 | 01 |

| | | | |
|---|---|---|---|
| | Cylindrical shell (FE) | PU410-2102-1001-03 | 01 |
| | Cylindrical shell (AFT) | PU410-2103-1001-02 | 01 |
| | Cylinder for MMH catch tank | PU410-2160-0100 -02 | 01 |
| | Hemisphere-MMH catch tank | PU410-2160-0200- 02 | 01 |
| | Fore end dome Sub assembly | PU411-2104-1000-01 | 1 |
| | Fore end dome | PU411-2104-2100-01 | 1 |
| | Fore end boss | PU411-2104-2300-01 | 1 |
| | Fore end ring | PU410-2104-2200-03 | 1 |
| | CBH dome Sub assembly | PU411-2107-1000-01 | 1 |
| | CBH dome | PU411-2107-2100-01 | 1 |
| | CBH dome end Boss | PU411-2107-2300-01 | 1 |
| | Middle ring | PU410-2118-0140-06 | 1 |
| | Aft end dome Sub assembly | PU411-2103-2000-01 | 1 |
| | Aft end dome | PU411-2104-2100-01 | 1 |
| | Aft end Boss | PU411-2103-3300-01 | 1 |
| | Aft end ring | PU410-2103-3200-04 | 1 |
| | Cylindrical shell (FE) | PU410-2102-1001-03 | 1 |
| | Cylindrical shell (AFT) | PU410-2103-1001-02 | 1 |
| | Cylinder for MMH catch tank | PU410-2160-0100 -02 | 1 |
| | Hemisphere for MMH catch tank | PU410-2160-0200- 02 | 1 |
| | MON3 diffuser clamp | PU410-2112-0500-06 | 1 |
| | MON3 diffuser sub assembly | PU410-2100-0500-01 | 1 |
| | MON3 diffuser assembly | PU410-2150-0000-05 | 1 |
| | MON3 diffuser inner tube | PU410-2150-0100-04 | 1 |
| | MON3 diffuser outer cover | PU410-2150-0200-05 | 1 |
| | MON3 diffuser closure | PU410-2150-0300-04 | 1 |
| | MON3 diffuser adaptor | PU410-2112-0100-05 | 1 |
| | MON3 diffuser sleeve | PU410-2112-0300-05 | 1 |
| | MMH fill and drain sub assembly | PU410-2100-0600-01 | 1 |
| | MMH fill and drain sleeve | PU410-2100-0602-02 | 1 |
| | MMH fill and drain adaptor | PU410-2100-0603-02 | 1 |
| | MMH diffuser assembly | PU410-2120-0000-07 | 1 |
| | MMH diffuser inner | PU410-2120-0100-05 | 1 |
| | MMH diffuser outer cover | PU410-2120-0400-03 | 1 |
| | MMH diffuser adaptor | PU410-2120-0300-03 | 1 |
| | MMH diffuser flange | PU410-2120-0200-08 | 1 |
| | Dome closure sub assembly | PU410-2130-0000-07 | 1 |
| | Dome closure | PU410-2130-0100-05 | 1 |
| | Pressure pick up adaptor | PU410-2130-0200-04 | 1 |
| | MMH Fill and drain pad | PU410-2100-0601-03 | 1 |
| | MON3 diffuser pad | PU410-2112-0201-02 | 1 |
| | MMH Pressurization line support bracket | PU410-2100-0008-01 | 1 |
| | MMH Pressurization line support clamp | PU410-2100-0009-02 | 1 |
| | EB welding specimens for PAD welding | LBF-PLNG-1130 | 1 Set |
| | Bead on EB weld specimen stage 1 ps4 propellant tank | SPF/PS4/PT/WTS-01 | 1 |
| | Bead on EB weld specimen stage 2 ps4 propellant tank | SPF/PS4/PT/WTS-01(R) | 1 |

Table 9 Indicative Weld Test Specimens requirement per tank

| Tank Capacity | Part Description | Drawing No. | Qty. Per tank |
|---|---|---|---|
| 30/35L | 30L/35L Tank Linear Joint WTS (WELD #4.2&5.2) | WTS-4.2-5.2-2 | 3Nos |
| | 30L/35L Tank Linear GO-NO GO WTS (WELD #4.2&5.2) | WTS-4.2-5.2-1 | 3Nos |
| | 30L/35L Tank Linear Joint WTS (WELD #6.5&6.6) | WTS-6.5-6.6-2 | 3Nos |
| | 30L/35L Tank Linear GO-NOGO WTS (WELD #6.5&6.6) | WTS-6.5-6.6-1 | 3No |
| | 30L/35L Tank Linear Joint WTS (WELD #6.3&6.4) | WTS-6.3-6.4-2 | 3Nos |
| | 30L/35L Tank Linear GO-NOGO WTS (WELD #6.3&6.4) | WTS-6.3-6.4-1 | 3No |
| | 30L/35L Tank Joint Configuration WTS (WELD #6.1,6.2&6.2A) | WTS-6.1-6.2-6.2A-2 | 3Set |
| | 30L/35L Tank GO-NOGO WTS (WELD #6.1#6.2&#6.2A) | WTS-6.1-6.2-6.2A-1 | 3No |
| | EB Weld test specimen for joint no. 4.2&5.2 (PROP-GAS PORT) | 1.2.01.1230000-A-WS | 3Sets |
| | EB weld test specimen for joint no. 6.3&6.4 (PMD) | 1.2.01.1200000-A-3-WS | 3Sets |
| | EB weld test specimen for joint no. 6.5&6.6 (PORT COVER) | 1.2.01.1200000-A-4-WS | 3Sets |
| 390/516/ 650L | WTS for EBW #27.1 & 28 (Tank level PMD) | WTS-3222000-B | 3Nos |
| | WTS for EBW # 27.2 (Port cover) | WTS-3223000-A | 3Nos |
| | WTS for EBW #9.3 (Propellant Port) | WTS-3216000-A | 3Nos |
| | WTS for EBW #9.2 (Propellant Port-STC) | WTS-3215000-A | 3Nos |
| | WTS for EBW #8.3 (Gas Port) | WTS-3214000-A | 3Nos |
| | WTS for EBW #16 (Intermediate Bottom) | WTS-3217000 | 3Nos |
| | WTS for EBW #19 (Button weld) | WTS-3221000-A | 3Nos |
| | Joint configuration WTS for weld # 1 | GY SM WTS JT 01 0 | 3Nos |
| CASSINI | Joint configuration WTS EBW# 1.11A, 1.11B & 1.2 | 110124WS10Q0 | 3Nos |
| | GO/NOGO WTS EBW# 1.11A, 1.11B & 1.2 | 110124WS100 | 3Nos |
| | Cassini WTS specimen for joint No 5.3 | 110124WS170 | 3Nos |
| | EB Weld test specimen for joint No 6.4 | 110124WS190 | 3Nos |
| | EB Weld test specimen for joint No 6.5 | 110124WS200 | 3Nos |
| | GO/NO GO weld test specimen EBW #1.9 | 110124WS080 | 3Nos |
| | Joint configuration weld test specimen EBW# 6.6 | 110124WS210 | 3Nos |
| PAS MMH & MON3 | WTS for EBW #1.2 supporting cylinder Assy. To supporting Ring | 1001100-WTS | 02 nos |
| | WTS For EBW #2 Housing lower half to outer retainer ring | 1001-WTS-1A | 02 nos |

| | | | |
|---|---|---|---|
| | WTS For EBW #3 Housing lower half to gallery outlet | 1001200-WTS-A | 02 nos |
| | WTS For EBW #11.1 Vent pot to clamping ring | 1001600-WTS-1-A | 02 nos |
| | WTS For EBW #11.2 Vent tube to venting pot | 1001600-WTS-2 | 02 nos |
| | WTS For EBW #12 Clamping Ring to Baffle plate | 1001605-WTS | 02 sets |
| | WTS For EBW # 13 Cover plate Assy. To Vent Assy | 1001500-WTS | 02 nos |
| | WTS For EBW #14 Retainer ring, screen, screen holder (Gas barrier assy.) | 1001400-WTS-A | 02 nos |
| | WTS For EBW #15 Gallery holder to flange | 1001-WTS-2-A | 02 sets |
| | WTS For EBW #16 Gallery assembly to gallery holder | 1001-WTS-3-A | 02 sets |
| | WTS For EBW #20A Propellant outlet to MON3 outlet adapter | 1001700-WTS-A | 02 nos |
| | WTS For EBW #20 Interface flange to propellant outlet adapter | 1003B | 02 nos |
| | GO-NOGO Weld test specimen | 1001-WTS-1-A | 02 nos |
| | GO-NOGO WTS for joint no. 11.1 | 1001600-WTS-1-A | 02 nos |
| | GO-NOGO WTS for joint no. 11.2 | 1001600-WTS-2 | 02 nos |
| | GO-NOGO WTS for joint no. 12 | 1001605-WTS | 02 sets |
| | GO-NOGO WTS for joint no. 14 | 1001400-WTS-A | 02 nos |
| | WTS for joint no. 16, 17 & 19 | 1001-WTS-3-A | 02 nos |
| CBH (L 2.5 version) | WTS assembly drg 1ST stage EB welding (AE & FE) | SPF/PS4/PT/WTS-10 | - |
| | WTS ring-1 ps4 propellant tank 1st stage EB welding(AE & FE) | SPF/PS4/PT/WTS-02 | 4* |
| | WTS ring-2 ps4 propellant tank 1st stage EB welding(AE & FE) | SPF/PS4/PT/WTS-03 | 4* |
| | WTS PS4 propellant tank 2nd stage EB welding assembly drg | SPF/PS4/PT/WTS-20 | - |
| | WTS ring-1 ps4 propellant tank 2nd stage EB welding | SPF/PS4/PT/WTS-11 | 4* |
| | WTS ring-2 ps4 propellant tank 2nd stage EB welding | SPF/PS4/PT/WTS-12 | 4* |
| | Note:<br>For Qualification of CBH tank, Sl No XII & XIII – 4 Sets are required<br>For Production of CBH tank, Sl No XII & XIII – 1 Set is required to be fabricated | | |
| *All the above information is tentative and may change dynamically based on WTS evaluation results.<br>*All efforts were put to provide complete information. However additional WTS may be added as and when required. | | | |

## 9.2. Applicable documents for Assembly, Testing and Inspection.

**Table 10 – Details of the applicable documents for the contract**

| # | Annexure document description | Doc. No |
|---|---|---|
| 1 | Procedure Document for realization of CBH | LPSC/LBF/LHWC/ESTP/TR/059/23 |

| # | Annexure document description | Doc. No |
|---|---|---|
| | propellant tank | |
| 2 | 30/35L capacity propellant tank assembly procedure document | LPSC/LBF/SCCP/PMSD/PD/707/18 |
| 3 | 60L Xenon tank assembly procedure document | LPSC/LBF/SPSG/PMSD/PD/008/23 |
| 4 | 390L/516/650L capacity propellant tank assembly procedure document | LPSC/LBF/SCCP/PMSG/PD/815/19 |
| 5 | 769L/875L capacity propellant tank assembly procedure document | LPSC/LBF/SCCP/PMSG/PD/783/18 |
| 6 | PAS-MMH assembly procedure document | LPSC/LBF/SPSG/PMSD/RF/131/22 |
| 7 | PAS-MON3 assembly procedure document | LPSC/LBF/SPSG/PMSD/RF/192/23 |
| 8 | Chemical Cleaning Process Document for Launch Vehicle Tankages (CBH) | LPSC/LBF/FP/STF/TR/008/13 |
| 9 | Chemical Cleaning Process Document for PMD components of Satellite Propellant Tank & Propellant Acquisition System (PAS) Components. | LPSC/LBF/FP/STF/PD/019/13 |
| 10 | Chemical Cleaning Process Document for Satellite Propulsion Propellant Tankages. | LPSC/LBF/FP/STF/TR/007/13 |
| 11 | Electron Beam welding procedure document for 30L/35L propellant tank | LPSCB/LBF/FP/SPF/TR/027/13 |
| 12 | Electron Beam welding procedure document for 390L/516L/650L propellant tank | T EBW 62 53 PP 00 |
| 13 | Electron Beam welding procedure document for L2.5 CBH propellant tank | T/PC4/62/PP/R1/13 |
| 14 | Functional test procedure for 30/35L propellant tanks | LPSC/LBF/SCCP/PMSG/PM/148/13 |
| 15 | Functional test procedure for 390,516 &650 L propellant tanks | LPSC/SCPSG/PMSG/PD/411/11 |
| 16 | Functional test procedure for 769/875L propellant tanks | LPSC/LBF/SCCP/PMSG/TP/056/12 |
| 17 | Cleanliness test procedure for spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TP/833/19 |
| 18 | Dryness test procedure for spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TP/834/19 |

| # | Annexure document description | Doc. No |
|---|---|---|
| 19 | External leak test procedure for spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TE/835/19 |
| 20 | General handling procedure for spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TP/839/19 |
| 21 | Mass measurement test procedure for spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TP/836/19 |
| 22 | Surface cleaning, final visual inspection and packing procedure for spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TP/838/19 |
| 23 | Pressure test procedure document for spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TP/837/19 |
| 24 | Vibration test procedure document for 30 & 35 L spacecraft propellant tanks and Vibration test procedure document for 390 -875 L spacecraft propellant tanks | LPSC/LBF/SCCP/PMSG/TP/964/20 & LPSC/LBF/SCCP/PMSG/TP/963/20 |
| 25 | PAS Cleanliness test procedure document | LPSC/LBF/SCCP/PMSG/TP/825/19 |
| 26 | PAS dry mass measurement test procedure document | LPSC/LBF/SCCP/PMSG/TP/879/19 |
| 27 | PAS External leak test procedure document | LPSC/LBF/SCCP/PMSG/TP/832/19 |
| 28 | PAS proof pressure test procedure document | LPSC/LBF/SCCP/PMSG/TP/831/19 |
| 29 | PAS static retention test procedure document | LPSC/LBF/SCCP/PMSG/TP/826/19 |
| 30 | PAS Flow test procedure document | LPSC/LBF/SCCP/PMSG/TP/878/19 |
| 31 | PAS Vibration test procedure document | LPSC/LBF/SCCP/PMSG/TP/855/19 |
| 32 | PAS Handling and storage procedure document | LPSC/LBF/SCCP/PMSG/TP/880/19 |
| 33 | PAS Test plan procedure document | PTSTD/PAS/TR/3/88 |
| 34 | NDE procedure for spacecraft propellant tanks. | LPSC/LBF/SR-SPS/QC-W&E/TR/240/24 |
| 35 | NDE procedure for CBH propellant tanks | LPSC/LBF/SR-SPS/QC-W&E/TR/241/24 |
| 36 | EB Weld Procedure for 35L Satellite Propellant Tank | LPSC/LBF/FP/SPF/TR/027/13 |
| 37 | EB Welding Procedure for 650L Titanium Alloy Satellite Propellant Tanks | T EBW 62 53 PP 00 |

| # | Annexure document description | Doc. No |
|---|---|---|
| | ( Exchange the PMD welds) | |
| 38 | EB Weld Procedure Document for 769L & 875L Titanium Alloy Satellite Propellant Tanks ( Excluding PMD Welds) | LPSC/LBF/FP/ELTF/TR/106/24 |
| 39 | EB Weld Procedure Document for Titanium Alloy PS4 Propellant Tank | LPSC/LBF/FP/SPF/TR/060/16 |
| 40 | EB & TIG Welding Procedure for Propellant Acquisition System (PAS) MMH & N2O4 | LPSC/LBF/FP/SPF/TR/078/19 |

## 10. CONTRACT EXECUTION & RESPONSIBILITIES

Objective is for smooth operation & maintenance of ITPF by Industry by deploying suitable skilled manpower and produce Titanium alloy spacecraft/CBH propellant tanks along with PAS sub assembly as per the department requirements.

- The clauses stipulated in this RFP may not cover everything.
- Attempt has been made to bring out all the points comprehensively.
- Anything further can be added with the concurrence of CMC based on mutual agreement.

The details of the responsibilities are given below.

### 10.1. Responsibilities of the DEPARTMENT (Pre-production phase):

(i) Handing over of Validated Integrated Titanium alloy tank Production Facility (ITPF) to the Industry for the period of five years, which includes Machining, Metrology, Non-Destructive-Inspection (NDI), Special process facilities, Surface treatment facilities, Clean rooms, storage facilities for machining, assembly & testing of satellite propellants, CBH propellant tanks & PAS.

(ii) Providing training to the Industry manpower during pre-production phase in selected areas of assembly, testing & evaluation, QC functions of spacecraft/CBH propellant tanks and PAS.

(iii) Familiarization of the machining process of Titanium alloy tank parts and its relevant fixtures for these tank parts as per the indicative machining process plans.

(iv) Providing Personal Computers etc for implementation of Digital Work Flow (DWF) system and support to the Industry for development and induction of Digital Work Flow software usage at each process work station from production phase ($2^{nd}$ year onwards).

(v) Issue of necessary technical documents pertaining to assembly, testing, evaluation and delivery of propellant tanks & PAS respectively for each deliverable envisaged in the Contract.

(vi) Review and approval of following technical documents which were generated by the INDUSTRY manpower during Pre-production phase prior to realization of proto flight hardware.

- Process plans for propellant tank parts machining.
- Process plans in applicable formats for assembly, testing & evaluation.
- Delivery documents of envisaged deliverables.

(vii) To indicate the proto flight hardware variants & quantity during pre-production phase based on CMC recommendation.

(viii) To issue all required titanium forgings for tank parts, weld test specimens, accepted machined parts (PAS), standard parts & consumables as Free-Issue-Material (FIM) for all phases of the Contract in line with scope of machining, assembly & testing of tanks for the deliverable quantity for each year as decided by the CMC towards proto flight.

(ix) For providing required complete set of tooling & fixtures for carrying out machining, assembly and testing associated processes of satellite/CBH propellant tank and fixtures for PAS sub-assembly.

(x) To permit the operation of DEPARTMENT's facilities by the INDUSTRY man power for performing machining, assembly, testing & evaluation of envisaged deliverables in the case of facility yet to be commissioned (or) of emergency / equipment breakdown with the approval of CMC on case-to-case basis by reviewing nature of breakdown etc.

(xi) Certify Industry's man power after successful completion of training for further production phase at ITPF.

(xii) Certify equipment/machinery/facility established in ITPF after successful completion of proto flight hardware realization by Industry's manpower for further production at ITPF.

(xiii) The DEPARTMENT reserves the right to verify the adequacy of the training, technology transfer and process requirements. Necessary documents in this regard should be submitted for department approval.

(xiv) To arrange familiarization program of ITPF facility, utilities, AC units, Sewage, Cranes etc. at ITPF to Industry work force.

(xv) Department will provide necessary tools and consumables to the Industry for the training and realization of proto flight hardware.

(xvi) Deployment of the following.

I. Security personnel.
II. CCTV surveillance & monitoring.
III. Access Control System & monitoring.
IV. IT Infrastructure for security etc.
V. Housekeeping/Laboratory up keeping & Gardening.

## 10.2. Responsibilities of the INDUSTRY (Pre-production phase):

(i) To identify & deploy identified, validated and certified personnel for carrying out machining, assembly, testing and evaluation of propellant tanks.

(ii) INDUSTRY man power shall undergo training at department facilities in the areas of assembly, testing & evaluation of satellite & CBH propellant tanks.

(iii) INDUSTRY man power shall carryout machining, assembly & testing of the proto flight hardware as finalized by CMC during pre production phase.

(iv) To carry out the QC functions by an independent QC section and report the deviations.

(v) Industry should implement the digital workflow system before commencing production phase. All necessary infrastructures such as computers etc. shall be provided by the department.

(vi) Receive the certified Free-Issue-Material (FIM) towards the proto flight hardware and carryout necessary inspection. In case of any deviation in received FIM the same shall be intimated to DEPARTMENT.

(vii) Participate and provide necessary support during shearography, vibration testing etc. of respective tanks at URSC/other department facilities in Bangalore if necessity arises wherever applicable.

(viii) INDUSTRY shall handle all operation and maintenance of all equipment/facilities independently in ITPF after completion of training.

(ix) Compilation and submission of inspection documents, testing documents etc. to appropriate review committees and obtain final approval.

(x) After completing the machining, inspection and acceptance of the parts, finished parts shall be safely stored in finished parts storage of ITPF.

(xi) To ensure that all quality procedures are complied with.

(xii) To ensure that all safety aspects are adhered to during assembly & testing of propellant tanks.

(xiii) Industry is restricted to undertake any additional activity for their own or any other third party requirement without obtaining approval from the Department.

### 10.3. Responsibilities of the DEPARTMENT (Production phase):

(i) Finalizing the annual scope-of-work towards machining, assembly & testing of tanks for the deliverable's quantity through CMC and the priorities of realization of each deliverable based on the project requirements before start of each production year.

(ii) To permit the operation of DEPARTMENT established ITPF facility by the trained manpower of the INDUSTRY for performing all machining, assembly, testing & evaluation of tanks during production phase. Also, in case of need, DEPARTMENT shall make available its In-house facilities or other department facilities for operations relating to assembly, testing & evaluation of envisaged deliverables.

(iii) To issue all required titanium forgings, raw material for WTS, machined parts (PAS), anti slosh baffles, standard parts as Free-Issue-Material (FIM) for production phase towards the deliverables for each year as finalized by the CMC.

(iv) To ensure availability of adequate fixtures for carrying out machining of tank parts, assembly and testing of tanks.

(v) Providing disposition of major Non-Conformances (NCRs) raised by the Industry.

(vi) Carry out quality auditing and certification of machining, assembly & testing, Quality assurance of deliverables.

(vii) Certify equipment/machinery/facility established in ITPF after successful completion of proto flight hardware realized by Industry's manpower for further production in phase-II at ITPF.

(viii) To provide final acceptance of delivered parts/sub-assemblies/tanks.

(ix) Review and accord clearance after completion of salvage actions of machined parts/ sub-assemblies/tank as applicable as per LSC/CMC recommendations

(x) To arrange periodic verification of records pertaining to items issued to the Industry.

(xi) To organize periodical Local Salvage Committee (LSC), Contract Management Committee (CMC) and other committee meetings to ensure smooth operation of the Contract.

(xii) During this phase, based to the project demand DEPARTMENT has the right to issue finished tank parts available at in-house inventory on case-to-case basis with the approval of CMC for assembly & Testing operation. Payment for the same shall be reviewed and finalized by CMC.

(xiii) Retaining the following.

I. Security personnel.
II. CCTV surveillance & monitoring.
III. Access Control System & monitoring.
IV. IT Infrastructure for security etc.
V. Housekeeping/Laboratory up keeping & Gardening.

### 10.4. Responsibilities of the INDUSTRY (Production phase):

(i) Receipt and storage of all required titanium forgings, machined parts for PAS, standard parts as Free-Issue-Material (FIM) for production phase scope of machining, assembly & testing of tanks for the deliverable quantity for each year as decided by the CMC.

(ii) Depute trained, qualified and certified manpower of the Industry for carrying out machining, assembly, testing & evaluation and delivery of propellant tanks and associated operations such as machining of tank parts, chemical cleaning, EB welding, TIG welding, vacuum ageing, NDI etc. and QC functions.

(iii) Procurement of all necessary Tools, Spares, Consumables etc for the realization of envisaged deliverables by CMC in each production year.

(iv) Carrying out counter-verification of FCDs for machined parts & regular inspection of standard parts supplied by the DEPARTMENT.

(v) To carryout trial assembly using accepted machine tank parts before the actual assembly of tank parts.

(vi) To carryout machining, assembly, testing evolution and delivery of propellant tanks and associated operations at ITPF and QC functions as per approved documents issued by the DEPARTMENT.

(vii) The required fixtures for realizing various sub-assemblies / final assemblies are supplied by the Department. Responsibilities lie with the party to realize the sub-assemblies / final assemblies by following the process given by Department which is already proven through industry/in-house facilities.

(viii) Industry shall comply for the salvaging of machined parts, sub-assemblies, tanks as applicable and carryout associated operations as recommended by appropriate review committees.

(ix) To accept change in deliverable quantity (increase/decrease) of the tanks and change in the variant, relative priorities and comply with delivery schedules as per CMC decision.

(x) For operation and day-to-day routine maintenance of all the machinery/ equipment/facilities under ITPF established by the Department for the intended scope.

(xi) To refer non-conformances (NCRs), if any, to the Department for disposition.

(xii) For verification of Interface Control Dimension (ICD) of final tanks.

(xiii) To ensure periodic preventive and breakdown maintenance of all machinery, equipment and facilities in ITPF.

(xiv) To ensure un-interrupted power supply & basic amenities to ITPF and ensure smooth running of the Contract.

(xv) To ensure all security and safety aspects are adhered to.

(xvi) To carry out the QC functions by an independent QC section.

(xvii) To ensure that all the quality procedures are complied with.

(xviii) For safe & secured packing of all parts/sub-assemblies/tanks as applicable in containers supplied by the department for the purpose and deliver them to Department with all documents.

(xix) To present technical, commercial and management issues to Contract Management Committee for smooth execution of the Contract.

(xx) To retain the Department trained manpower of the Industry for executing this Contract. In case of the Contract is unable to retain the trained manpower, the onus of re-training them shall rest with the Industry.

(xxi) Industry shall be equipped to meet any exigency requirements.

(xxii) Maintenance of ITPF facility as per clause no. 7.5.

Note:

- Department reserves the right to verify the adequacy of the process requirements etc.
- Department has the right to use ITPF by DEPARTMENTS personnel, in case of need.

(xxiii) Industry is restricted to undertake any additional activity for their own or any other third party requirement without obtaining approval from the Department.

# 11. CONTRACT ADMINISTRATION

The DEPARTMENT and the INDUSTRY shall have to identify the following administering authorities for specific functions as mentioned against each.

## 11.1. Contract Management Committee (CMC)

A Contract Management Committee consisting of key management personnel from both DEPARTMENT and the INDUSTRY shall be constituted to co-ordinate the training, effective utilization of the facilities and adequacy of machined parts and standard parts to be issued as free-issue material and all other activities for smooth execution of the contract. In respect of commercial matters, Head-Accounts/IFA and Head, Purchase & Stores of the DEPARTMENT and commercial personnel from INDUSTRY side will also be members of the CMC.

**The CMC–ITPF shall address the following:**

(i) Proper co-ordination between all agencies.

(ii) Review of implementation of technology assimilation training at Department's facilities in areas of assembly & testing and facility operation.

(iii) Periodic review of Contract implementation status & address any technical issues.

(iv) Depending on dynamic project needs/priorities, the CMC shall review changes if any.

(v) Change in quantity (increase/decrease) of deliverables, tank variants, assign relative priorities and identify delivery schedules during entire period of the Contract.

(vi) Peruse and certify additional claims to be paid to the INDUSTRY towards supply of excess quantity over and above the scheduled annual deliverable quantity or salvaged part/sub-assembly/final tank based on CMC recommendation, if any.

(vii) Recommending extension of delivery schedules, if any / extension of contract period to meet contract deliverables, if any.

(viii) To review and recommend plan of action which includes schedule & cost for salvage of parts/sub-assembly, final tanks on case-to-case basis.

(ix) To decide payment and authorization of the same subsequent to successful completion of salvage of tank.

(x) Assess and recommend issue of excess FIM over and above rejection allowance.

(xi) To review and approve any unexpected expenses (not specified in this contract) incurred by the Industry for the production of envisaged deliverables during the currency of this contract.

(xii) The CMC may co-opt specialists for specific issues. The CMC shall meet as frequently as possible but at least once in two months.

(xiii) Constitution of necessary sub committees such as Joint Working Team (JWT), Local Salvage Committee (LSC), Failure Analysis Committee (FAC), Components Acceptance Committee etc.

(xiv) CMC is empowered to perform surprise visits to ITPF for ensuring proper maintenance of the facilities and other safety & security related aspects.

(xv) CMC is empowered to include any new tank variants/deliverables based on Department requirement. CMC will finalize the cost and payment terms for such deliverables based on mutual agreement with the Industry.

(xvi) CMC is empowered for constitution & deputing of Co-ordination call and assigning their roles & responsibilities on need basis.

(xvii) ITPF can be used to supply Titanium alloy propellant tanks for NSIL or IN-SPACe requirements if spare capacity exists with approval of LPSC/Department. CMC will finalize the cost and payment terms for such deliverables based on mutual agreement with the Industry.

(xviii) Any other point(s) in relation to the Contract.

### 11.2. Contract Managers:

The Contract Manager of the DEPARTMENT and the Contract Manager of the INDUSTRY shall execute the Contract effectively. They shall also be ultimately responsible for the overall performance of the Contract. A suitable organizational structure shall be put in place to support the Contract managers.

Responsibilities of Contract manager:

(i) Contract Manager will furnish all the inputs to all Committees

(ii) All appropriate committee minutes of meetings (MOM) deliberations shall be communicated to contract manager. Contract manager shall be the custodian of all data regarding all appropriate committee deliberations.

(iii) Contract-Manager of Industry shall co-ordinate with Contract Manager of the DEPARTMENT towards technical aspects of the hardware and to channelize the activities to meet annual targets as envisaged in the Contract

(iv) To review and certify the payment of the same subsequent to successful completion of tank realization and for salvage operation of tank as per the CMC direction.

(v) Contract Managers shall ensure Industry complying to all LPSC specified standards, process plans/documents, quality protocols, safety standards etc.

(vi) Contract Managers shall ensure smooth execution of the contract.

### 11.3. Local Salvage Committee (LSC)

A Local Salvage Committee (LSC) consisting of key personnel from both the DEPARTMENT and the CONTRACTOR shall be constituted and authorized to dispose off all non-conformances.

The LSC shall meet, by a suitable arrangement- including video/tele-conferencing, as frequently as required. The LSC shall be authorized to co-opt additional members, if necessary for specific functions.

The DEPARTMENT's Non Conformance Review Board (NCRB) shall ratify/decide on all non-conformances reported.

### 11.4. Components Acceptance Committee (CAC)

A Components Acceptance Committee (CAC) shall be constituted consisting of personnel from both DEPARTMENT and the INDUSTRY, which will be authorized to

- Review the compliance to approved machining, assembly & test procedures.
- Review the inspection reports of machined parts conforming to approved drawings and accord clearance.
- Review the conformance of realized sub-assembly/ full tank/PAS with respect to all processes, subassembly stage test results, NDI/NDT results and accord clearance
- Review the test results for compliance to performance specifications and accord clearance for fully Proto flight/Acceptance tested hardware.

### 11.5. Industry Quality Assurance Manager

The INDUSTRY shall identify a dedicated Quality Assurance Manager as the focal point for all activities related to assembly, testing and delivery of propellant tanks and associated operations at ITPF facility. Quality Assurance Manager shall also be responsible for the following:

(i) There should be a dedicated Quality Assurance Manager for the facility (there should not be any dual responsibility of Facility and Quality functions).

(ii) To follow up QC related work progress.

(iii) To ensure maintenance of documentation from raw material stage to finished tank.

(iv) To conduct visual inspection of the FIM received from DEPARTMENT and record it.

(v) To ensure trained manpower are only performing the tasks during machining, inspection, assembly and testing activities.

(vi) To perform quality audit on finished tank parts / tanks periodically and report it to DEPARTMENT.

(vii) To ensure in process QC function for assembly & testing.

(viii) To participate in and certify any functional and environmental testing done outside ITPF of propellant tanks.

(ix) To ensure compliance of proper handling procedures and environmental control during inspection, assembly and testing operations.

(x) To ensure validity of all the instruments and equipments for the calibration and proper validation before their usage.

(xi) To report all Observations, Non-Conformances and Failures to the DEPARTMENT in time.

(xii) To inform the details regarding rejections, replacement & salvage of propellant tanks and/or parts to the DEPARTMENT.

(xiii) To over-view and certify the packing of finished deliverables.

(xiv) To bring out a comprehensive Quality Assessment report for all finished deliverables.

### 11.6. Facility & Equipment maintenance Committee

This committee shall be constituted by CMC with members from both Department and Industry for ensuring smooth maintenance of ITPF facility along with its equipment's. Scope of work of the committee shall be finalized during constitution of the committee. This committee shall ensure maintenance of following;

1. Equipment/Facilities Maintenance.
2. Calibration activities.
3. Prevention/Break Down maintenance.
4. Consumables /Spares Procurement.

## 12. ORGANISATION OF WORK

(i) The INDUSTRY shall identify all the personnel responsible for executing the job with clear demarcation of work and the same shall be informed to the Contract Manager of the DEPARTMENT.

(ii) The INDUSTRY shall identify key persons for critical activities which shall be identified by CMC. They shall be replaced only by persons of equivalent qualification, knowledge and experience and with the prior intimation of the DEPARTMENT. Also training shall be imparted to the replaced personnel for seamless flow of the activities.

(iii) The DEPARTMENT shall have the right to withhold its approval for replacement of any / all the key personnel, if in its opinion; the substitutes offered by the INDUSTRY do not have the requisite qualification, knowledge and experience. INDUSTRY shall ensure that the progress of the work under the Contract shall not be affected due to the absence of the key personnel.

(iv) Replaced manpower shall undergo all qualification protocols stipulated by department.

## 13. TIMELINES

The time lines for the project shall be as below:

Table 11 – Details of Contract Timeline

| Id No | Activity | Schedule |
|---|---|---|
| T0 | Date of placement of order | Start |
| T1 | Deployment of manpower & commencement of work & positioning of FIM for Pre Production Phase | T0 + 1 month |
| T2 | Pre Production Phase I | T1 + 6 months |
| T3 | Pre Production Phase II | T2 + 6 months |
| T4 | Commencement of Production Phase 1$^{st}$ year | T1 + 13$^{th}$ to 24$^{th}$ month |
| T5 | Commencement of Production Phase 2$^{nd}$ year | T1 + 25$^{th}$ to 36$^{th}$ month |
| T6 | Commencement of Production Phase 3$^{rd}$ year | T1 + 37$^{th}$ to 48$^{th}$ month |
| T7 | Commencement of Production Phase 4$^{th}$ year | T1 + 49$^{th}$ to 60$^{th}$ month |

## 14. DELIVERY SCHEDULE

### 14.1. Pre-production phase

In this phase, Industry should complete realization of all proto flight tank variants & quantity decided by the CMC and deliver to department with in T1 + 12 months.

#### 14.1.1. (Pre Production Phase-I: T1 to T1 + 6 months):

(i) In this phase, familiarization of machining facility to industry manpower and machining of the hardware required for the envisaged proto flight hardware will be carried out.
(ii) Training of the industry team on assembly & testing activities.
(iii) Only machined tank parts will be realized during this module.
(iv) The quantity and variants of the tank parts to be machined and supplied towards proto flight during this period will be finalized by CMC. The same shall be realized by the industry partner.
(v) Submission of the inspection reports cleared by appropriate committees of the realized tank parts is considered as first milestone of tank realization.

#### 14.1.2. (Pre Production Phase -II: T1 + 7$^{th}$ to 12$^{th}$ months):

(i) During this phase along with the machining of envisaged deliverables, envisaged proto flight tanks & PAS sub-assembly hardware shall rollout of ITPF. The variant and quantity of the proto flight hardware will be as decided by CMC.
(ii) During this phase, for the finalized proto flight deliverables by CMC, submission of the documents pertaining to inspection reports for the deliverables, assembly & testing reports for CAC review & clearance for the fully realized tank is considered as delivery.
(iii) Industry should also submit the process plans/Inspection plans for machining of all tank variants.

### 14.2. Production phase (T1 + 13$^{th}$ to 60$^{th}$ months):

(i) In this phase, industry team will independently carryout production, planning and execution in realizing the tanks.

(ii) During this phase CMC will finalize the quantity and variants of the deliverables for each production year. Accordingly, industry team should carryout production, planning and execution of the same in that production year (i.e within 12 months in each production year).

### 14.3. Contemplated cycle time for realization of envisaged deliverables:

(i) Based on the variant of tank/deliverable, the duration of overall realization period will be different.

(ii) Based on the In-house experience, the realization cycle time for each envisaged deliverable is estimated and briefed in below Table 12. The estimated realization time is only tentative and may vary.

(iii) During the currency of the contract, CMC shall finalize the annual deliverables including quantity based on requirement at the starting of each production year.

Table 12 – Typical realization cycle time of envisaged deliverables at ITPF

| S.No | Deliverable | Estimated realization cycle time in Hrs | |
|---|---|---|---|
| | | Machining | Realization & Testing |
| 1 | 30/35L Propellant Tank | 240 | 464 |
| 2 | 60L Propellant Tank | 240 | 372 |
| 3 | 390 L Propellant Tank Mono/Bi | 1126 | 752 |
| 4 | 516 L Propellant Tank | 1210 | 760 |
| 5 | 650 L Propellant Tank | 1360 | 796 |
| 6 | 769 L Propellant Tank | 1613 | 728 |
| 7 | 875 L Propellant Tank | 1758 | 756 |
| 8 | 1212 L Propellant Tank | 2228 | 1168 |
| 9 | 1417 L Propellant Tank | 2443 | 1168 |
| 10 | CBH Propellant Tank (L 2.5 version) | 5040 | 390 |
| 11 | PAS per Set (i.e MMH&MON3) | Not | 563 |

(iv) The above estimated realization cycle time (process hours) is based on machining, assembly & testing w.r.t each tank variant and the facility utilization.

(v) The delivery period shall be reckoned from date of positioning of FIM / Process & Quality plan approval (by appropriate committee) whichever is later for machining and Assembly & Testing for envisaged deliverables.

### 14.4. Actual Delivery Schedule

(i) The detailed delivery schedule is defined in Clause no.15.

(ii) Time delays accruing owing to scheduling of job, priority changes, pending decisions from DEPARTMENT, unavoidable machine breakdown, FIM supply, FIM defects as applicable shall be reckoned as under:

(iii) Actual Delivery schedule = Contract stipulated delivery schedule + F + G + H + I.
Where,

- F – Waiting period owing to job scheduling & FIM Issues
- G – Time shift owing to priority change from Department
- H – Waiting period for want of clarification/clearance from DEPARTMENT

- I – Unavoidable Machine breakdown period, if any

(iv) Whenever DEPARTMENT puts a hold for a given FIM or Hardware, then the date of lifting of such hold shall be considered for revision of contract stipulated delivery schedule and in turn the "Actual delivery schedule".

(v) CMC shall define the exact delivery schedule for each deliverable before commencing each production year.

### 14.5. Delays in Delivery

(i) If in any case the DEPARTMENT is not able to position raw material, for a particular deliverable in one lot, then the delivery period for that particular deliverable shall deem to begin from the date of placement of the complete raw material, for that particular deliverable at ITPF site.

(ii) If the delay is attributable to INDUSTRY, no additional cost will be borne by Department and LD as applicable will be levied. If the delay is attributable to Department, the delivery schedule shall stand amended by the delay period.

(iii) In case of additional work to accommodate design revisions and production holds, the delivery schedule shall be revised considering the additional time required for carrying out the work. The change in delivery schedule shall be mutually agreed between the Contract Managers of DEPARTMENT and INDUSTRY in the specific review meetings, the minutes of which (approved by both) with approval from CMC would be forwarded to DEPARTMENT and would be construed as revision to Delivery Schedule.

(iv) With reference to the above, the Contract Manager of Department shall recommend the following for CMC review and clearance:

- Change in delivery schedule of the hardware.
- Claims of additional amount towards escalation up to the mutually agreed schedule.

(v) LPSC shall pay additional amount towards escalation for the delay in delivery, due to reasons attributable to DEPARTMENT including non-supply of drawings, delay in supply of FIM and requests for production-hold etc.

## 15. TRAINING & FAMILIARIZATION TO THE INDUSTRY PERSONNEL

Training shall be imparted to industry personnel in all the relevant fields among the operations such as Assembly, Chemical cleaning, Welding (EB & TIG), Testing (functional, pressure, vibration etc), Inspection etc for the deliverables envisaged as per clause no.6 or as per the CMC recommendation.

The details of training to be imparted to the Industry personnel in the various areas are detailed below:

Table 13 - Training to be imparted to the Industry personnel

| Description | Duration | Remarks |
|---|---|---|
| Machining training | 2 - 3 weeks | ▪ No full-fledged training.<br>▪ Experienced personnel anticipated.<br>▪ Familiarization with machines, tools, indicative processes/methods, fixturing |

| | | |
|---|---|---|
| | | involved, onsite inspection etc. |
| Metrology/NDI training | 3 - 4 weeks | ▪ No full-fledged training.<br>▪ Experienced personnel with NDI Level-2 certificate holders anticipated. |
| Assembly / testing training | 24 weeks | ▪ Comprehensive training will be imparted to Industry team during Module-I of the 1st year |
| Familiarization of ITPF facility for facility Maintenance | 03 weeks | ▪ Familiarization of all equipments, cranes, premises, utility like water, electricity, sewage treatment etc… |

## 16. ACCEPTANCE & REJECTION

(i) Responsibility of accepting or rejecting of machined tank parts or full propellant tank or any envisaged deliverable lies with the Quality Manager of Industry team. Subsequent to communicating to DEPARTMENT, the final authority of acceptance and or rejection of any deliverable at various stages rest with the DEPARTMENT.

(ii) The final acceptance of delivered propellant tanks shall be based on the following:

- ✓ The conformity of envisaged deliverable with applicable drawings, functional specifications and all acceptance standards.
- ✓ Successful machining, assembly & testing, delivery as called for in this Contract, with relevant documents for the delivered envisaged deliverables.

(iii) In the event of non-conformances noticed during parts realization stage, sub-assembly stage or final tank realization stage, the same shall be reviewed by appropriate committees. After deliberations/recommendations the final call will be taken by the department Contract Manager and suitable disposition/plan of action to salvage the hardware will be accorded to the deviations.

(iv) In the event of non-conformances noticed during any sub-assembly stage of a component or during final stage due to technological reasons, the DEPARTMENT may consider for acceptance of the non-conforming product for partial payment. The perusal of such cases & recommendation relating to part payment would be carried out by the CMC on case-to-case basis.

## 17. REJECTION ALLOWANCE / REPLACEMENT

### 17.1. Machining & parts realization:

**(i) Pre-Production phase:**

Forging for envisaged deliverables are expensive and rare, hence no additional forgings shall be provided for developmental trails.

Before carrying out final machining of the Titanium forgings, party shall carryout development machining trials on titanium forgings while carryout out rough machining operations itself. Through this process, Industry personnel will get acquaintance with machines, fixturing methodology, CNC programming, Inspection methodology etc.

During this phase, rejection allowance of 1:1 is proposed to be provided with maximum up to 02 nos of forgings for entire pre production phase. However all efforts shall be put up by Industry to minimize rejection.

**(ii) Production phase**

In the regular production phase while machining of Titanium alloy forgings, no rejection allowance is envisaged. However due to unforeseen reasons if any rejection occurs, the maximum rejection allowance provided is 05% of forgings for entire production phase.

If the rejection of the pressure vessel parts occurs due to the defect in the FIM such as Titanium Forgings, sub assemblies etc., the same shall be intimated to DEPARTMENT. Based on the review and recommendations of the same in appropriate committees and CMC approval, FIM replacement will be issued on case-to-case basis.

## 17.2. Assembly & testing:

(i) Design of the propellant tanks, assembly & testing processes, quality surveillance processes have been well validated at in-house facilities, any non-conformance/deviation/quality observation will be addressed by the quality surveillance team on real time basis.

(ii) Further, appropriate committees would actively be guiding the team to address the minor/major non-conformances & remedial actions/measures/recommendations. Also efforts will be in place to prevent reoccurrences of such non-conformance.

(iii) The NCR/deviation/observation of major in nature, which is attributed to raw material / process / machine / operator. The same will be reviewed by appropriate committees and the findings would be presented to CMC for a final view and further course of action.

(iv) Over and above the rejection allowance, the raw material/standard parts will be issued against payment basis if required. However no extra cost will be paid for machining, inspection, assembly & testing of rejected items.

(v) Any rejection of the deliverable during final stages of realization will be reviewed by appropriate committee and CMC. Based on the deliberations, the final decision will be taken on the basis as described below:

a. If the rejection occurs due to the workman ship or negligence of industry partner, the cost towards the raw material will be recovered from the Industry partner.

## 17.3. Salvage of hardware

(i) The propellant tank parts/sub-assemblies/tanks in assembly and testing stage is with very high value addition with respect to both raw material & processes involved till such stage of the hardware. Such hardware cannot be rejected as such in the case of any major deviation. Depending on the nature of deviation and possibility to salvage the hardware partially or fully, the same will be discussed on case-to-case basis in appropriate committees & CMC.

(ii) Subsequent to the discussion, the rework recommendations to salvage the hardware shall be executed by the Industry team.

(iii) If the reason for the occurrence of the deviation is attributed to Industry, the recommended salvage plan by appropriate committee would be taken up at no extra cost. The modalities of the same shall be as per the decision of the CMC.

(iv) If the reason is attributed to the raw material issued by the Department, equipment malfunctioning, then the recommended salvage plan by LSC/CMC would be taken up by Industry on payment basis on pro-rata basis as finalized by CMC.

## 18. DESIGN AND CHANGES

The design of the satellite propellant tanks / CBH propellant tank/PAS sub-assembly is by and large frozen. As a policy of continual improvement and also due to the varying project requirements, modifications or changes are likely in the design. Also, in certain instances, requests for additional testing or compliance with additional procedures may be made. INDUSTRY shall be willing to incorporate such changes and comply with such requests at no additional cost.

## 19. ABSOLUTE RESPONSIBILITY:

Throughout the currency of the contract, the INDUSTRY team shall be solely responsible for the correctness, accuracy and sufficiency of the machining, assembly, testing and other process documents.

Any clearance given by the DEPARTMENT shall not absolve the INDUSTRY of their responsibility in executing the Contract in full conformity with the specifications.

## 20. CHANGES & MODIFICATIONS/IMPROVEMENTS

(i) The DEPARTMENT reserves the right at any time to modify the qualitative and quantitative requirements, specifications or drawings relating to the work that needs to be executed by the INDUSTRY.

(ii) The DEPARTMENT may also consider modifications/Improvements if any proposed by the INDUSTRY on their own initiatives.

(iii) Unless the DEPARTMENT directs otherwise, the INDUSTRY shall in either case, submit within a reasonable time limit, an estimate of the effect of any such modification. In the light of these estimates, the DEPARTMENT shall decide whether and if so at what stage, the modification is to be introduced and advise the INDUSTRY in writing together with the DEPARTMENT's new limits of liability within thirty days of receipt of the details by the INDUSTRY.

(iv) When a modification or other change is so authorized, the INDUSTRY shall proceed with action in accordance with the DEPARTMENT's direction. The INDUSTRY shall, moreover, as soon as possible after the receipt of such directions submit to the DEPARTMENT a firm and detailed estimate showing any decrease or increase in cost owing to the modification and any effect on the delivery schedule on its introduction.

(v) Any additional work which is executed by the Industry shall be consolidated for the respective/each hardware and shall be submitted for payment on pro-rata basis.

The payment towards such additional works shall be made based on review & clearance of CMC against certification by the Contract manager of Department.

(vi) Total cost for such additional work shall be up to 10 % of the unit cost of Hardware. In case, the cost of such additional works goes beyond 10 % of the unit cost, Contract shall be amended with the approval of CMC.

(vii) Inclusion / deletion of component(s):
During the entire Contract period, the DEPARTMENT may, depending on project needs, alter the scope of deliveries and include new component(s) under the Contract scope based on recommendation of the CMC.

## 21. MANAGEMENT OF FAILURES

Any failure encountered in materials, process during machining, assembly & testing of the propellant tanks shall be referred to the DEPARTMENT's Failure Analysis Committee which shall be constituted by CMC. For this, a failure initiation report shall be prepared by the INDUSTRY's QC and forwarded to the DEPARTMENT's Contract Manager.
As per the final recommendations of FAC, INDUSTRY shall implement the recommendations of the Failure Analysis Committee.

## 22. SUMMARY OF MANPOWER:

The indicative estimated manpower required for operation and maintenance of ITPF are given in Table-14 & 15.
INDUSTRY shall note that this indicative technical manpower of 55 personnel is arrived based on the In House assessment, however INDUSTRY is free to estimate the manpower requirement based on the scope of work envisaged in this RFP. However, Industry should ensure deploying manpower wherever specialization is specified as given in Table no. 16.

**Table 14 – Indicative technical manpower estimated for realization of deliverables at ITPF capacity.**

| Sl. No. | Facility | Industry Man power | | |
|---|---|---|---|---|
| | | ITI | Diploma | Engineer |
| 1 | Machining Facility | 8 | 2 | 1 |
| 2 | Chemical Cleaning Facility | 2 | 1 | 1 |
| 3 | Assembly Facility | 3 | 2 | 1 |
| 4 | Test Facility | 4 | 2 | 1 |
| 5 | Special Process Facility | 3 | 1 | 1 |
| 6 | Metrology & NDI Facility | 7 | 2 | 2 |
| 7 | Quality Assurance Team | 0 | 4 | 1 |
| 8 | Storage Facility | 1 | 0 | 0 |
| 9 | Facility Maintenance | 3 | 1 | 1 |
| **Sub total** | | **31** | **15** | **9** |
| **Total** | | **55** | | |

**Table 15 - Details of manpower with specialization**

| # | Discipline | Specialisation | Requirement | | | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Machining | Chemical | Assembly | Testing | SPF | Metrology & NDT | Storage | Quality Assurance | |
| 1 | ITI | Fitter | 01 | - | 03 | 03 | - | 05 | 01 | - | |
| | | Welder | - | - | - | - | 03 | - | - | - | |
| | | Turner | 07 | - | - | - | - | - | - | - | |
| | | Fitter | - | - | - | - | - | - | - | - | |
| | | Electronics | - | - | - | 01 | - | - | - | - | |
| | | Electroplater | - | 02 | - | - | - | - | - | - | |
| | | Fitter for non-destructive inspection | - | - | - | - | - | 02 | - | - | NDI Level-2 certified |
| 2 | Diploma Engineer / BSc | Mechanical | 02 | - | 02 | 01 | 01 | 01 | - | 02 | |
| | | Electronics | - | - | - | 01 | - | - | - | 01 | |
| | | Chemical | - | 01 | - | - | - | - | - | 01 | |
| | | Mechanical Engr. for non-destructive inspection | - | - | - | - | - | 01 | - | - | NDI Level-2 certified |
| 3 | Graduate engineer | Mechanical | 01 | - | 01 | 01 | 01 | 02 | - | 01 | |
| | | Electronics | - | - | - | - | - | - | - | - | |
| | | Chemical | - | 01 | - | - | - | - | - | - | |

**Note 1:** For NDI operations, Technician & Diploma Engr. shall be certified with ISNT/ ASNT Level-2 certificate in NDI.

**Note 2:** For machining facility, ITI turners shall be with 3 years of minimum experience in operating CNC lathes of Dia.1500mm class lathe.

**Note 3:** Maintenance team (01 Engr, 01 Diploma & 01 ITI ) details not included in above table, manpower with over all experience in handling production facilities is recommended for overall maintenance of equipments/ ACs/Sewage system/Cranes and other associated facilities in ITPF.

## 23. DOCUMENTATION

The INDUSTRY shall maintain the following documents during the course of the Contract:

(i) Machined parts, standard parts and consumables ID register
(ii) Quality Assurance Plans
(iii) NDI, sub-assembly inspection Reports

(iv) Surface Treatment Report
(v) Ageing/Heat Treatment Report
(vi) Weld Quality Reports
(vii) Hardware Clearance Report
(viii) Assembly &Test Procedure Documents
(ix) Assembly Parts List
(x) Assembly log book
(xi) Assembly checklist
(xii) Test report
(xiii) Facility log book
(xiv) Non-Conformance Report for parts / sub-assembly / assembly & testing documentation.
(xv) Interface Control Dimensions measurements reports.
(xvi) End Item Data Package
(xvii) Any other report / documents required or applicable during the course of contract.

## 24. OVER ALL PROJECT PLAN

The INDUSTRY shall submit in 03 (Three) weeks to the DEPARTMENT a Project Plan that provides visibility on all matters relating to the execution of the Contract as per the delivery schedule. This plan shall be updated as and when required and shall summarize all major Contract activities and timelines in bar-chart form. The plan shall establish milestones and identify all hardware and other deliverables specified in this document. Sufficient milestones shall be established to allow the Department to assess the progress.

## 25. PROGRESS REPORT

The INDUSTRY shall submit to the Department at one-month intervals, a Progress Report covering the contract activities during the preceding one-month period and activities planned during the subsequent month in line with the project plan. The Report shall provide a complete description of the progress on the contract and explain fully any problems encountered, along with proposed or implemented solutions.

The report shall include the following:

(i) Summary schedule
(ii) Contract status
(iii) Machining and inspection status
(iv) Assembly and testing status
(v) Clearance status
(vi) Status on action items
(vii) Meeting summaries
(viii) Problems and proposed solutions
(ix) Indicative projection for next one month and delivery schedules
(x) Commercial aspects, if any.

## 26. QUALITY ASSURANCE PLAN

Product Assurance Plan being one of the major requirements for the successful completion of the Contract, the INDUSTRY shall prepare a product assurance plan that shall include the following:

(i) Organizational structure to support the overall activity.
(ii) Product acceptance procedure as per guidelines given by the DEPARTMENT.
(iii) Quality assurance requirements like audits, control, equipment certification, etc.

## 27. MATERIAL TRACEABILITY PROCEDURE

### 27.1. Procedure to be followed by the department

(i) The DEPARTMENT will dispatch cleared material with a Raw Material Clearance Certificate (RMCC) to the INDUSTRY. An identification number will also be punched on each material. The RMCC will also identify the material being issued for each part.
(ii) The DEPARTMENT will maintain the details of these materials, such as material grade, size, certificate No/ Heat No/ Melt No, identification No, inspection report sent by material suppliers, batch numbers, quantity and details of job for which the materials are dispatched along with drawing No.

### 27.2. Procedure to be followed by the Industry

(i) The INDUSTRY shall maintain an Inward Register for materials received from the DEPARTMENT giving details of materials, identification number, quantity, size and date of receipt along with the RMCC reference.
(ii) The INDUSTRY shall ensure that all FIM dispatched by the DEPARTMENT bear the identification number and stock such materials in bonded stores in a separate identified area.
(iii) The INDUSTRY shall inform the DEPARTMENT in case of non- availability of above information on the materials.
(iv) The INDUSTRY shall incorporate the identification No. and details of the materials in job order card issued.
(v) The INDUSTRY shall maintain a material issue register, giving details of job orders, quantity of materials issued and RMCC no. identification No. of materials and the part for which the material is issued.
(vi) The INDUSTRY shall incorporate the material Identification number appearing in the RMCC in the inspection report of the finished components.
(vii) The INDUSTRY shall preserve the rejected parts (in process) and submit a periodical account for obtaining formal decision on the rejection.

## 28. PACKING, FORWARDING AND DELIVERY

(i) The INDUSTRY shall safely & securely pack the propellant tanks and PAS-CBH assemblies, using appropriate storage containers as per department requirements.
(ii) Deliver them to the DEPARTMENT's bonded Stores at ITPF:

(iii) Following original dispatch documents shall be delivered along with each consignment, as applicable:

- ✓ Delivery note.
- ✓ Inspection reports including visual inspection reports as applicable.
- ✓ Following product End Item Data Package shall accompany deliveries:
  - As built configuration record.
  - Dimensional inspection report & NDI reports.
  - All appropriate committee dispositions.
  - COC & Quality Assessment report
  - Action closure reports for NCs, if any.
  - Action closure reports.
  - Acceptance reports.

## 29. IN PROCESS HANDLING:

(i) The INDUSTRY shall handle all machined parts carefully so as not to cause damages like notches, dents, nicks, etc.

(ii) Finished parts, tanks and standard parts shall be individually wrapped in polythene covers and stored in corrugated boxes during in process transportation and storage. Adequate packing shall also be given to prevent the parts from hitting and damaging each other.

(iii) This is essential as the pressure vessel parts are very thin and susceptible for damage due to mishandling.

## 30. STORAGE:

The INDUSTRY shall pack finished parts, standard parts and sub-assemblies for storage in the bonded store. The final accepted propellant tanks shall be stored in safe custody in the identified storage location in ITPF till they are collected by the department.

## 31. TANK IDENTIFICATION NUMBER:

The INDUSTRY shall identify each component by a unique identification number. This number shall be engraved / labeled on each component at the area specified in each drawing.

A serial numbering register shall be maintained separately, which records the identification number issued to each component.

## 32. RECORDS MAINTENANCE

The INDUSTRY shall maintain books, records, documents, data, correspondence, receipts, maintenance contracts, purchase orders, vouchers, memoranda and other data relating to the Work and other evidence relating to this contract and performance of the services described herein, including but not limited to accounting procedures and practices that sufficiently and properly reflect all direct and indirect costs of any nature expended in the performance of this contract. INDUSTRY shall retain such records for a

period of five years following the date of final payment. At no additional cost, these records, including materials generated under the contract, shall be subject at all reasonable times to inspection, review or audit by the department, personnel duly authorized by the department. If any litigation, claim or audit is started before the expiration of the five (5) year period, the records shall be retained until all litigation, claims, or audit findings involving the records have been resolved.

## 33. GENERAL

(i) Conditions hereunder, the documents as per Annexures and drawings here to form integral part of this RFP and are complimentary to each other.

(ii) The INDUSTRY shall not give any publicity of any kind of whatsoever regarding this RFP to anyone without prior written approval of the Department.

(iii) LPSC reserves the right to utilize ITPF facilities as and when required based on mutual agreement with Industry without affecting the regular production activities by Industry.

## 34. CONTRACT TYPE AND PRICES

### 34.1. Contract Type

The contract cost shall remain firm and fixed for the pre production phase & 1st year of Production phase. Subsequently the same shall be escalated as per the escalation formula given below till effective delivery schedule.

i. 2nd year (1st year Production phase) cost shall be taken as reference for estimation

ii. 1st year unit cost is derived from 2nd year cost with as development charges to be spelt out by the party {MOQ = 5 s/c tanks+ 1 CBH tank (with PAS)}

iii. Similar methodology as 2nd year has been adopted with annual escalation based on last 10 years average of CPI(IW) for deriving cost plus profit value & unit cost of each variant from 3rd year to 5th year i.e., Escalation is applicable only from 3rd year of the contract i.e after completing 1st year of production phase (i.e 2nd year)

### 34.2. Payment

(i) 100% Payment shall be made within 30 days from the date of acceptance of the deliverable by CMC or submission of Invoice (whichever is later) on pro-rata basis of the respective production year.

(ii) In case of excess supply over and above MOQ in a year, 5% bonus of total unit cost of respective deliverable will be given along with variable cost on pro-rata basis of the respective production year.

(iii) In case of shortfall MOQ, only fixed cost (or) actual cost whichever is less shall be paid on pro-rata basis of the respective production year.

### 34.3. Payment Procedure

Payment shall be made against the satisfactory delivery of envisaged deliverables.

**(i) Payment Request**

Along with each accepted deliverable, Industry should submit invoice for the deliverable price along with all appropriate committee approvals. Payment shall be made on pro- rata basis.

**(ii) Final Payments**

Upon satisfactory review of submitted documentary evidence and recommendations of the department contract manager and appropriate committees, Department shall release the payment within 30 days from the date of invoice.

### 34.4. Interest payment

No Interest shall be paid for the payments due and unpaid by department due to any reason to the industry.

### 34.5. Advance payment

Advance payment is not envisaged in this contract.

## 35. PATTERN FOR SUBMISSION OF QUOTATION

(i) The taxes and duties applicable along with their rates shall be clearly mentioned in the offer.

(ii) Payment will be against delivery of accepted spacecraft propellant tank/CBH propellant tank/PAS sub-assembly.

(iii) The INDUSTRY shall quote the unit-cost-per-deliverable for 1st year i.e pre-production phase and 2nd year as "base price". Further for 3rd year onwards, the unit-cost-per-tank/PAS sub-assembly shall be calculated based on the annual fixed escalation as per clause 34.0 based on 2nd year prices as base line.

### 35.1. PATTERN FOR SUBMISSION OF QUOTATION (PRE-PRODUCTION PHASE-1st Year)

Industry should submit quotation for unit rate of all the deliverables given below and the overall cost for pre-production phase.

| Deliverable | Quantity | Fixed Cost in Rs. | Variable Cost in Rs. | Total Cost in Rs. |
|---|---|---|---|---|
| 35 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 390 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 650 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 769 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 1212 L/1417 L CASSINI Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| CBH Propellant Tank (L 2.5 version) | 1 nos. | XXXX | XXXX | XXXX |
| PAS-CBH MON3 | 1 nos. | XXXX | XXXX | XXXX |
| PAS-CBH MMH | 1 nos. | XXXX | XXXX | XXXX |
| **TOTAL 1st year Cost** | **06+02 nos** | XXXX | XXXX | XXXX |
| **One Time Developmental Charges** | | | | **XXXX** |
| **TOTAL COST FOR 1st YEAR in Rs.** | | | | **XXXX** |

Note: Developmental charges are considered due to "The development of any hardware involves a pre-production stage where all the planning, design & development and documentation happen. These pre-production engineering activities cover 2D to 3D drawing conversion, methodizing, CNC programming validation, NC programming etc. Commencement of utilization of commissioned facilities can only happen after achieving some progress on the above engineering activities to ensure that process and tools are validated progressively by the time production work is taken up. As part of operationalization, initial trials at the ITPF would be required to set the parameters aiming to achieve required process capability. This would be followed with realization of various sub-assemblies through systematic manufacturing process / methodizing. Once the pre-production stage is completed the project moves into a production stage. Due to more effort and less output during this pre production phase, Developmental charges are envisaged"

## 35.2. PATTERN FOR SUBMISSION OF QUOTATION (PRODUCTION PHASE – 2nd Year)

Industry should submit quotation for unit rate of all the deliverables given below and the overall cost for 2nd year based on minimum deliverables envisaged per annum during production phase specified in Clause no.8.2.

| Deliverable | Quantity | Fixed Cost in Rs. | Variable Cost in Rs. | Total Cost in Rs. |
|---|---|---|---|---|
| 30/35 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 60 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 390L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 516 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 650 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 769 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 875 L Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| 1212 L/1417 L CASSINI Propellant Tank | 1 nos. | XXXX | XXXX | XXXX |
| CBH Propellant Tank (L 2.5 version) | 1 nos. | XXXX | XXXX | XXXX |
| PAS-CBH MON3 | 1 nos. | XXXX | XXXX | XXXX |
| PAS-CBH MMH | 1 nos. | XXXX | XXXX | XXXX |
| **TOTAL 2nd Year Cost as per quantity specified in Table 6 & 7** | | **XXXX** | **XXXX** | **XXXX** |

# 36. PATTERN FOR ARRIVAL OF OPERATIONAL COST & UNIT COST OF DELIVERABLES

## 36.1. Minimum Manpower Deployed

| | Nos. |
|---|---|
| Engineer | XXXX |
| Tech Assistant / Diploma grade | XXXX |
| Technician / ITI grade | XXXX |
| **Grand Total** | XXXX |

## 36.2. Calculation of net active working hours in a year (assumed)

| | | |
|---|---|---|
| Total number of days in a year | : | 365 Days |
| Less: Sundays – 1 day in a week x 52 weeks | : | 52 Days (-) |
| Public holidays in a year (Average) | : | 14 Days (-) |
| Active Working Days in a year | : | 299 Days |
| **Active working hours in a year : 299 days ** X 8 Hrs** | **:** | **2392 Hours** |

## 36.3. Basic table for calculation of operational cost

| | **COST ELEMENT** | **Cost Rs. in Lakhs** |
|---|---|---|
| A | Variable Cost | xxxx |
| B | Fixed Cost | xxxx |
| C | SUB TOTAL C = A+B | xxxx |
| D | Administrative overhead @X% on Subtotal (A+B) | xxxx |
| | TOTAL OPERATIONAL COST | xxxx |
| E | Profit@ xx % | xxxx |
| | **Total Operational Cost Plus Profit (C+D+E)** | XXXX |

## 36.4. Realisation time for each variant of tank

| | **TANK DETAILS** | Man machine hours | F= Ratio of man machine hours in terms of 30/35L tank |
|---|---|---|---|
| 1 | 30/35 L | H1 | F1= H1/H1=1.0 |
| 2 | 60 L | H2 | F2=H2/H1 |
| 3 | 390 L | H3 | F3= H3/H1 |
| 4 | 516 L | H4 | F4 = H4/H1 |
| 5 | 650 L | H5 | F5 = H5/H1 |
| 6 | 769 L | H6 | F6 = H6/H1 |
| 7 | 875 L | H7 | F7 = H7/H1 |
| 8 | CASSINI 1212/1417 L | H8 | F8 = H8/H1 |
| 9 | CBH (L 2.5 version) | H9 | F9 = H9/H1 |
| 10 | PAS CBH MON3 | H10 | F10 = H10/H1 |
| 11 | PAS CBH MMH | H11 | F11 = H11/H1 |

## 36.5. Method of estimating the Fixed cost

Elements fixed cost are:

i. **Manpower cost**
   100% of Engineers cost + 50% of technical assistant cost + 50% of Technician cost is considered.
ii. **Power charges of / Equipment**
   Only Demand charges are considered.
iii. **AMC of plant/ Equipment**
   AMC charges per annum for the entire equipments shall be spelt out

## 36.6. Method of estimating the Variable cost

Elements of variable cost are

i. **Bought out and consumables**
   Cost of envisaged bought outs and consumables
ii. **Power charges of / Equipment**
   Only consumption charges are considered.
iii. **Manpower cost**
   50% of technical assistant cost + 50% of Technician cost is considered.
iv. **Tools and spares**
   Cost of tools and spares to be spelt out (%age of equipment cost is preferred)

## 36.7. Method of arriving Administration Overheads

As a percentage of fixed cost and variable cost.

## 36.8. Method for arriving the unit cost of the tank

As the first year (only six tanks are expected as deliverables) is for mainly for training and qualification of tanks, the manpower will be used for learning the procedures and systems to be followed. The unit cost of tank cannot be taken as basis for successive years.

In the second year, 14 tanks & 2 PAS are expected as deliverables. The second year unit cost can be taken as taken as basis for further calculation. The cost for 3$^{rd}$ to 5$^{th}$ years are escalated with CPI(IW) index as basis. The first year unit cost is arrived as 2$^{nd}$ year cost + development charges. The developmental charges to be stated as percentage of unit tank cost.

To arrive at the unit cost of 30/35L tank for the second year the following formula is applied.

Total operational cost plus profit = $x*(q_1*F_1 + q_2*F_2 + q_3*F_3 + q_4*F_4 + ..... q_{11}*F_{11})$

Whereas

x=30L tank cost;

Factor F, is ratio of man-machine hours of each variant to 30L tank man-m/c hrs;

q is respective deliverable quantity for the applicable year

The unit cost of other variants of tanks for the second year can be computed by using the factor F and shall be presented as below. The below table is basis for arriving at the unit cost of the tank for the 1$^{st}$ year and 3$^{rd}$, 4$^{th}$ and 5$^{th}$ years.

| # | Deliverable | Quantity | Price in Rs. |
|---|---|---|---|
| 1 | 30/35 L Propellant Tank | 1 nos. | XXXX |
| 2 | 60 L Propellant Tank | 1 nos. | XXXX |
| 3 | 390L Propellant Tank | 1 nos. | XXXX |
| 4 | 516 L Propellant Tank | 1 nos. | XXXX |
| 5 | 650 L Propellant Tank | 1 nos. | XXXX |
| 6 | 769 L Propellant Tank | 1 nos. | XXXX |
| 7 | 875 L Propellant Tank | 1 nos. | XXXX |
| 8 | CASSINI 1212/1417 L | 1 nos. | XXXX |
| 9 | CBH Propellant Tank (L 2.5 version) | 1 nos. | XXXX |
| 10 | PAS MON3 | 1 nos. | XXXX |
| 11 | PAS MMH | 1 nos. | XXXX |

### 36.9. Method of estimating the unit cost in case of excess supply or short supply

In case of excess supply of the tanks within the single shift operation, the following formula is applied to calculate the unit tank cost. From the above calculation, it is clear that the unit cost of the tank comprises of two parts i.e., fixed cost and variable cost.

The fixed and variable cost can be represented as percentage of total cost (variable cost + fixed cost).

In case if the department could not supply the FIM for any envisaged deliverable (shortfall quantity), the fixed cost of respective deliverable will be given to the industry.

For excess quantity in a year, 5% bonus of total unit cost of respective deliverable will be given along with variable cost.

As an illustration, the second year is taken as example.

| **Tank Variant** | Payment For Excess Quantity | | | | Payment For Shortfall Quantity |
|---|---|---|---|---|---|
| | 2nd yr. fixed cost (x% of unit cost) | 2nd yr. variable cost (y% of unit cost) | 2nd year unit cost | Excess deliverable tank cost* | |
| Any variant | A | B | **C=A+B** | **B+5%C** | A |
| For example | 60 | 40 | **100** | **45** | 60 |

## 37. PRICE VARIATION FOR DELAY IN DELIVERIES:

If the INDUSTRY is not able to complete the scope of work within stipulated Contract period and delivery is affected in the subsequent production year, following pricing methodology will be applicable.

(i) If delay in delivery of tank/tank part is attributable to the INDUSTRY, then payment for delayed quantity shall be paid as per previous year unit-cost-per-part after deducting Liquidated Damages as applicable.

(ii) If delay in delivery of tank / tank parts is attributable to the DEPARTMENT as decided by CMC, then payment for delayed quantity shall be paid as per that year (delivery year) unit-cost-per-component as applicable.

## 38. STATUTORY DUTIES & TAX

(i) GST shall be paid by the DEPARTMENT against document proof. INDUSTRY shall specify the applicability of service tax, if any, in their offer.

(ii) Income-tax, if any, as per prevailing Income Tax Act will be recovered by the DEPARTMENT at source.

## 39. FREE-ISSUE-MATERIAL (FIM)

(i) The DEPARTMENT shall issue Titanium alloy forgings, raw materials, sub-assemblies (Draining device), PMD parts and other essential standard parts for envisaged Satellite Propellant Tanks.

(ii) The DEPARTMENT shall issue Titanium alloy forgings, sub-assemblies (Anti Slosh Baffle) and other essential standard parts for envisaged CBH Propellant Tanks.

(iii) The DEPARTMENT shall issue machined parts and standard parts for assembly and testing of PAS (MMH & MON3).

(iv) All standard parts and consumables as indicated in technical documents of respective deliverables in batches as free-issue materials required for assembly and testing of propellant tanks & PAS hardware for the identified deliverable quantity on yearly basis.

(v) The DEPARTMENT shall issue necessary fixtures for machining of parts for realization of envisaged deliverables. Industry is responsible for the procurement of tools, spares and consumables.

(vi) The DEPARTMENT shall issue necessary fixtures for assembly and testing and its associated operations for realization of the envisaged deliverables.

(vii) The INDUSTRY shall receive, handle, utilize and account for FIM and submit periodic consumption statement to the DEPARTMENT's Contract Manager. Periodicity shall be decided by CMC during execution of contract.

(viii) For rejections due to defective raw materials/standard parts positioned by the DEPARTMENT as free issue, the DEPARTMENT shall replace the materials free-of-cost. The DEPARTMENT shall also reimburse the Industry, cost of fabrication effort put on the material till the stage of rejection.

(ix) Based on the deliverables finalized by CMC for each production year, Industry should submit the Indemnity Bond & all risk insurance policy for the total FIM value for every production year to enable LPSC to position Free-Issue-Materials (FIM) (on pro-rata basis of equivalent value of FIM).

## 40. SECURITY DEPOSIT

Security deposit @03% of the Contract value shall be furnished in the form of Bank Guarantee/Indemnity Bond from any of the Scheduled Banks executed on non-judicial stamp paper of appropriate value towards performance of Contract and shall be valid for period of 60 days beyond the date of completion of all the terms and conditions of Contract/expiry of warranty period for final year deliverables.

## 41. PARALLEL / ADHOC CONTRACT

DEPARTMENT reserves the right to enter into parallel / adhoc Contract(s) with any other INDUSTRY(s) during the currency of this Contract for the same work.

## 42. TRANSFER OR SUB-LETTING OF CONTRACT

The INDUSTRY shall not be permitted to transfer or sub-let the work under the Contract either in whole or in part, and shall not float an INDUSTRY nor set-up an association with another INDUSTRY for the fulfillment of the Contractual obligations vested with them.

## 43. LIQUIDATED DAMAGES

(i) Liquidated damages (LD) is not applicable for pre-production phase (module-I & module-II) as 1st year scope of work contains training to industry personnel and realization of proto flight hardware.

(ii) LD is applicable for production phase i.e 2nd year onwards (Phase-II).

(iii) The delivery date for each variant of tank/ tank parts shall be as per the delivery schedule given in Clause no 15.4 and will be reckoned from the date of receipt of Free Issue Material (FIM) for the respective annual deliverable quantity (as decided by the CMC) to the INDUSTRY by department at ITPF facility from Phase-II i.e 2nd year production onwards. Accordingly, LD will be calculated.

(iv) If the INDUSTRY fails to deliver as per Contract scope as per the delivery schedule given in Clause no 15 (from Phase-II i.e 2nd year onwards) or any extension thereof, DEPARTMENT shall recover liquidated damages @0.5% (Zero-point five percent) of cost of undelivered hardware per week (or) part thereof, subject to a ceiling of 10% (ten percent) of the cost of items so delayed.

## 44. FORCE MAJEURE

Neither DEPARTMENT nor bidder shall be considered in default in the performance of its obligations under this contract, if such performance is prevented or delayed for any causes beyond the reasonable control of the party affected by eventualities such as war, hostilities, revolution, riots, civil commotion, strikes etc., or because of any law and order situation, proclamation or regulation or ordinance of any government or sub-division thereof, or because of an act of God provided notices in writing of any such cause with necessary evidence that the obligation under the agreement is affected or prevented or delayed is given within 15 days from the happening of the event and in case it is not possible to serve notice within the said 15 days period, then, within the shortest possible period without delay. As soon as the cause of force majeure has been removed, the party whose ability to perform his obligation has been affected shall notify the other party of the actual delay that has occurred due to such force majeure condition, so that actions under the provisions of this contract can be mutually reviewed and agreed upon between the Industry and the department. If the force majeure condition extends over a period of six months, both the parties of the contract shall mutually discuss and arrived at an agreement for continuation or termination of the Contract.

If the Contract is terminated under this Clause, the DEPARTMENT shall be at liberty to take over all unused, damaged & acceptable materials and bought out parts/components in the possession of the INDUSTRY at the time of such termination the from the INDUSTRY at price fixed by the DEPARTMENT which shall be final.

## 45. JURISDICTION, APPLICABLE LAWAND INFRINGEMENT THERE OFF

The Contract shall be governed by the laws of India for the time being in force. The Courts in and around Bangalore of the Karnataka State only shall have jurisdiction to

deal with and decide any legal matters or disputes if any, whatsoever arising out of this Contract. The DEPARTMENT shall not be responsible, if the industry infringes the Laws.

## 46. ARBITRATION

In the event of any dispute or difference arising out of any terms and conditions of this Contract, the parties shall strive to find mutually acceptable solution, failing which, all disputes or differences arising against this Contract or in connection with the agreement shall be settled through Arbitration& Conciliation Act of India 1996 through an Arbitrator not below the Rank of Joint Secretary, nominated by the Secretary, Department of Space. The award of the Arbitration shall be final and binding on both the parties of this agreement.

## 47. SECRECY

(i) The technical information, drawings, specifications and all related documents forming part of the RFP and Contract and exchanged between DEPARTMENT and the INDUSTRY to each other shall not be used for any other purpose except for execution of the Contract. All rights for materials supplied by the DEPARTMENT including rights in the event of grant of patent and registration of design are reserved by the DEPARTMENT. The technical information, drawings, specifications and any other documents shall not be copied, transcribed, traced or reproduced either in whole or in part and shall not be duplicated, modified divulged and/or disclosed to any third INDUSTRY except with the written consent of the DEPARTMENT. All the drawings, assembly process documents and inspection documents generated for the Contract shall be returned to the DEPARTMENT after completion of work covered by the Contract.

(ii) The drawings and documents sent along with the proposed Contract shall form part of vital documents and same should be kept confidential. Under any circumstances, INDUSTRY shall not part with or transfer the technology / contents of drawings and documents whatsoever to any third INDUSTRY / agency without DEPARTMENT's prior written consent. If at any time, it is brought to the DEPARTMENT's notice that the documents have been transferred by INDUSTRY intentionally or otherwise to any third INDUSTRY / agency, INDUSTRY shall be liable to indemnify the loss / damage incurred by the DEPARTMENT. In addition, DEPARTMENT reserves its rights to resort to legal remedies as per applicable law.

(iii) The INDUSTRY and all his employees shall abide by Indian Official Secrets Act in vogue & shall provide confirmation of awareness of the above, in writing.

(iv) The INDUSTRY shall not take any document / process sheet / data of the results / CD etc. issued to them containing work details to outside the place of working in any form.

(v) The INDUSTRY or his employees shall not divulge any information that is made known to him across to any person not authorized to receive such information.

(vi) Any violation of secrecy, detected at any time of the Contract, by any of the employees of the INDUSTRY may lead to termination of services of such employee /

Contract itself as deemed fit by the DEPARTMENT. Any violation in this regard shall attract serious consequences.

(vii) The plant designs, process of manufacture, etc whether or not protected by patent, are to be strictly treated as secret & the INDUSTRY shall not disclose any details of the above to any unauthorized person or to any other party not directly linked with the DEPARTMENT and shall not use the same for any other purpose.

## 48. INDUSTRY'S DEFAULT LIABILITY

The DEPARTMENT reserves the right to terminate the Contract in whole or in part as per its discretion and also under the circumstances noted below giving sufficient notice to the INDUSTRY:

(i) If the INDUSTRY commits breach of any of the terms of the Contract.

(ii) If the INDUSTRY fails to rectify, reconstruct or replace any defective part/assembly within a reasonable period mutually agreed to after the DEPARTMENT having given a notice to this effect.

All the free-issue-material (Machined parts, standard parts) received by the INDUSTRY shall be returned to the DEPARTMENT whatever be the stage of completion of work. The INDUSTRY shall be paid the cost of assembly & testing carried out as on the date of such termination for which the assessment of the DEPARTMENT shall be final and binding on each INDUSTRY.

## 49. DEVIATION OF ANY PROCESS / INSPECTION PROCEDURES

INDUSTRY shall not deviate from any of the approved process documents or inspection procedures unless DEPARTMENT approves either by waiver or amendment to the concerned process documents or inspection procedures in writing.

## 50. AMENDMENT TO THE CONTRACT

Modifications or amendments to the Contract shall be affected only in writing, after recommendation of CMC signed by the DEPARTMENT and the INDUSTRY authorized representatives exercising their mutual consent to the modifications or amendments involved.

## 51. WARRANTY

(i) All the deliverables shall have warranty period of one year from the date of acceptance by department.

(ii) INDUSTRY shall remedy at their own expenses, the defects solely attributable to faulty workmanship that may appear in envisaged deliverables under this Contract within a period of one year from the date of their acceptance by the DEPARTMENT.

(iii) INDUSTRY shall submit Indemnity bond for 3% cost of the envisaged annual deliverables by CMC every year. Bond shall be submitted within 15 days from the date of commencement of that production year.

## 52. PUBLICITY RELATING TO THE CONTRACT

Advertisements, press releases or other specialized publicity documents which are related to or reveal the existence of the Contract and are intended by the INDUSTRY for a public distribution and / or the press, broadcasting or television shall be notified to the DEPARTMENT. The DEPARTMENT may direct the INDUSTRY to withhold such publicity and / or the required modifications to be made to the publicity material. The INDUSTRY does not receive such direction within thirty (30) days of the receipt by the DEPARTMENT of the notification as the INDUSTRY to engage in such publicity, the DEPARTMENT shall be deemed to have no objection, to such publicity.

## 53. INDEMNITY

The INDUSTRY shall indemnify the DEPARTMENT against any action, claim or proceedings relating to infringement of all or any of the prevailing labour laws like Workman's components Act 1923, Contract Labour (Regulation & Abolition) Act 1938, Industrial Disputes Act 1947, and Employees' State Insurance Act 1952 during the currency of the Contract or any other Act specifically not mentioned.

## 54. OWNERSHIP AND CUSTODY

(i) ITPF facility located near Tumkuru comprising Building, Equipments, Toolings, Fixtures, Utilities, Sewage treatment facility, Sub Stations, AC Units, Labs, Horticulture, Roads, Open space within the compound wall etc. are the exclusive property of the LPSC/ISRO.

(ii) Industry is allowed to utilize above facilities to deliver envisaged deliverables during the currency of this contract.

(iii) INDUSTRY shall be responsible for preservation and up keeping of the facility till the completion of the contract.

(iv) All the tooling's (if any) realized during the currency of this contract shall be the exclusive property of the DEPATTMENT. A consolidated list of such items indicating quantity shall be prepared by the INDUSTRY and certified by contract manager of the department and shall be made available to the DEPARTMENT.

(v) INDUSTRY shall be the custodian of all the drawings, documents and the FIM issued by the DEPARTMENT as well as the documents generated during the currency of work and shall be responsible for their safe custody.

## 55. LEGAL

(i) The CONTRACTOR shall abide by the law of the land including Contract Labour (Regulation & Abolition) Act, and all labour related laws/ Acts or any new

regulations/legislations enacted in this regard and its compliance as applicable during the tenure of the CONTRACT. CONTRACTOR shall ensure minimum wage to their work force as per minimum wage act 1948 as per the orders issued time to time by Chief labour commissioner, Ministry of labour and employment, Government of India applicable to Area B.

DEPARTMENT shall in no way be responsible for any default of the CONTRACTOR regarding statutory obligation.

(ii) The CONTRACTOR shall mandatorily undertake to insure their workforce comprehensively against any risks during the course of work undertaken by them in Department Work Place through a Comprehensive All Risk Insurance (ARI) Policy obtained from any of the Insurance Companies as approved by the Insurance regulatory & Development Authority of India (IRDA). The Contractor shall have to furnish originals of the ARI Policy along with premium receipts and other papers related thereto the Officer concerned of the DEPARTMENT within 15 days from the date of commencement of CONTRACT. Entry Passes will be issued to the workforce of the CONTRACTOR only after receipt of the original policy documents from the CONTRACTOR concerned. Individual policies with a minimum coverage of Rs.10 lakhs per person ( in the name of the CONTRACTOR's Workforce) shall be taken by the CONTRACTOR.

(iii) The CONTRACTOR shall discharge all the legal obligations in respect of the work-force engaged by them for the execution of the work in respect of their remuneration and Service conditions and shall also comply with all the rules and regulations and provisions of the law in force that may be applicable to them from time to time. The CONTRACTOR shall indemnify and keep indemnify the DEPARTMENT from any claim, loss or damages that may be caused to it on account of any failure to comply with the obligations under various laws. In case of any dispute, the decision of the DEPARTMENT shall be final and binding on the CONTRACTOR.

(iv) The timely payment of remuneration to the work-force, remittance of EPF and ESI shall be the sole responsibility of the CONTRACTOR. For any default with regard to statutory obligation, the CONTRACTOR is solely responsible.

(v) The CONTRACTOR shall completely be responsible to maintain the Attendance, acquittance of remuneration paid,EPF, ESI and medical insurance policy as the case may be. Governmental authorities shall have the right to inspect these records at any time and take necessary penal action for non compliance of these provisions, if any.

(vi) The Contract MANAGER is fully responsible for timely claiming and disbursing monthly payment of remuneration to their work-force engaged in the campus of the DEPARTMENT, within the time limit prescribed in the relevant Act/Rules. CONTRACTOR shall keep all these records for verification.

(vii) Issue of Entry Pass :- For arranging Entry Pass to enter the DEPARTMENT premises, the CONTRACTOR should submit the details of their work force to the DEPARTMENT Focal Point and the same shall contain the following documents. The respective Contract Manager shall scrutinize the same and shall forward it to the Senior Administrative Officer, GAD/P&GA duly approved by their General Manager:

(a) Police Clearance Certificate.

(b) ID Card issued by the CONTRACTOR.

(c) Any valid Photo ID card issued by any Government Agency.

(viii) The CONTRACTOR shall be solely responsible for the redressal of grievances/resolution of disputes relating to the work-force engaged by them. DEPARTMENT shall in no way be responsible for the settlement of such disputes. CONTRACTOR should maintain a record of grievances received from their work force and action taken for settlement.

(ix) For all intents and purposes, the CONTRACTOR shall be the "Employer" within the meaning of different Labour Legislations in respect of the work-force engaged for this contract. The work-force engaged by the CONTRACTOR for this contract shall not have any claim whatsoever of "Master and Servant" relationship nor have any "Principal and Agent" relationship with DEPARTEMNT.

(x) The CONTRACTOR shall obtain all necessary Labour license from the Labour Department for deploying their work force inside LPSC.

(xi) Any other terms, conditions or clauses not covered in this document shall be in accordance with other statutory Rules/Acts applicable to DOS/ISRO.

## 56. INTELLECTUAL PROPERTY

The ownership of intellectual property rights whether statutorily protected or not and generated in the course of or resulting from work undertaken for the purpose of this Contract shall vest with the DEPARTMENT.

The INDUSTRY is strictly forbidden to make use of or transfer the technology gained in the course of executing the Contract to manufacture by themselves or transfer the same to the third party.

## 57. VALIDITY OF THE CONTRACT

The Contract shall remain valid for a period of 60 months from the date of commencement of Pre Production Phase-1 training to industry personnel or delivery of all hardware whichever is later.

## 58. SHORT CLOSING / TERMINATION OF CONTRACT

(i) Under normal circumstances short-closing/termination of the Contract is not foreseen. However, in case of continued non-performance of the Contract resulting in inordinate delays in the delivery dates in spite of repeated written requests for meeting the delivery schedule as provided for in the Contract, the DEPARTMENT reserves the right to terminate wholly or partly the Contract by giving a notice of not less than one month.

(ii) In case of major changes in the policies of the Government of India as a result of which the DEPARTMENT may curtail its requirements wholly or partly, the DEPARTMENT and the INDUSTRY shall enter into negotiations to mutually agree to terminate this Contract wholly or partly.

(iii) In the event of short-closing/termination of the Contract, the following procedure shall be followed.

a) The DEPARTMENT shall give a notice of not less than one month.

b) On receipt of the notice the INDUSTRY shall take all necessary steps for winding up of the Contract in line with the notice within a reasonable period, but in any case not exceeding three months from the date of posting the notice.

c) The compensation to be paid to the INDUSTRY shall be agreed to by mutual negotiations. The DEPARTMENT shall in no circumstances be liable to pay any sum which, when added to the other sums paid, due or becoming due to the INDUSTRY under this Contract, exceeds the value of this Contract.

## 59. SAFETY

(i) The safety of all persons engaged by the INDUSTRY shall rest entirely with the INDUSTRY and shall provide proper personal safety equipment's to all employers. General safety precautions as laid down by the DEPARTMENT will be strictly adhered to in all activities.

(ii) The INDUSTRY shall provide uniform, protective clothing and footwear as per Industry standards.

(iii) The INDUSTRY shall ensure strict compliance of the provisions of Factories Act and the Workman's Compensation Act. Any liability for the persons employed shall be responsibility of the Industry.

## 60. INSURANCE

It is Industry responsibility for Insuring ITPF facility along with its equipments/Infrastructure/Utility/Building etc for the contract period.

## 61. SECURITY

(i) The INDUSTRY shall ensure that all the personnel deployed are Indian citizens and their character & antecedents are verified by the Police. The police verification certificate should be submitted to the DEPARTMENT.

(ii) The INDUSTRY shall ensure that no child labour is employed at the facility and the child labour law applicable in the state of Karnataka shall be strictly adhered to. All the relevant labour laws should be strictly adhered to.

(iii) The INDUSTRY shall ensure provisions of social security measures under Employees State Insurance Act and Employees Provident Fund (Misc. Provision) Act to the personnel employed by them.

(iv) The INDUSTRY shall ensure provisions of social security measures under Employees State Insurance Act and Employees Provident Fund (Misc. Provision) Act to the personnel employed by them.

(v) The INDUSTRY shall also verify/certify the conduct of the work force at frequent intervals. If any of the work force misbehaves or commits acts of misconduct, the

DEPARTMENT reserves the right to refuse permission to such persons to enter into the DEPARTMENT premises. Any violation in this regard will result in the termination of the Contract without any notice.

(vi) Entry & Exit access control.

## 62. DISPOSAL OF WASTE

(i) The INDUSTRY shall assist the DEPARTMENT in disposal of waste products / Chemicals/ materials generated during the process by following procedures and safety norms laid down by the DEPARTMENT / Government Statutory authorities.

(ii) All the broken / worn tools, metal chips, empty drums etc. and all accountable items have to be returned to DEPARTMENT's Stores for internal accounting purpose with a list including their quantity and weight.

## 63. INSTRUCTION TO THE INDUSTRY

(i) Over Time: INDUSTRY shall have provision for Overtime (OT) in case of urgent requirement & to meet the schedules of the Department.

(ii) The industry shall ensure all government mandatory benefits to the work force deployed in ITPF Facility.

(iii) Uniform: All the work force shall always be in neat uniform and shall have appropriate safety footwear and all the work force shall compulsorily wear the uniform on all working days.

(iv) ID cards with digital access control shall be issued by the INDUSTRY for all their personnel deployed for ITPF and they shall be displayed in the DEPARTMENT campus.

(v) **Human Resources & HR Policy:**

The Industry/Company shall deploy the necessary workforce to operate & maintain the ITPF facility.

Workforce should be qualified, experienced and possess requisite skill-sets for operation and maintenance of the dedicated facilities in ITPF and perform production work as specified.

The anticipated technical work-force of around 55 personnel (comprising of Graduate Engineers, Diploma Engineers & Technicians) may be required to be deployed for the production task.

In addition to above, adequate manpower to be deployed for the facility maintenance, housekeeping, security etc.

**Training of workforce:**

The Personnel to be deployed shall possess basic skills in the broad areas identified under section 4 above.

LPSC shall impart essential job-specific training to the workforce in relevant critical areas. LPSC will provide training initially for identified personnel from the Industry/Company. Subsequently the trained personnel shall impart the training to other personnel.

**HR Policy of Industry:** INDUSTRY shall have a HR Policy of retaining the personnel trained by the DEPARTMENT in the area of assembly, testing and associated operations. Attrition of DEPARTMENT trained INDUSTRY manpower shall be avoided, since training in the area of assembly & testing of propellant tanks is long-lead activity.

This is very essential since attrition would lead to derailment of production activities, affect quality and delay in delivery schedule and lead to uncertainty in contract execution.

In case, there is an eventual need for replacement for the trained manpower, re-training to the replaced manpower shall be arranged by the INDUSTRY only. Also, such replacements shall be done with prior intimation of the DEPARTMENT in writing and requalification shall be as per department stipulated terms and conditions.

## 64. OTHER POINTS

(i) All equipment and utilities entrusted to the INDUSTRY should be handled with due care and caution and any liability whatsoever in nature due to mishandling or otherwise shall be borne by the INDUSTRY. It is also agreed by and between the parties that in any case, any liability arises, neither the DEPARTMENT /Government nor any person and or agent or representative of the DEPARTMENT/Government will be responsible for the same. In case it is assessed by the Government Committee that the damages have been caused due to mishandling or otherwise by the INDUSTRY, the INDUSTRY will be liable to pay the entire damages to the DEPARTMENT / Government and or to 3rd party.

(ii) All registers & records maintained by the INDUSTRY shall be returned to the DEPARTMENT at the end of the Contract or termination of the Contract, as applicable.

## 65. HAND OVER OF PROJECT ASSETS

All the Project Assets Including ITPF building, Utilities, equipment/facilities for machining, assembly & Testing of envisaged deliverables at the Manufacturing Unit at ITPF shall be handed over to the department upon completion of the contract Period or Termination of this contract whichever is earlier.

Upon handover of the Project Assets hereunder, all equipment, machinery, building, structures, hardware, software and other assets at ITPF facility shall vest in the department without any Encumbrance.

Department reserves the right to review the Infrastructure/equipment health through assessment by OEMs/ Internal Experts. It is industry responsibility to ensure all Infrastructure/equipments are in satisfactory working condition before handing over to the department after completion of contract period.

## 66. DISPUTE SETTLEMENT

(i) It is mutually agreed that all differences and disputes arising out of or in connection with this contract shall be settled by mutual discussions and negotiations.

(ii) In case such disputes and differences cannot be settled and resolved by discussions and negotiations then the same shall be referred to the Sole Arbitrator appointed by the Department whose decision shall be final and binding on both the parties.

(iii) Any legal dispute will be subject to Bangalore, Karnataka only.

## 67. NON DISCLOSURE AGREEMENT

It is mandatory for Industries to sign the Non Disclosure Agreement (NDA) in enclosed format for participating in this RFP. All applicable documents w.r.t RFP will be submitted to participating Industry after undertaking NDA. Unsuccessful bidders should return all the documents/annexures submitted as part of this RFP and no duplication of these documents should be made by the Industry for any reasons.

## 68. DEPARTMENT CO-ORDINATION CELL AT ITPF

Department will identify a Co-Ordination cell and depute based on need basis at ITPF. The scope of work of the Co-Ordination cell is overseeing the following.

I. Production at ITPF.
II. Maintenance at ITPF.
III. Quality Assurance.
IV. Security of the ITPF premises.
V. CCTV surveillance & monitoring.
VI. Access Control System & monitoring.
VII. House Keeping, Laboratory Upkeeping, Garden maintenance etc.

## 69. PARTICIPATION CRITERIA

Aerospace manufacturing Indian Industries, that have experience to the ones described under points in Clause no 3 regarding operation and maintenance of ITPF, who have the skilled human resources for such critical activities, who have the requisite work experience & financial credentials can participate in the RFP. However, all necessary information shall be furnished by the participating Industry to facilitate evaluation of offers by LPSC.

**Other requirements to be met by Indian Industries:**

a. **Security:** The workforce shall comply with necessary security regulations.

b. **Safety:** The Workforce shall follow all safety stipulations.

c. **Secrecy:** The work if entrusted shall be treated as confidential and shall not be divulged to any 3rd party. Industry and their workforce shall abide by instructions of LPSC in vogue and shall provide undertaking to this effect.

## 70. CRITERIA FOR SCRUITINY AND EVALUATION OF BIDS

The bid shall conform to the specifications and terms and conditions given in the RFP. Bids will be rejected in case services offered do not conform to the required parameters stipulated in the technical specifications. Notwithstanding the general conformity of the bid to the stipulated specifications, the following requirements will have to be particularly met by the Bidders without which the same will be considered as non-responsive and will not be considered for evaluation. Bidders are advised not to take any exception/deviations to the bid document.

**ESSENTIAL REJECTION CRITERIA FOR EVALUATION OF BIDS.**

**Bids shall be rejected for further processing in case of non submission of following details.**

1. Prior expertise in Machining of thin walled (thickness <2.0 mm) titanium propellant tank parts (≥ 400 mm) with thickness tolerance in the order of 50 microns, EB welding etc.
2. Industry desirous of submitting RFP proposals shall mandatorily be accredited with valid AS9100 or ISO9100 certification for the last 3 years of existing operation and maintenance.
3. Prior experience of more than 3 years in the last 10 years is essential in work areas such as manufacturing (machining, welding, heat-treatment, inspection) assembly, NDT, testing, evaluation and production of precision / complex / critical aerospace assemblies.
4. Industry shall possess human resource with adequate knowledge, skill and experience in the areas of manufacturing, metrology inspection, assembly, advanced non-destructive inspection, testing, quality control and maintenance of industrial equipment's & other essential requirements listed in section 3.0 .
5. Viable plan for Liquidity and Solvency during the currency of the project to an extent of Rs. 5.0 crores to be outlined.

**MANDATORY GUIDELINES FOR SUBMISSION OF BIDS**

1. Industry should quote the unit rate for the deliverables stipulated in 1$^{st}$ contract year (Pre Production Phase) and 2$^{nd}$ year (Production Phase).
2. Quotation should include individual per unit deliverable cost of envisaged deliverables in clause no. 35 and the overall per year cost for both 1$^{st}$ contract year and 2$^{nd}$ contract year.
3. Department will evaluate the overall contract cost i.e 5 years considering "escalation of 7% (Compound) from 3$^{rd}$ year onwards".
4. Technically suitable & Lowest price bidder for the overall contract period of five years shall be considered for contract placement.

**Note:**

(1) For all sub clauses under Cause. No. 70, information provided by the Industry shall be backed by documentary evidences. Printed brochures to be enclosed.

(2) The final evaluation of the responses will be based on inputs furnished against our criteria, assessment based on facility visit, if necessary, feedback from customers and overall assessment.

(3) LPSC Expert Committee may scrutiny the Expertise/Experience/Heritage of the participating company in all specified fields of this RFP especially Clause no. 3, 63, 69 & 70 (if deemed necessary).

## 71. MODE OF QUOTING

The offers shall be submitted on a two-part bid basis separate in two covers

(i) Technical & commercial (other than prices) bid

(ii) Price bid

### 71.1. The technical & commercial (other than prices) bid(check list)

**(i) The Technical & Commercial (other than prices) bid shall contain the following:**

(i) Conformance on all clauses this RFP by a detailed compliance matrix.

(ii) HR policy of the company

(iii) Copy of pattern of price bid, strictly as per pattern for quote given in clause No. 35 but with the prices masked.

This part shall not contain any prices. The technical & commercial (other than prices) bid shall be kept in a sealed envelope super scribing the following details:

(i) Tender no:

(ii) For :

(iii) Due on :

(iv) Part 1 :

**(ii) The Price bid**

The price bid shall contain the prices, strictly as per pattern for quote given in Clause No.35.

The price bid shall be kept in a sealed envelope super scribing the following details:

(i) Tender no:

(ii) For :

(iii) Due on :

(iv) Part 2 :

**Important Note:**

I. Fax & e-mail offers will not be considered.

II. Bidders who are not agreeing to provide Security Deposit and Liquidated Damages will be summarily rejected.

III. Unsigned quotation will not be considered.

IV. Pre bid meeting shall be arranged for interested parties upon request from the party. All the technical details such as facility details, deliverable drawings, operation scope, criticalities etc shall be shared/briefed during pre bid meeting.

V. Opportunity shall be given to interested parties to visit ITPF facility upon request from the party during pre bid meeting.

## 72. THE PURCHASER

The tenders shall be addressed to:

*Purchase & Stores Officer (Purchase)*
Liquid Propulsion Systems Centre
Govt. of India, Dept. of Space
80 Feet Road, HAL II Stage HPO,
Bangalore 560 008

*For any clarifications the following numbers can be contacted*

*Ph: (080) 25037170 / 140 Fax: (080) 25037139*

## 73. DATE & TIME FOR RECEIPT OF TENDERS: 24.02. 2026 @14:00 Hrs IST.

**ANNEXURE I FOR MAINTENANCE OF ITPF FACILITY**

ITPF houses Building, Open area, Sub Station, Utilities, Sewage treatment Facility, AC Units, Cranes, Equipments, Horticulture, etc. for realization of Titanium propellant tanks and other hardware's. For ensuring smooth functioning of the facility, maintenance plays a pivotal role. Brief description of the role of Industry in maintenance of the ITPF facility is given below. Industry shall ensure that following stipulated terms and conditions are met during the execution of the contract.

**1. ITPF area details**

| # | Main Building | Area in Sqm | Total Area in Sqm |
|---|---|---|---|
| **I** | Building Area | 168 X 57 | 10576 |
| | Toilet Area | 7.5 X 7.5 | 168.75 |
| | **Total Area** | | **10744.75** |
| **II** | Road | 168 X 5.8 | 1948 |
| | | 87 X 5.8 | 1009.2 |
| | **Total Area** | | **2957.2** |
| **III** | a) Open Space | 168 X15 | 5040 |
| | | 58 X 15 | 1740 |
| | b) Open Space | 168 X 17 | 2856 |
| | | 168 X 3 | 504 |
| | c) Open Space | 70 X 3 | 210 |
| | | 70 X 6 | 420 |
| | **Total Area (a+b+c)** | | **10770** |
| **I** | Substation | 500 | 500 |
| **TOTAL** | | | **24971.95** |

**2. Operation & Maintenance of Electrical and AC Installations**

(i) Day to day operational and Maintenance of 11KV/433V HT /LT substation, all the Electrical Installations and Electrical equipment. Including periodical checking and preventive Maintenance works to be carried out as in shifts on all days. All the materials as required for the Maintenance works will be under the scope of the INDUSTRY.

(ii) Supervision of Periodical maintenance of Electrical and AC installation. Include planing day to day activities of maintenance works, deploying men & materials, maintenance of receipt & consumption MAS registers, attendance register, complaint registers, inspection register, progress reports etc.

(iii) Day to day operational and Maintenance of AC installations. Including periodical checking and preventive Maintenance works to be carried out a in shifts on all days including all holidays (except national holidays) etc..., complete as required and as directed by Department focal point. All the materials as required for the Maintenance works will be responsibility of contractor.

(iv) The list of all electrical units at ITPF is given below.

| **MAIN 11KV HT METER PANEL** | | | | |
|---|---|---|---|---|
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | KPTCL LINE | 1R X 3C X 400 sqmm, 11KV | HT PANEL | 2 |

| | | | | |
|---|---|---|---|---|
| 2 | VCB (MAIN INCOMING) | 11KV, 500MVA,800A | HT PANEL | 2 |
| 3 | VCB | 11KV, 500MVA,800A | HT PANEL | 1 |
| 4 | VCB (MAIN OUTGOING) | 11KV, 500MVA,800A | HT PANEL | 5 |
| 5 | TRANSFORMER | 3000KVA | HT PANEL | 3 |
| **SUBSTATION LT PANEL-1** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | FEEDER-1F1 | 400A, MCCB | OUTGOING | 1 |
| 2 | FEEDER-1F2 | 400A, MCCB | - | 1 |
| 3 | FEEDER-1F3 | 400A, MCCB | SUBSTATION DB | 1 |
| 4 | FEEDER-2F1 | 1000A, ACB | VIBRATION FACILITY | 1 |
| 5 | FEEDER-2F2 | 1000A, ACB | OLR TO 300KVAR APFC PANEL | 1 |
| 6 | FEEDER-3F1 | - | METER PROTECTION | 1 |
| 7 | FEEDER-3F2 | 1600A,ACB | EBW FACILITY | 1 |
| 8 | FEEDER-4F1 | - | METER PROTECTION | 1 |
| 9 | FEEDER-4F2 | 3200A, ACB | - | 1 |
| 10 | FEEDER-5F1 | - | METER PROTECTION | 1 |
| 11 | FEEDER-5F2 | 2500A, ACB | DG INCOMMER -1 | 1 |
| 12 | FEEDER-6F1 | - | METER PROTECTION | 1 |
| 13 | FEEDER-6F2 | 5000A, ACB | TRANSFOMER-1 | 1 |
| **SUBSTATION LT PANEL-2** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | FEEDER-7F1 | - | METER PROTECTION | 1 |
| 2 | FEEDER-7F2 | 5000A, ACB | BUS COUPLER | 1 |
| 3 | FEEDER-8F1 | - | METER PROTECTION | 1 |
| 4 | FEEDER-8F2 | 5000A, ACB | TRANSFOMER-2 | 1 |
| 5 | FEEDER-9F1 | - | METER PROTECTION | 1 |
| 6 | FEEDER-9F2 | 2500A, ACB | DG INCOMMER -2 | 1 |
| 7 | FEEDER-10F1 | - | METER PROTECTION | 1 |
| 8 | FEEDER-10F2 | 3200A,ACB | - | 1 |
| 9 | FEEDER-11F1 | - | METER PROTECTION | 1 |
| 10 | FEEDER-11F2 | 1600A,ACB | ALL A/C MAIN PANEL | 1 |
| 11 | FEEDER-12F1 | 1000A, ACB | - | 1 |
| 12 | FEEDER-12F2 | 1000A, ACB | APFC-2 TO CAPACITOR BANK | 1 |
| 13 | FEEDER-13F1 | 400A, MCCB | ASSEMBLY FACILITY | 1 |
| 14 | FEEDER-13F2 | 400A, MCCB | - | 1 |
| 15 | FEEDER-13F3 | 400A, MCCB | - | 1 |
| **SUBSTATION LT PANEL-3** | | | | |

| Sl.No. | Equipment | Capacity | Location | Quantity |
|---|---|---|---|---|
| 1 | FEEDER-14F1 | - | METER PROTECTION | 1 |
| 2 | FEEDER-14F2 | 5000A, ACB | BUS COUPLER | 1 |
| 3 | FEEDER-15F1 | - | METER PROTECTION | 1 |
| 4 | FEEDER-15F2 | 5000A, ACB | TRANSFOMER-3 | 1 |
| 5 | FEEDER-16F1 | - | METER PROTECTION | 1 |
| 6 | FEEDER-16F2 | 1000A, ACB | DG INCOMMER -3 | 1 |
| 7 | FEEDER-17F1 | - | METER PROTECTION | 1 |
| 8 | FEEDER-17F2 | 3200A, ACB | - | 1 |
| 9 | FEEDER-18F1 | - | METER PROTECTION | 1 |
| 10 | FEEDER-18F2 | 1600A, ACB | CNC MACHINE SHOP | 1 |
| 11 | FEEDER-19F1 | 1000A, ACB | - | 1 |
| 12 | FEEDER-19F2 | 1000A, ACB | APFC-3 TO CAPACITOR BANK | 1 |
| 13 | FEEDER-20F1 | 400A, MCCB | OHT WATER TANK | 1 |
| 14 | FEEDER-20F2 | 400A, MCCB | - | 1 |
| 15 | FEEDER-20F3 | 400A, MCCB | - | 1 |
| **CAPACITOR BANK** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | APFC PANEL-1 | 300KAVR, 800A, ACB | CAPACITOR BANK | 1 |
| 1.1 | 2F1A/3F2B | Each 5KVAR | | 1 |
| 1.2 | 2F1B/3F1A/3F2A | Each 10KVAR | | 1 |
| 1.3 | 2F3/3F3 | Each 25KVAR | | 1 |
| 1.4 | 2F4/3F4 | Each 50KVAR | | 1 |
| 1.5 | 2F5/3F5 | Each 50KVAR | | 1 |
| 2 | APFC PANEL-2 | 300KAVR, 800A, ACB | CAPACITOR BANK | 1 |
| 2.1 | 2F1A/3F2B | Each 5KVAR | | 1 |
| 2.2 | 2F2A/2F2B/3F1A/ 3F2A | Each 10KVAR | | 1 |
| 2.3 | 2F3/3F3 | Each 25KVAR | | 1 |
| 2.4 | 2F4/3F4 | Each 50KVAR | | 1 |
| 2.5 | 2F5/3F5 | Each 50KVAR | | 1 |
| 3 | APFC PANEL-3 | 300KAVR, 800A, ACB | CAPACITOR BANK | 1 |
| 3.1 | 2F1A/3F2B | Each 5KVAR | | 1 |
| 3.2 | 2F2A/2F2B/3F1A/ 3F2A | Each 10KVAR | | 1 |
| 3.3 | 2F3/3F3 | Each 25KVAR | | 1 |
| 3.4 | 2F4/3F4 | Each 50KVAR | | 1 |
| 3.5 | 2F5/3F5 | Each 50KVAR | | 1 |
| **VIBRATION PANEL** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | FEEDER NO:2F1 | 1000A,4P,EDO,ACB, MICROPROCESSOR | VIBRATION PANEL | 1 |
| 2 | ACB | 300A,3P,EDO | 29T SHACKER | 1 |
| 3 | MCCB | 100A | CRANE | 1 |

| | | | | |
|---|---|---|---|---|
| 4 | MCCB | 400A | SPARE | 1 |
| 5 | MCCB | 100A | OUTDOOR UNIT A/C | 1 |
| 6 | MCCB | 800A,3P,EDO ,ACB,MICROPROCESSOR | SPARE | 1 |
| 7 | MCCB | 400A, TP | - | 1 |
| 7.1 | MCCB | 200A | 4T SHACKER | 1 |
| 7.2 | MCCB | 100A | SPARE | 1 |
| 7.3 | MCCB | 100A | SPARE | 1 |
| 7.4 | MCCB | 100A | UPS PDB-6 | 1 |
| 7.5 | MCCB | 125A | UPS PDB-7 | 1 |
| 7.6 | MCCB | 100A | UPS PDB-8 | 1 |
| 7.7 | MCCB | 125A | UPS PDB-9 | 1 |
| 7.8 | MCCB | 100A | SPARE | 1 |
| 7.9 | MCCB | 200A | SPARE | 1 |
| 8 | MCCB | 125A | SPARE | 1 |
| **EBW FACILITY** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | FEEDER NO:3F | 1250A, EDO ACB(50KA) | EBW FACILITY PANEL | 1 |
| 2 | MCCB | 630A, 3P | | 1 |
| 3 | MCCB | 400A | UPS (200KVA) | 1 |
| 3.1 | MCCB | 200A | 120KVA ,FF, EBW | 1 |
| 3.2 | MCCB | 100A | 40KVA SCREW COMPRESSOR | 1 |
| 3.3 | MCCB | 100A | | 1 |
| 3.4 | MCCB | 125A | UPS PDB-11 | 1 |
| 3.5 | MCCB | 200A | SPARE | 1 |
| 3.6 | MCCB | 125A | SPARE | 1 |
| 4 | MCCB | 400A | 200KVA UPS | 1 |
| 4.1 | MCCB | 200A | 120KVA ,FF, EBW | 1 |
| 4.2 | MCCB | 100A | 40KVA COOLER TOWER | 1 |
| 4.3 | MCCB | 100A | | 1 |
| 4.4 | MCCB | 200A | SPARE | 1 |
| 5 | MCCB | 400A | 200KVA UPS | 1 |
| 5.1 | MCCB | 160A | 80KVA F1 EBW | 1 |
| 5.2 | MCCB | 100A | 40KVA LEAKAGE TESTING | 1 |
| 5.3 | MCCB | 100A | | 1 |
| 5.4 | MCCB | 100A | 30KVA FB EBW | 1 |
| 5.5 | MCCB | 100A | SPARE | 1 |
| 5.6 | MCCB | 100A | SPARE | 1 |
| 5.7 | MCCB | 160A | SPARE | 1 |
| 6 | MCCB | 400A | 50KVA GENERAL PURPOSE | 1 |
| 7 | MCCB | 160A | - | 1 |
| 8 | MCCB | 160A | SUB-INPUT PANEL | 1 |
| 9 | MCCB | 400A | SPARE | 1 |
| 10 | MCCB | 630A | SPARE | 1 |
| **CNC MACHINE SHOP** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | PDB No:3F1 | 1250A, 4P,ACB, MICROPROCESSOR | CNC MACHINE SHOP | 1 |
| 2 | MCCB | 400A | 160KVA UPS | 1 |
| 3 | MCCB | 400A | 160KVA UPS | 1 |
| 3.1 | MCCB | 200A | CNC MACHINE | 1 |

| | | | | |
|---|---|---|---|---|
| 3.2 | MCCB | 200A | SHOP | 1 |
| 3.3 | MCCB | 200A | | 1 |
| 3.4 | MCCB | 200A | | 1 |
| 3.5 | MCCB | 100A | CNC LATHE M/C | 1 |
| 3.6 | MCCB | 400A | PDB-1 | 1 |
| 3.7 | MCCB | 200A | SPARE | 1 |
| 3.8 | MCCB | 100A | SPARE | 1 |
| 4 | MCCB | 630A | 300KVA UPS | 1 |
| 4.1 | MCCB | 630A | CNC LATHE M/C | 1 |
| 4.2 | MCCB | 630A | | 1 |
| 4.3 | MCCB | 630A | SPARE | 1 |
| 5 | MCCB | 630A | 4AXIS MACHINE | 1 |
| 6 | MCCB | 250A | SUB PANEL | 1 |
| 6.1 | MCCB | - | PDB-1 | 1 |
| 6.2 | MCCB | - | PDB-2 | 1 |
| 6.3 | MCCB | - | PDB-3 | 1 |
| 6.4 | MCCB | - | 20KVA UPS | 1 |
| 6.5 | MCCB | - | SPARE | 1 |
| 6.6 | MCCB | - | UPS DB-2 | 1 |
| 6.7 | MCCB | - | SPARE | 1 |
| 7 | MCCB | 400A | SPARE | 1 |
| 8 | MCCB | 250A | 4AXIS A/C | 1 |
| **CHEMICAL CLEANING FACILITY** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | MCCB | 250A,TP | 36No'S HEARS | 1 |
| 2 | MCCB | 160A | 24No'S HEARS | 1 |
| 3 | MCCB | 100A | RAW PDB-8 | 1 |
| 4 | MCCB | 100A | RAW PDB-9 | 1 |
| 5 | MCCB | 100A | RAW PDB-10 | 1 |
| 6 | MCCB | 100A | 10T CRANE | 1 |
| 6.1 | MCB | 32A,3P | LDB-1 | 1 |
| 6.2 | MCB | 32A,3P | LDB-2 | 1 |
| 6.3 | MCB | 32A,3P | LDB-3 | 1 |
| 6.4 | MCB | 32A,3P | LDB-4 | 1 |
| 6.5 | MCB | 32A,3P | LDB-11 | 1 |
| 6.6 | MCB | 32A,3P | SPARE | 1 |
| 6.7 | MCB | 32A,3P | SPARE | 1 |
| 7 | MCCB | 160A | MLDB-1 | 1 |
| 8 | MCCB | 250A | 120KVA UPS,SPM | 1 |
| 9 | MCCB | 160A | 80KVA UPS, UT-LAB | 1 |
| 10 | MCCB | 100A | UT UPS | 1 |
| 11 | MCCB | 100A | 30KW, LAUNCH VECHILE | 1 |
| 12 | MCCB | 100A | 20KW, SATELITE | 1 |
| 13 | MCCB | 100A | 20KW PMD LINE | 1 |
| 14 | MCCB | 100A | 20KW PAS LINE | 1 |
| 15 | MCCB | 250A | 30KVA OVEN | 1 |
| 16 | MCCB | 100A | SPARE | 1 |
| 17 | MCCB | 160A | SPARE | 1 |
| 18 | MCCB | 100A | SPARE | 1 |
| 19 | MCCB | 100A | SPARE | 1 |
| **ASSEMBLY PANEL** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |

| | | | | |
|---|---|---|---|---|
| 1 | FEEDER NO:13F1 | 400A,TPN,MCCB MICROPROCESSOR BASED | ASSEMBLY FACILITY | 1 |
| 2 | MCCB | 125A,TP,25KA | RAW PDB-4 | 1 |
| 3 | MCCB | 100A | RAW PDB-5 | 1 |
| 4 | MCCB | 100A | RAW PDB-6 | 1 |
| 5 | MCCB | 100A | RAW PDB-7 , PRES TEST FACILITY | 1 |
| 6 | MCCB | 100A | 40KVA UPS FUNCTIONAL TEST FACILITY | 1 |
| 7 | MCCB | 100A | MLDB | 1 |
| 8 | MCCB | 160A | FIRE FIGHTING PANEL FUN. TEST FACILITY | 1 |
| 9 | MCCB | 160A | SPARE | 1 |
| 10 | MCCB | 100A,25KA MICROPROCESSOR BASE | FF LDB& PDB | 1 |
| **A/C PANEL** | | | | |
| **Sl.No.** | **Equipment** | **Capacity** | **Location** | **Quantity** |
| 1 | FEEDER No:13F | 1600A, 4P, EDO ACB | A/C PANEL | 1 |
| 2 | MCCB | 630A | AIR COOLED CHILLER | 1 |
| 3 | MCCB | 630A | AIR COOLED CHILLER | 1 |
| 4 | MCCB | 630A | A/C SUB DB | 1 |
| 5 | MCCB | 250A | A/C SUB DB | 1 |
| 6 | MCCB | 630A | AIR COMPRESSOR | 1 |
| 7 | MCCB | 250A | | 1 |

(v) The list of all AC units at ITPF is given below.

| # | Location | As Built | |
|---|---|---|---|
| | | **Indoor unit** | **Outdoor unit** |
| **VRF SYSTEM** | | | |
| 1 | Reception area | 4 Nos. of VRF High-wall unit of capacity 2TR | (12+14+14) 40HP VRF outdoor unit |
| 2 | General purpose shop | VRF AHU of air quantity 4800 cfm of capacity 12TR | |
| 3 | First aid and change room | 2 Nos. of VRF High-wall unit of capacity 2TR | |
| 4 | Room 2 | 2 Nos. of VRF High-wall unit of capacity 2TR | |
| 5 | Room 3 | 2 Nos. of VRF High-wall unit of capacity 2TR | |
| 6 | Video conference room | 2 Nos. of VRF Cassette unit of capacity 4TR | (20+14+14) 48HP VRF outdoor unit |
| 7 | Conference hall | 2 Nos. of VRF Cassette unit of capacity 3TR | |
| 8 | Documentation and design room | 2 Nos. of VRF Cassette unit of capacity 3TR | |

| | | | |
|---|---|---|---|
| 9 | Engineer office area | 2 Nos. of VRF Cassette unit of capacity 4TR | |
| 10 | Telephone exchange Room | 1 No. of VRF Cassette unit of capacity 3.5TR | |
| 11 | Room 2 (mezzanine) | 1 No. of VRF Cassette unit of capacity 3.5TR | |
| 12 | Documentation room | 1 No. of VRF High-wall unit of capacity 2TR | |
| 13 | Visual inspection room | 1 No. of VRF High-wall unit of capacity 2TR | |
| 14 | Server Room | 2 Nos. (1W+1S)VRF AHU of air quantity 2400 of capacity 6TR | (12+12) 24HP VRF outdoor unit |
| 15 | SPM | VRF AHU of air quantity 4800 of capacity 12TR | |
| 16 | Ultrasonic & Eddy current lab | VRF AHU of air quantity 8000 of capacity 21.5TR | (12+14) 26HP VRF outdoor unit |
| 17 | Eng. room (M/C shop mezzanine) | 1 No. of VRF High-wall unit of capacity 1.5 TR | (12+12) 24HP VRF outdoor unit |
| 18 | CAD/CAM room (M/C shop mezzanine) | 1 No. of VRF High-wall unit of capacity 1.5 TR | |
| 19 | Tool crib room (M/C shop mezzanine) | 1 No. of VRF High-wall unit of capacity 1.5 TR | |
| 20 | Exposer room-1 | 2 Nos. of VRF High-wall unit of capacity 2TR | |
| 21 | Control room | 5 Nos. of VRF High-wall unit out of those 3 Nos. capacity 1TR and 2 Nos. Capacity 1.5TR | |
| 22 | Exposer room-2 | 2 Nos. of VRF High-wall unit of capacity 2TR | |
| 23 | Conventional Metrology lab | 2 Nos. VRF AHU of air quantity 4400 of capacity 11TR | (14+12) 26HP VRF outdoor unit |
| 24 | UPS room | 2 Nos. Inverter High-wall unit of capacity 2TR | 2 x 2.6HP outdoor unit |
| 25 | Water treatment plant room 11 | 2 Nos. VRF AHU of air quantity 8000 of capacity 20TR | (14+12) 26HP VRF outdoor unit x 2nos. |
| 26 | Room-3,4,5, 6 & 7 | | |
| 27 | Pneumatic test Lab | | |
| 28 | Hydraulic test lab | | |
| 29 | PAS flow test lab | 2 Nos. High-wall unit of capacity 2TR | 2 x 2.6 HP outdoor unit |

**WALL MOUNTED SPLIT AC UNITS**

| S.No | Rooms | AS BUILT | |
|---|---|---|---|
| | | Ground Floor | First Floor |

| | | | |
|---|---|---|---|
| 1 | Finished parts storage | Normal AC area with total air quantity of 3400 cfm and capacity of 11TR | 2 x 165 TR Air cooled screw chiller packages |
| 2 | Finished tank storage | Normal AC area with total air quantity of 4100 cfm and capacity of 14TR | |
| 3 | CNC Machine Shop | Normal AC area with total air quantity of 17550 cfm and capacity of 46.4TR | |
| 4 | EBW | Normal AC area with total air quantity of 10300 cfm and capacity of 50TR | |
| 5 | Assembly facility with 100000 class clean rooms | Room class 100,000 clean area with 32600 cfm Recirculation AHUs of capacity 43TR TFA AHU of air quantity 5600 and capacity of 22 TR common for both clean room AHUs | |
| 6 | Clean room- Class 10000 | Class 100,00 Clean Room area with 23000 cfm Recirculation AHUs of capacity 25TR | |
| 7 | Pre assembly and Bubble point facility | Normal AC area with tota air quantity of 4750 cfm and capacity of 14TR | |
| 8 | Vibration test facility | Normal AC area with total air quantity of 7400 cfm and capacity of 30TR | |
| 9 | Function test facility R9 | Normal AC area with tota air quantity of 6100 cfm and capacity of 38TR | |
| 10 | Fixture and tool storage area | Normal AC area with total air quantity of 2700 cfm and capacity of 7.5TR | |

## 3. Maintenance of Cranes & other mechanical systems

### 3.1. Scope of work:

The scope of work includes periodic inspection, maintenance (both Mechanical & Electrical/Electronic in nature) servicing and testing of cranes and handling equipments as mentioned in clause 4.2. In addition to periodic maintenance, breakdown maintenance shall also to be carried out.

### 3.2. List of Cranes & other mechanical systems

| # | Facility / Location | Capacity | Final Span (Mtrs) | Hook height (Mtrs) | Bay length (Mtrs) | Quantity |
|---|---|---|---|---|---|---|
| **CRANES** | | | | | | |
| 1 | Loading bay | 3T SG | 6.6 | 8.00 | 15.3 | 1 Nos |
| 2 | CNC Machine Shop | 5T DG | 23.2 | 8.00 | 45.3 | 1 Nos |
| 3 | SPM | 2T SG | 8.51 | 8.00 | 12.45 | 1 Nos |
| 4 | EBW | 3T DG | 23.2 | 7.00 | 37.8 | 2 Nos |
| 5 | X-ray | 2T SG | 5.35 | 5.00 | 8.00 | 2 Nos |
| 6 | Metrology | 2T SG | 8.60 | 7.00 | 24.12 | 1 Nos |
| 7 | 100000 Class Clean Room | 3T SG | 13.205 | 6.00 | 24.12 | 1 Nos |
| 8 | Fixtures Area | I T SG | 9.5 | 6.00 | 8.20 | 1 Nos |
| 9 | Chemical | I T SG | 10.00 | 5.00 | 24.12 | 2 Nos |

| | | | | | | |
|---|---|---|---|---|---|---|
| | cleaning | | | | | |
| 10 | Pressure Test Facility R 10 | 3T SG FLP | 6.25 | 8.00 | 12.45 | 1 Nos |
| 11 | Pressure Test Facility R 11. | 1 T SG | 6.25 | 8.00 | 12.45 | 1 Nos |
| 12 | Function Test Facility. R3, R4,KS, R6, R7 | 1 T SG | 13.423 | 8.00 | 14.85 | 1 Nos |
| 13 | Function Test Facility. K1 | 1 T SG | 5.3 | 8.00 | 6.20 | 1 Nos |
| 14 | Function Test Fact I Qty. R9 | 1 T SG FLP | 10.52 | 8.00 | 24.12 | 1 Nos |
| 15 | Vibration Test Facility. | 10T DG FLP | 23.20 | 8.00 | 16.3 | 1 Nos |
| 16 | Function Test Facility. Px2 | 1 T SG | 6.40 | 8.00 | 6.20 | 1 Nos |
| | **TOTAL** | | | | | **19 Nos.** |

| **Rolling shutter** | | | |
|---|---|---|---|
| **#** | **Location** | **Door Size, Mtr** | **Nos** |
| 1 | Main Corridor | 7.00 x 6.00 | 2 |
| 2 | Vibration | 6.00 x 9.00 | 1 |
| 3 | Parking area | 3.50 x 3.00 | 1 |
| **Lead lined door** | | | |
| **#** | **Location** | **Door Size, Mtr** | **Nos** |
| 1 | Exposer room-1 & 2 | 4.50 x 4.00 | 2 |
| 2 | Exposer room-1 & 2 | 1.30 x 2.40 | 2 |

### 3.3. PERIODICITY OF MAINTENANCE:

The periodicity of Inspection shall be as follows:

| | | |
|---|---|---|
| Periodical preventive maintenance | - | Once in three months |
| Annual maintenance and load testing | - | Once in Year |
| Breakdown maintenance | - | As and when required |

Periodical preventive maintenance, Annual maintenance and load testing shall be carried out as per the checklist given in clause 4.6. The party shall ensure that these are done in time.

### 3.4. LOAD TESTING:

1. Every crane shall be tested once in a year with a dummy load equal to the cranes rated capacity (SWL) at the time of annual maintenance.
2. Proof load test with dummy load equal to 1.25 times the rated capacity of cranes shall be done on cranes prior to initial use or extensively repaired/extensively modified cranes or cranes involved in accidents.
3. The deflection measurements shall also be carried out and recorded. The necessary items for deflection measurement shall be brought by the contractor.
4. Necessary dead weight blocks (only steel blocks with anti-rust painting) should be provided by the contractor. Forklift support will be provided by the Department for carrying out the load test.

5. Only tested slings, D shackle and rings with certificate shall be used for load testing and the same shall be brought by the Contractor.
6. Performance testing with SWL shall be done for each crane after each brake adjustment.

**3.5. MINOR/MAJOR BREAKDOWN:**

1. Failures involving brake adjustments, electrical failures such as connectors, contact failures, fused wire, slip ring/ brush contact failures, electrical component failure and such other failures which involve up to 5 working man days to set right are considered to be Minor Breakdown. Any number of Minor Breakdown is to be attended by the Contractor and no extra payments will be made.

2. Major Breakdown involves activities such as gear box opening and rectification/replacement of gears. Motor rewinding/replacement and alignment, major changes and such major failures involving more than 5 working man days for rectifying. Breakdown calls shall be attended as early as possible(not more than 24 hours)

3. Removing and brining down any defective equipment/components such as motors, gear box, shafts etc., from the crane for further repair is the responsibility of the Contractor. The Contractor shall refit the parts immediately after repair. The necessary spares will be supplied by LPSC. Breakdown calls shall be attended by the teams in their respective areas (as mentioned in annexure-II) as and when required. In case of emergency the breakdown complaint shall be attended even on holidays and after office hours with prior permission of the Competent Authority of the Department.

**3.6. Checklist for periodic preventive maintenance of Crane**

The inspection of crane shall be carried out as per below checklist for periodical preventive maintenance/annual preventive maintenance with following observations:

| Sl.No. | Parts of the crane | Condition (Good/needs replacement/Bar) |
|---|---|---|
| 1 | Bridge rails(LT/CT) | |
| 2 | End Carriage (End Trucks) | |
| 3 | Wheels(LT) | |
| 4 | Drive System (LT main /LT macro) | |
| 5 | Brake units(LT main/LT macro) | |
| 6 | Brake units[ CT main / CT macro) | |
| 7 | Brake units ( CT main/ CT macro) | |
| 8 | Drive System (Hoist main / Hoist micro) | |
| 9 | Brake units (Hoist main / Hoist micro) | |
| 10 | Drive System (Aux. Hoist main/ Aux. Hoist micro) | |
| 11 | Brake units(Aux. Hoist main/ Aux. Hoist micro) | |
| 12 | Hook | |
| 13 | Rope Drum | |
| 14 | Rope/Chains | |
| 15 | Pulley/ Sheaves | |
| 16 | Electrical | |
| 16.1 | Main panel | |
| 16.2 | Main hoist panel (Main/Micro) | |
| 16.3 | Aux hoist panel (Main/ Macro) | |
| 16.4 | Long Travel panel (Main/Micro) | |
| 16.5 | Cross Travel panel (Main/Macro) | |
| 17 | Limit Switches: | |
| 18 | Insulation resistance of Brake units | |
| 19 | Insulation resistance of Main hoist motor | |
| 20 | Insulation resistance of Auxillary Hoists motor | |
| 21 | Insulation resistance of LT motor /Ct motor | |
| 22 | Earthing | |
| 23 | Pendant | |
| 24 | Junction Boxes | |

1. It is certified that the crane LPSC-CR- is in good condition and is safe for further use at the specified rated load of SWL for the intended purpose.
2. It is certified that the crane LPSC-CR- will be fit for further use subject to the following condition
3. It is certified that the crane LPSC-CR- is not in good condition and is not fit for further use due to the following conditions. Hence recommended for condemnation.

**4. Maintenance of Sewage Treatment Facility**

(i) Operation and Maintenance of Sewage treatment plant of capacity 10 KLD including collection well operation and maintenance of pumps and related equipments, in shifts

on round the clock basis pertaining to Sewage treatment plant, collection well., complete all as directed by the Engineer-In-charge and as detailed below:

**Note:**

a) Operation of pumps, pressure filters, air-blowers, rotors etc., pertaining to SEWAGE TREATMENT PLANT and collection well throughout the day i.e 24 hrs /day.
b) Working Mechanism for regular maintenance of pumps located in STP
c) Working Mechanism for daily testing of water and waste water / effluents in PH lab for monitoring the performance of Centralized Sewage treatment Plant. The physio-chemical testing to be conducted are Turbidity, Colour, PH Total dissolved solids, hardness, DO,COD, Suspended solids, MLSS, Phosphate, Nitrogen Nitrate, Sulphate, Iron etc., and other tests as directed by our resident team. The samples of chemicals used at STP have to be checked for its qualification whenever required.
d) Periodical cleaning of Over Head Water Tanks of various capacities from (500L to 5000L) at all heights, to be cleaned once in 3 months.

**5. Maintenance of Internal & External Environment of ITPF**

(i) Removal of dirt, dust and other waste elements clinged to the corridors and workshop premises (measuring an area upto 30,000 Sq.m) with suitable working mechanism using perfumed soap solution or other dirt cleaning agents, so as to bring the floor to the original condition.

(ii) Periodical upkeep of all Toilet (Both Gents & Ladies), Bath rooms and various other common utility areas comprising of wash basins, mirrors, glazed tiles etc; and operation), cloak rooms With various modes of scrubbing, rubbing and removal of dirts, dabs and other stains to bring it to the original condition as required by the department and as per the directions of Engineer- in - charge at all floors.

(iii) Periodical up keeping of laboratories & sitting places measuring about 12,000 Sq.m With various modes of scrubbing, rubbing and removal of dirts, dabs and other stains to bring it to the reasonably good condition.

(iv) Also removal of cobwebs and cleaning of glass panes periodically or with a sequence to repeat the performance once in 15 days carefully to bring the surface to original condition. Filling of water cans and sanitizers

**Note:**

a) The work is required to be carried out on periodical basis.
b) The work includes mopping the floors with liquid soap solution using best quality soap solution as per the need of the Lab, which is of periodical in nature and will be intimated well in advance.
c) The work includes dry sweeping also using brooms or by mechanical means or electrically operated dust collectors / dust absorbers, etc;
d) The laboratory tables and Lab sinks shall also be cleaned periodically using suitable detergents / non corrosive chemical cleaning agents to remove stains, dirts and spot discolouring of sinks and tables to bring it to reasonably good conditions.
e) The tables and sinks are not separately measured for and the floor area where the items are kept only shall be measured for payment and the rates are inclusive of these elements.
f) Materials such as chemicals Glass cleaning liquids, liquid soap, urinal cakes etc; shall be procured by the INDUSTRY.

g) The work relating at cleaning cobwebs and glass area are related to the carpet area of locations where the cobwebs are formed in roof or side walls and surface area of glass windows fixed which may be noted.
h) The frequency of remedial measures depends upon the speed at which cobwebs are formed and dirts collected in glass panes.

**6. Maintenance of Horticulture**

(i) Periodical upkeep of roadways, and other miscellaneous areas. Clearing the roadways/ pathway & side beams, storm water drains measuring appx.15,000.00 Sq.m**.** of the areas surrounding around the ITPF and Substation Buildings, periodically as and when called for.

**Note:**

a) The work includes Periodical removal of waste papers of the entire area before commencement of office hours and to keep the road in clean condition free from paper wastes, debris, stones, etc;
b) The work calls for keeping the road free from dry leaves also by employing suitable methods as deemed required for the occasion
c) All necessary materials such as brooms, cleaning essentials etc; shall be procured by the INDUSTRY.

(ii) Providing suitable working mechanism for carrying out the following works at ITPF. All as directed by Engineer in Charge or his authorized departmental personnel.

a) Periodical upkeep of all areas of grass, tuff / flower beds / lawn measuring about 1500 sqm by removing fallen leaves and all kind of waste materials, lying in and around nursery yard, all around trees and disposal of dry leaves to a place 200m to 300m away to a location as per the directions.
b) Providing periodical arrangements for watering the area as mentioned under para (a) in places and pots and located in various places of Campus by means of rubber hose and running water which will be supplied by department free of cost.
c) Periodical arrangement for application of natural / biologically converted nutrients in the greenery, turf area once in 15 days / 30 days as the case may be for the soil in the Campus.
d) Flower beds are to be applied with natural and chemically growth oriented products once / twice in a month for nurturing the plants / shrubs harvest.
e) Periodical mowing operation on lawn, turf artifcial mounds, once /twice in a month as suitable to the soil condition in URSC and disposing of all unwanted materials within a distance of 300 M
f) Replacement of damaged flower beds and turf and greenways by clipping, cutting and trimming the over growth once / twice in a month
g) Periodical assistance for rendering insecticide and chemical spray supplied by department free of cost to regenerate the dead / partially withered plant.

**Note:**

a) The work requires operation on more than one occasion in a week during autumn and summer and may not need frequent operation during winter/ spring.
b) The work may require proper coordination of time and type and mode of operation which need to be properly logged as the frequency of operation which need to be properly logged as the frequency of operation is not predetermined.

(iii) Charges for maintaining upto 500 flower pots all sizes including periodical watering, removing weeds, spraying pesticides / insecticides and includes keeping inside the building at all heights and changing them with other flower pots once in a week at periodical intervals without damaging the pots, etc;. (The pesticides, buckets, tools etc shall be procured by the INDUSTRY)

**Note:**

a) The contractor shall finalize his mode of carrying out the work in writing initially and the same shall be followed till the currency of the contract.

b) The lead may vary upto 500 metres and includes all heights upto 25M from GROUND LEVEL

c) The work may require proper coordination of time and type and mode of operation which need to be properly logged as the frequency of operation is not predetermined.

**7. Maintenance of Air Conditioning Units& VRF Units at ITPF**

**7.1. Comprehensive AMC Scope Of Work for A/C Units And VRF Units**

A. Monthly preventive maintenance

1. Check of all relay setting, loose contacts, switches, isolators etc., of the electrical panel of the plant.
2. Checking and setting of humidifiers.
3. Checking and setting of heaters.
4. Checking of electrical panels.
5. Checking of voltage and currents.
6. Checking of HP/LP cutouts.
7. Checking of gas leakage if any. If necessary topping up of refrigerant.
8. Testing HP/LP pressures.
9. General cleaning and servicing like belt tension checks, adjustment etc.,
10. Checking of Micro Processor Units/VFDs and its Functions.
11. Checking of V Belts and Pulley Alignment
12. Checking and Cleaning of Drain Line
13. Checking of Oil Heaters and Oil Level
14. Check for Vibrations.
15. Check Oil Seal for leakages
16. Check Motor Terminal for Proper tightness
17. Checking of Chiller Pumps for Leakage

B. Quarterly preventive maintenance

1. Cleaning of air filters.
2. Greasing of motors.
3. Electrical panel board maintenance.
4. Cleaning of AHU coils/ Condenser Coils

C. The maintenance/repair/servicing of Air conditioning plant/units include inspection, repair, servicing, and over hauling, labour, cleaning, corrective and remedial measures, setting right the malfunctions of the system etc., so as to keep the system in good working condition.

D. The maintenance contract includes replacement of necessary spare parts, both mechanical and electrical and includes consumable like refrigerant, oil, greases, V belts etc., In addition, the contractor has to provide proper refrigerant Gas for charging/top up and Cylinders required for carrying the Gas shall be arranged from the contractor end.

E. Repair of air ducting louvers, air handling units, thermocouple insulation of all piping system of the plant, touching and painting of repaired portions, replacement of compressor , replacement of heaters, replacement of Microprocessor Units /VFDs ,replacement of Bearings, servicing of pan humidifiers etc., are includes in the scope of maintenance.

F. Only genuine & original parts of the existing parts shall be replaced by the Contractor.

G. Monthly preventive maintenance/service and attending to any number of breakdown calls to be attended within 4 hours of intimation to the contractor failing which will result in the reduction amount of Rs 500/hr.

H. The following equipment parts of the Package/ Duct able split AC plant are to be repaired/ replaced during the Annual maintenance Contract.

1. Check the compressor and its spare parts, compressor motors and its coupling.
2. Electrical connections, maintenance of relays gauges and panels.
3. Microprocessor based VFD drive and relays relating to this, Air Handling Units (AHU) & its blower motors including main blower motors.
4. Humidifier heater coils, electrical contractors, fuses, individual isolating switch (SFUs), MCBs, over load relays (protective relays) etc.,
5. System operating individual starters, terminal connectors etc.,

**7.2. Replacement of Spares**

All essential spare parts needs to be replaced as and when required such as Bodies of all motor and pumps, Panel board structure, HEPA and pre-filters etc. to ensure functioning of the units all the time.