



भारत सरकार / Government of India  
अंतरिक्ष विभाग / Department of Space  
यू.आर. राव उपग्रह केंद्र / U.R.RAO SATELLITE CENTRE  
एच.ए.एल. एयरपोर्ट रोड, विमानपुरा डाक / HAL Airport Road, Vimanapura Post,  
बेंगलूरु/ BENGALURU – 560 017

Ref No: URSC/PUR/ISMS-2024-0-61674/EoI-01/2024-25

30.08.2024

ऊष्मीय परीक्षण तथा क्रियान्वयन कार्यकलाप सहित अंतरिक्षयान संरचना के उत्पादन तथा संयोजन हेतु  
इच्छा की अभिव्यक्ति का आमंत्रण [ई ओ आई]

**INVITATION FOR EXPRESSION OF INTEREST [EOI]**  
**FOR MANUFACTURING AND ASSEMBLY OF SPACECRAFT STRUCTURE**  
**INCLUDING THERMAL TESTING AND IMPLEMENTATION ACTIVITIES**

यू.आर.राव उपग्रह केंद्र [यू आर एस सी], (पूर्व नाम इसरो उपग्रह केंद्र) सभी भारतीय उपग्रह की अभिकल्पना, विकास, संविचन तथा परीक्षण के लिए भारत सरकार के अंतरिक्ष विभाग के तहत भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) का अग्रणी केंद्र है।

U.R. Rao Satellite Centre [URSC] (Formerly known as ISRO Satellite Centre), of Indian Space Research Organisation [ISRO] under Department of Space, Government of India is the lead Centre of ISRO for Design, Development, Fabrication and Testing of all Indian made Satellites.

इस ई ओ आई का मूल उद्देश्य उन पी एस यू के लिए है जो पहले से ही यू आर एस सी/इसरो के साथ समझौता ज्ञापन (एम ओ यू) प्राप्त किये हैं उनके अलावा अन्य अतिरिक्त विक्रेताओं को पहचानना तथा अर्हता प्रदान करना है। घरेलू विक्रेता जो ऊष्मीय परीक्षण तथा अनुसंधान क्रियाकलाप सहित अंतरिक्षयान संरचनाओं के उत्पादन तथा संयोजन का कार्य कर सकते हैं केवल वे ही इस ई ओ आई के लिए प्रतिक्रिया दे सकते हैं। पी एस यू जो यू आर एस सी/इसरो के साथ समझौता ज्ञापन/संविदा प्राप्त किए हैं वे इस ई ओ आई में भाग नहीं ले सकते और उनके द्वारा प्रस्तुत ई ओ आई पर विचार नहीं किया जाएगा।

This EOI is primarily aimed to identify and qualify additional vendors apart from PSUs already having Memorandum of Understanding (MOU) / Contracts with URSC / ISRO. Domestic vendors who can take up manufacturing and assembly of spacecraft structures including thermal testing and implementation activities shall only respond to this EOI. PSUs having MOUs / Contracts with URSC/ISRO for manufacturing and assembly of spacecraft structures shall not participate in this EOI and their EOIs will not be considered.

ई ओ आई दस्तावेज में लघु विवरण उपलब्ध है। जिसे हमारे वेबसाइट [www.isro.gov.in](http://www.isro.gov.in) (निविदा नोटिस के तहत) या [www.eprocure.gov.in](http://www.eprocure.gov.in) (केन्द्रीय लोक प्रापण पोर्टल) से डाउनलोड किया जा सकता है।

Brief description is available in the Eoi document which can be downloaded from our website [www.isro.gov.in](http://www.isro.gov.in) (under 'Tender Notices') or [www.eprocure.gov.in](http://www.eprocure.gov.in) (Central Public Procurement Portal).

क्रियाकलापों को अच्छी तरह समझने तथा कोई संदेह हो तो उसका निवारण करने हेतु, यू आर राव उपग्रह केंद्र द्वारा एक पूर्व – बोली बैठक का आयोजन किया जाएगा।

A Pre-EOI meeting will be arranged by U.R. Rao Satellite Centre, Bengaluru in order to have a better understanding of the activities involved, clarify doubts, if any.

तदुपरांत, निम्नलिखित सूचना को विस्तार में इच्छा की अभिव्यक्ति के रूप में विक्रेताओं को प्रस्तुत करना होगा।

Subsequently, the vendor(s) shall submit the response to Expression of Interest along with the following information in detail:

1.	पंजीकृत पते के साथ फोन, फ़ैक्स, ईमेल, वेब इत्यादि Registered address with Phone, Fax, Email, Web etc.
2.	कंपनी की स्थिति(पी.एस.यू./स्वामित्व/भागीदारी/निजी लि./आदि) के साथ स्वामित्व भागीदार, बोर्ड के निदेशक का नाम व पता आदि। Company Status (PSU / Proprietary / Partnership / Private Ltd., etc.) with Name and Address of Proprietor, Partners, Board of Directors etc.
3.	सहयोगी: (क)भारतीय (ख) विदेशी: व्यापार सह भागिता में प्रतिशत (यदि हो तो) Associates: (a) Indian (b) Foreign. Percentage of business partnership (if any).
4.	प्रमुख उपभोक्ताओं की सूची के साथ पूरा पता और उनके संपर्क व्यक्ति/ब्यौरे List of Major Customers with full address and their Contact Persons/Details.
5.	अवसंरचना सुविधा का स्वामित्व/ क्रियाकलाप चलाने हेतु उपलब्धता के ब्यौरे Details of Infrastructure Facilities owned / available to carry out activities.
6.	नवीनतम वार्षिक रिपोर्ट की प्रति सहित पिछले तीन वित्तीय वर्ष (31 मार्च 2024 को समाप्त वर्ष) हेतु लेखा परीक्षित वित्तीय विवरण Audited Financial Statements for the preceding Three Financial Years (year ending 31 March, 2024) with copy of latest Annual report.
7.	उपलब्ध वित्तीय क्षमता /ऋण सुविधाएँ Financial Capacity / Credit facilities available.
8.	बैंकों के नाम व पता Name and Address of Bankers.
9.	व्यापार संघ जिससे उद्योग संबंधित हैं Trade Association to which industry belongs to
10.	संस्था/ बिक्री/जी एस टी पंजीकरण तथा पैन संख्या Establishment/Sales/GST Registration and PAN Number.
11.	व्यापार का प्रकार Nature of Business
12.	संगत उद्योग/उद्योगों की अन्य कोई जानकारी Any other information of the industry/ies consider relevant
13.	अपने सामर्थ्य और कमियों के क्षेत्रों को स्पष्टतः उल्लेख करते हुए कंपनियों के प्रोफाइल The Profile of the Company/ies clearly bringing out the areas of Strength and Weaknesses
14.	ई ओ आई में भाग लेने हेतु स्वमूल्यांकन तकनीकी और संगठनात्मक क्षमता Self-Assessment Technical and Organisational competence to take part in the EOI
15.	ई ओ आई में यथा उल्लिखित प्रतिक्रिया फार्म Response forms as mentioned in the EOI

### **ई.ओ.आई.प्रतिक्रिया का समापन/Completion of the EOI Response:**

- a. कंपनी / फर्मों को सलाह दी जाती है कि वे ई.ओ.आई .दस्तावेजों में निहित सभी अनुदेश; नियम व शर्तें; फॉर्मस; आवश्यकताएं तथा अन्य सूचनाओं को ध्यानपूर्वक पढ़ें। ऐसा माना जाएगा कि ई.ओ.आई की प्रस्तुति को उसके आशय को पूरी तरह समझने के साथ ई.ओ.आई दस्तावेजों का ध्यानपूर्वक अध्ययन तथा परीक्षा के उपरांत ही किया गया है।

The Company/Firms are advised to study all the instructions; Terms and Conditions; Forms; Requirements and other information in the EOI documents carefully. The submission of EOI shall be deemed to have been done after a careful study and examination of the EOI documents with full understanding of its implications.

- b. इस ई.ओ.आई के लिए प्रतिक्रिया ,संपूर्ण तथा सभी पहलुओं में परिपूर्ण होना चाहिए। ई.ओ.आई .दस्तावेज द्वारा आवश्यक सूचनाओं को न प्रस्तुत करने या सभी तरह से ई.ओ.आई .दस्तावेजों को पूरी तरह प्रतिक्रियात्मक न होते हुए प्रस्तुत करना कंपनी/फर्मों के जोखिम पर होगा तथा इससे दस्तावेज की अस्वीकृति भी हो सकती है।

The response to this EOI should be full and complete in all respect. Failure to furnish all the information required by the EOI document or submission of proposal not substantially responsive to the EOI documents to every respect will be at the risk of the Company/Firms and may result in rejection of the document.

- c. प्रस्तुत ई.ओ.आई के सभी पृष्ठों पर संख्या लिखना है तथा प्राधिकृत हस्ताक्षरी द्वारा हस्ताक्षरित होना है।

All the pages of the EOI submitted must be numbered and signed by the authorized signatory.

- d. ई.ओ.आई के संबंध में प्रचार करना सख्त मना है तथा एजेंसी द्वारा प्रस्तुत ऐसे प्रचारित ई.ओ.आई अस्वीकृति के अधीन हैं।

Canvassing in connection with the EOI be strictly prohibited and such canvassed EOI submitted by the Agency are liable to be rejected.

### **पूर्व-ई आई ओ बैठक:**

एक पूर्व-ई ओ आई बैठक के क्रियाकलापों को अच्छी तरह समझने, यदि कोई संदेह हो तो उसका निवारण करने तथा उपरोक्त क्रियाकलापों को करने हेतु अन्य तकनीकी विवरण को समझने हेतु यू आर राव उपग्रह केन्द्र, द्वारा एक पूर्व-बोली बैठक का आयोजन किया गया है।

### **Pre-Eoi Meeting:**

A Pre-Eoi meeting is arranged by U.R.Rao Satellite Centre, Bengaluru in order to have a better understanding of our Invitation to Eoi document/activities involved, clarify doubts if any, and other allied technical details for carrying out the activities mentioned above.

इच्छुक विक्रेताओं से अनुरोध है कि वे उक्त दिनांक, समय व स्थल पर पूर्व-बोली बैठक में भाग लें।

The interested Vendor[s] are hereby requested to take part in the Pre-Eoi meeting on the Date, Time and Venue mentioned here below:

पूर्व ई ओ आई बैठक दिनांक

Date of Pre-Eol Meeting

समय व स्थल

: 01.10.2024 (मंगलवार/Tuesday)

: 10.00 बजे

यू.आर.राव उपग्रह केंद्र,  
एच.ए.एल. एयरपोर्ट रोड,  
विमानपुरा डाक  
बेंगलूरु - 560017

Time & Venue

: 10.00 Hours IST

U.R.Rao Satellite Centre,

HAL Airport Road,

Vimanapura Post, Bengaluru – 560 017

पूर्व ई ओ आई बैठक के लिए संपर्क व्यक्ति

: क्रय व भंडार अधिकारी (ग्रुप – बी)

संपर्क: 080 25084027

ई-मेल : [psb@urssc.gov.in](mailto:psb@urssc.gov.in)

Focal Point for Pre-Eol Meeting:

Purchase & Stores Officer (Group-B)

Contact No. 080 25084027

E-mail: [psb@urssc.gov.in](mailto:psb@urssc.gov.in)

विनिर्दिष्ट दिनांक के पहले पूर्व बोली बैठक में भाग लेने वाले प्रतिनिधियों के विवरण सुरक्षा स्वीकृति का प्रबंध करने हेतु तालिका – 1 में विनिर्दिष्ट संपर्क व्यक्ति को कृपया उपलब्ध करें। विक्रेता के प्रतिनिधि को पूर्व ई – ओ आई बैठक में भाग लेने हेतु “प्राधिकार पत्र” लाना होगा। बोली लगाने वाले/कंपनी/संगठन से सदस्य प्रतिनिधि, की संख्या अत्यधिक केवल दो (2) (एक तकनीकी तथा एक वित्तीय) तक सीमित होना चाहिए।

Interested Vendor[s] may please provide the details of the representative[s] taking part in the Pre-Eol meeting well in advance prior to dates specified in Table-1 to the Focal Point in order to arrange for Security clearance. Vendor[s] representative shall carry an “Authorization Letter” for attending the Pre-Eol meeting. Member Representative shall be limited to maximum of two (2) per bidder/company/organisation (one technical and one financial).

विक्रेता द्वारा पूर्व ई ओ आई पूछताछ, पूर्व बैठक की दिनांक के 05 दिन पहले यू आर एस सी. के मेल आई डी ([psb@urssc.gov.in](mailto:psb@urssc.gov.in)) पर पहुँचना चाहिए। कृपया नोट करें कि किसी भी परिस्थिति में, पूर्व ई ओ आई के लिए पूर्वन/स्थगन के अनुरोध पर विचार नहीं किया जाएगा।

Pre-EOI Queries from vendor [s] shall reach URSC 15 days prior to date of Pre-EOI meeting to Mail ID: [psb@urssc.gov.in](mailto:psb@urssc.gov.in). Please note that request for “Pre-ponement/postponement of Pre-Eol meeting” will not be entertained under any circumstances.

इच्छुक विक्रेता जो भी भाग ले रहे हैं, उनसे अनुरोध है कि वे स्वयं उपस्थित रहें। यू आर एस सी/इसरो द्वारा किसी भी तरह के परिवहन की व्यवस्था नहीं की जाएगी।

The Interested Vendor[s] who are participating are required to be present on their own. No transportation will be arranged by URSC/ISRO.

तालिका Table-1

ई ओ आई विवरण की प्रस्तुति Submission of EOI Details	
पूर्व – ई ओ आई स्पष्टीकरण	17.09.2024 10.00 HRS IST

Pre-EOI clarification	
पूर्व ई ओ आई बैठक - Pre-EOI meeting	01.10.2024 10.00 HRS IST
ई ओ आई की प्रतिक्रिया की प्रस्तुति के लिए अंतिम तिथि Last date for submission of response to Eoi	06.12.2024 10.00 HRS IST
ई ओ आई के खोलने की तिथि Opening date of Eoi	06.12.2024 10.30 HRS IST

ई ओ आई के लिए संपूर्ण प्रतिक्रिया यू आर एस सी में नीचे दिए पते पर प्राप्त होना चाहिए तथा उपरोक्त दिनांक तथा समय के बाद नहीं। कृपया अपने मोहर बंद ई ओ आई को हमारे उल्लिखित संदर्भ संख्या तथा नियत तारीख वाले संलग्न निविदा प्रपत्र के साथ विस्तृत कैटलॉग/पैम्पलैट/लिटरेचर भी प्रस्तुत करें। अनुलग्नक में उल्लिखित नियम व शर्तों के अनुसार ई ओ आई के लिए हमारे संदर्भ तथा नियत तिथि को ऊपर लिखें।

Complete response to EOI must be received at URSC to the address given below, not later than date and time specified above. Please submit your sealed EOI, in the Tender Form enclosed here along with the descriptive catalogues/pamphlets/literature, superscribed with our Ref. No. and Due Date for EOI as per the terms & conditions mentioned in Annexure.

व. प्रधान, क्रय व भंडार Sr. Head, Purchase & Stores  
यू आर राव उपग्रह केन्द्र U R Rao Satellite Centre,  
एच ए एल एयरपोर्ट रोड  
HAL Airport Road,  
विमानपुरा डाक, बेंगलूरु 560017-, भारत  
Vimanapura Post, Bangalore – 560017, India

ई ओ आई के लिए प्रतिक्रिया में संपर्क व्यक्ति के नाम के साथ, पदनाम, सही संपर्क संख्या तथा ई - मेल पते के साथ होना चाहिए।

Response to EOI must also include the name of the point of contact, together with the designation, appropriate contact number and e-mail address.

इस प्रस्ताव को पूर्व-ई ओ आई अर्हता के रूप में पहल किया गया है। बिना कारण बताए इच्छा की अभिव्यक्ति को स्वीकार या अस्वीकार करने का अधिकार यू आर एस सी आरक्षित रखता है।

This proposal is initiated as a Pre-Eoi Qualification. URSC reserves the right to accept or reject all or any such "Expression of Interest" without assigning any reasons what so ever.

इस ई ओ आई के लिए यदि कोई शुद्धिपत्र/अनुशेष हो, तो उसे हमारे वेबसाइट [www.isro.gov.in](http://www.isro.gov.in) पर डाला जाएगा।

Addendum/Corrigendum, if any, to this Eoi, shall be hosted at our website, [www.isro.gov.in](http://www.isro.gov.in)

**डिस्कलैमर:** इस आमंत्रण के अंग्रेजी और हिन्दी अनुवाद में विसंगति या असंगति के मामले में अंग्रेजी पाठ को सही माना जाएगा।

**Disclaimer:** The English version shall always prevail in case of any discrepancy or inconsistency between English and Hindi version of this Invitation.

**Sd/-**  
**वरिष्ठ, प्रधान, क्रय व भंडार**  
**SR. HEAD, PURCHASE & STORES**

Government of India,  
Department of Space,  
**U R Rao Satellite Centre [ URSC ]**

HAL Airport Road, Vimanapura Post,  
Bengaluru – 560 017



**Expression of Interest [EOI]**  
**for**  
**Manufacturing and Assembly of**  
**Spacecraft Structure including Thermal Testing**  
**and Implementation activities**

**August – 2024**

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## Note to Vendors

**This EOI is primarily aimed to identify and qualify additional vendors apart from PSUs already having Memorandum of Understanding (MOU) / Contracts with URSC / ISRO.** Vendors who can take up manufacturing and assembly of spacecraft structures including thermal testing and implementation activities shall only respond to this EOI. PSUs having MOUs / Contracts with URSC/ISRO for manufacturing and assembly of spacecraft structures shall not participate in this EOI and their EOIs will not be considered.

The Vendor is advised to read the EOI documents, terms and conditions and other details carefully relating to the work to be executed for spacecraft structure manufacturing and assembly activities including thermal implementation activities. The vendor shall be deemed to have known the nature, scope and magnitude of the work. Vendor should express the interest only if they consider themselves eligible and if they are having required facilities and documents as per the EOI. The vendors are required to study EOI document and express interest after carefully examining all instructions, required infrastructure, facilities demanded, eligibility criteria, forms, terms, standards and specifications as per the EOI document with full understanding of its implications.

If the vendor is found ineligible after opening of the EOI, their EOI document shall become invalid. EOI which are not in compliance with URSC EOI conditions shall be rejected, without assigning any reasons thereof. Failure to furnish all requisite information and/or documents shall result in rejection of their EOI. U R Rao Satellite Centre [URSC], Bengaluru reserves the right to assess the capability of the Vendor in view the overall interest of URSC. In the event, the vendor capability and capacity are found to be unsatisfactory; URSC reserves the right to reject the EOI response by the vendor, without assigning any reasons thereof.

The requirements stated herein below are preferable specifications and URSC reserves the right to request for any additional information and also reserves the right to reject the EOI response of any vendor, if in the opinion of URSC, the qualification or data is incomplete or if the vendor is found not qualified to satisfactorily execute the work. The vendor shall bear all costs and expenses associated with preparation and submission of EOI document including post EOI

clarifications, discussions, technical and other presentations and URSC shall in no case be responsible or liable for such costs, regardless of the outcome of the EOI process. Also, the vendor shall not be entitled to claim any costs, charges and expenses incidental to or incurred by them in connection with the submission of the EOI. URSC may modify or withdraw the invitation to EOI.

At any time prior to the deadline for submission of EOI, URSC may for any reason on its own initiative modify the EOI document by an amendment. The amendment shall be notified in writing or e-mail to the Vendor or uploaded online on the specified website. URSC shall bear no responsibility or liability arising out of non-receipt of the same in time or otherwise. Notwithstanding the above, URSC may at its discretion extend the deadline for submission of EOI in order to provide reasonable time to Vendor to consider the amendment in preparing the EOI.

All the EOI must be submitted before the time and date fixed for the receipt of EOI as set forth in the EOI document. URSC shall not be responsible for non- receipt of EOI due to any type of delays and it shall be the sole responsibility of the Vendor to ensure delivery of the EOI within the time fixed. URSC reserves the right to accept or reject any of the EOI either in full or part without assigning any reason thereof. EOI received after stipulated time and date shall be rejected.

Vendors may contact Senior Head, Purchase & Stores (Sr. HPS), U R Rao Satellite Centre, P.B.No.1795, HAL Airport Road, Vimanapura Post, Bengaluru – 560 017, on all working days between 10.00 Hrs to 16.00 Hrs IST for any clarifications related to this EOI. The Contact Phone No is (080) 2508 4005 / 6108 4005 and email ID is: [srhps@ursc.gov.in](mailto:srhps@ursc.gov.in). EOI documents will be available in ISRO's portal. Interested Vendor may express their interest. Upon successful completion of the EOI process, URSC may release an RFP / tender based on the revisions in the specifications and other terms as may be agreed upon/felt necessary during the process of the EOI and EOI evaluation. URSC reserves the right to make necessary modification(s) in the specifications/terms at the time of release of RFP or not to release an RFP as a sequel of this EOI. All other standard commercial and regulatory terms and conditions will be released as part of the RFP, which need to be complied and responded by the vendors in the RFP response.

The EOI shall be complete in respect of all technical specifications, instructions, drawings, pamphlets and catalogues, as per the EOI document. Failure to furnish all information as per the requirements of the EOI document and submission of EOI not substantially responsive to the EOI document shall render the EOI/Vendor liable for rejection. **EOI by way of fax/e-mail shall not be accepted.**

Vendors should send their EOI in a sealed envelope by Registered Post with Acknowledgement / Speed Post / Courier to the Postal address given below:

**Senior Head, Purchase & Stores (Sr. HPS),  
U R Rao Satellite Centre, P.B.No.1795,  
H A L Airport Road, Vimanapura Post,  
Bengaluru – 560 017**

Vendor shall clearly mention the EOI Number and due date on the sealed envelope. The Vendor should provide the Name of their Bankers along with their EOI document, if required by UR Rao Satellite Centre [URSC], Bengaluru.

The vendors need to get enrolled in ISRO's EGPS portal to submit their offer online during tendering / Request for Proposal (RFP) stage. Vendor needs to have Digital Signature Certificate and corporate e-mail ID as detailed on ISRO's EGPS portal.

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# Chapter-1

## Introduction and Scope of Work

### 1.1 EOI Objective

URSC is planning for realization of Spacecraft Structures by outsourcing of structural manufacturing and assembly activities including thermal testing and implementation through Indian industries. Outcome of this EOI is to identify and qualify additional vendors apart from PSUs already having Memorandum of Understanding (MOU) / Contracts with URSC / ISRO for the above mentioned activities. Request for proposal will be sent only to those vendors qualified through this EOI.

### 1.2 Introduction to Spacecraft

U R Rao Satellite Centre [URSC] is the lead Centre of Indian Space Research Organisation [ISRO] responsible for Design, Development, Assembly and Integration of Spacecrafts for various applications. URSC has two campuses viz., Main campus located at HAL Airport Road and ISITE campus located at Marathahalli, Bengaluru hereinafter collectively referred to as 'URSC'. The specialised teams of scientists, engineers and technicians at URSC have built advanced satellites for various applications in areas of tele-communications, television broadcasting, VSAT services, tele-medicine, tele-education, navigation, weather forecasting, disaster warning, search & rescue operations, earth observations, natural resource management, space science and interplanetary missions etc.

The Satellite Programme at URSC is categorized into:

- Geo-Stationary Satellite Programme
- Satellite Navigation Programme
- Earth Observation & Small Satellite Programme

Vendor shall provide required support as per the scope of work without compromising on ISRO's quality standards. Interested Vendors shall express their

interest for the same. The details of URSC's requirements from Vendors are provided in the subsequent chapters.

### **1.3 Introduction to manufacturing of spacecraft structures**

Spacecraft structures realization involves various stages of manufacturing viz., Primary bonding, Non-Destructive Testing (NDT), machining, inspection, post bonding and assembly of components along with Thermal testing and implementation activities. Primary bonding of composite products involves drawal of prepregs and film adhesives from cold storage, prepreg cutting, lay-up on pre-shaped mould, honeycomb core preparation, surface preparation, film adhesive application, assembly, vacuum bagging, autoclave curing. Similarly, primary bonding of metallic sandwich panel involves handling of aluminium face sheets with proper surface treatment followed by honeycomb core preparation, surface preparation, film adhesive application, assembly, vacuum bagging, autoclave curing. Machining of sandwich panels involves CNC programming, profiling, holes drilling etc. Post bonding activities involve inserts potting, bonding of cut-out doublers and edge filling etc. In addition, machining of aluminium rings from Aluminium forgings need to be carried out and bonded to the primary bonded component. At each stage of manufacturing, all structural components will be subjected to thorough inspection. Further, all the components individually made are assembled using special jigs / tooling to realise a spacecraft structure.

Spacecraft structural hardware requires critical and special manufacturing facilities and assembly fixtures. URSC is willing to receive Expression of Interest from promising vendors to realize these Structures to meet the increasing number of spacecrafts per year. Industries having spare capacity are requested to respond for manufacturing and assembly of spacecraft structures including thermal testing and implementation activities. This document describes the general facilities and pre-requisites required for short listing and qualification of the vendors.

### **1.4 Description & Scope of work:**

Each spacecraft structure consists of main central cylindrical shell, shear webs, equipment panels, Top Deck, bottom deck and intermediate decks made of

honeycomb sandwich. The scope of work is to realize these components from the specified raw materials and final assembly using jigs and fixtures. The proposed work is for supplying qualified structures for spacecrafts and continued demand for years to come.

Spacecraft structural components are having very close geometrical and dimensional tolerances which are used for on-board flight. Generally, they are manufactured/fabricated with Aluminium Sandwich panels, which in turn are made with aerospace grade Aluminium alloy Honey comb core sandwiched by thin Aluminium / Carbon Fibre Reinforced Plastics (CFRP) face sheets. These sheets are bonded to the central core with the help of high temperature cure film adhesives.

Components can be classified as:

- Flat Metallic Sandwich panels with Aluminium Alloy face sheets.
- Flat Composite Sandwich Panels with CFRP face sheets.
- Cylindrical monocoque sandwich shells with CFRP face sheets
- CFRP Tubes, Brackets, Angles, Edge clips and doublers.
- Aluminium alloy machined rings from forgings.

Typical part drawings are attached with this EOI for reference purpose. Typical manufacturing process (though not exhaustive and elaborate) followed for realizing CFRP Structure is given below.

- Manufacturing or procurement of required tools / special tools
- Procurement of raw materials and process consumables.
- Storage of shelf life, perishable, prepreg composite raw materials at - (minus)18 Deg. C in a controlled and monitored Cold storage facility with required humidity factor.
- Cutting of CFRP prepregs as per drawings and Lay-up on the pre-shaped mould or tool.
- Intermediate compaction / de-bulking of lay-up as and when necessary.
- Preparation of vacuum bagging.
- Autoclave curing of vacuum bagged component.

- De-moulding and trimming of component.
- Machining of sandwich panels
- Post bonding of sandwich panels.
- Thermal testing and implementation on Sandwich panels
- Assembly of Structural components.

Brief description about the scope of the vendor and URSC are given in the Table-1.

**Table-1: Scope of Vendor and URSC**

Scope of the vendor	Scope of URSC	Remarks
<p>a) Collection of accepted raw materials from URSC Stores and delivery of finished goods to URSC Stores.</p> <p>b) Design and fabrication of jigs, fixtures including raw materials, procurement of process consumables and special tools.</p> <p>c) Manufacturing, assembly of structural components, thermal testing and implementation activities on sandwich panels as per URSC qualified processes.</p> <p>d) Destructive testing of co-process test coupons.</p> <p>e) Packing and transportation of finished components and structure assembly to URSC.</p> <p>f) Online quality control including stage inspection and documentation.</p>	<p>a) Supply of approved fabrication drawings.</p> <p>b) Accepted raw materials for flight hardware will be provided by URSC as Free Issue Materials (FIM).</p> <p>c) Mandatory inspection points (MIPs) / process check points will be carried out by URSC.</p> <p>d) Reliability, Quality assurance and surveillance support prior to final delivery of hardware will be extended by URSC.</p>	<p>Raw materials will be issued as Free Issue Materials (FIM) after receipt of valid bank guarantee / insurance</p>

**1.4.1** Fabrication drawings both in hard copy and soft copy are supplied by URSC. However, Vendor should have clear interpretation/understanding of manufacturing drawing and CAD model. Wherever required they should be ready to modify the drawing based on specific instructions from URSC, then carry on the fabrication/machining.

**1.4.2 Process Planning (PP) & Quality Plan (QP):** Detailed PP & QP to be made by Vendor in discussion with URSC to meet all quality requirements specified in the drawing including schedule. Wherever required such PP & QP to be brought it to the notice of URSC. However, responsibility of achieving all the quality requirements rests with the Vendor.

**1.4.3 Product Quality requirements:** Quality requirements of the hardware realized out of Aerospace Materials:

- Proper tooling will give proper product output. Hence the design and fabrication of tools, jigs, fixtures and any special attachments shall be made to the best possible precision and accuracy.
- Flatness of realized product is very critical and shall be in the range of 0.5 mm/1000 mm length.
- Realized component shall be defect free.
- Cured product shall not have warping, distortion and other process induced defects.
- Since they are bonded components, residual stresses due to curing shall be kept minimum.
- Products with minor defects shall be referred to URSC Salvage committee for review and acceptance.
- Dimensional accuracies as specified in the drawing shall be achieved within the acceptable tolerance levels.
- Geometrical accuracies like Flatness, Parallelism, and Perpendicularity etc. are very much important and shall be achieved as specified in the drawing.
- Positional accuracies of hole drilling shall be within 100 microns.
- All manufactured components shall invariably be subjected to suitable NDT inspection depending on the type of the product.

#### 1.4.4 In process Inspection & Final Dimensional inspection:

- Required in-process inspection/stage inspection to be carried out by the Vendors as per the process plan and maintain such records for audit by URSC.
- Prepare primary bonding, machining, post bonding, thermal testing and implementation, assembly data sheet and maintain such records for audit by URSC.
- Dimensional Inspection of the fabricated/machined part to be carried out by Vendor indicating the nominal dimension with tolerance and actual measured value for each of the dimension of the part. The inspection report to contain the instrument used for each of the dimension with instrument identification number, to track its calibration status during audits by URSC.

1.4.5 **Collection of raw materials:** Generally, the quantity for manufacturing will be of job order type and not of a large production batch. Required quantity of raw materials will be provided by URSC as free issue materials (FIMs) against bank guarantee / insurance. These materials are tested and accepted by URSC. **Vendor should collect the raw material from URSC Stores, Bengaluru at their own cost within 3-4 days of intimation by URSC and shall be used within their shelf life.** The responsibility of collection, safe transportation including **controlled environment** logistics arrangement is in the scope of the vendor. Vendors who are willing to take up these types of jobs only need to respond for this EOI.

1.4.6 **Delivery of finished / semi-finished component to URSC:** After clearance by Vendor Quality Control (VQC) and URSC, hardware to be dispatched to URSC with a proper packing to avoid any damages during transportation.

1.4.7 **Component Inspection:** In addition to manufacturing facility, the Vendor should have very good dimensional and NDT inspection facility so that all parameters like geometrical & dimensional accuracies and defects in

fabricated components shall be measured and recorded in inspection reports.

- 1.4.8 Testing of supplied co-process coupons:** Wherever applicable, Vendor shall carry out the required tests (destructive and non-destructive) as mandated by URSC. The test reports shall be shared to URSC for final acceptance. Vendor shall also provide required size of co-process coupons for additional test and evaluation to be conducted by URSC. **Final acceptance of the component will be based on the test results.** **Decision of URSC is final and binding for ambiguous test results.** Overall responsibility of getting tested and acceptance of the component by URSC is with the vendor. Necessary co-ordination shall be done by vendor.
- 1.4.9 Supply of raw materials:** Required quantity of accepted raw materials for the ordered items will be provided by URSC against the submission of bank guarantee / insurance for equivalent amount. Vendor is required to procure required quantity of process consumables as per the approved specifications of URSC. These consumables are to be procured from identified suppliers. Further, vendors will be required to maintain the exclusive register containing actual consumed quantity of raw material, quantum of wastage of raw materials, received date, expired date, etc.
- 1.4.10 Qualification of Vendors:** Post receipt of EOI, vendor qualification shall be done by URSC to assess the suitability of the vendor for the specified operations towards spacecraft structures manufacturing, thermal testing and implementation activities.
- 1.4.11 Failure clause:** Post EOI, during execution phase, appropriate risk clause will be included as part of the order to recover the damages / defective items if any. Vendor should have the willingness to accept such clauses.

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# Chapter-2

## Type of activities for spacecraft structures manufacturing, assembly, thermal testing and implementation.

Spacecraft structural manufacturing, assembly, thermal testing and implementation activities are broadly classified and are given in table-2.

**Table-2: Classification of Spacecraft structures manufacturing, assembly, Thermal testing and implementation activities**

Work type	Name of the activity
Type-1	Primary bonding of spacecraft structural components
Type-2	Machining of Composite and Aluminium honeycomb sandwich panels
Type-3	Post bonding of Composite and Aluminium honeycomb sandwich panels
Type-4	Thermal testing and implementation activities.
Type-5	Assembly of spacecraft structural components and Machining of metallic rings

- 2.1 URSC prefers single vendor who can execute all the above 5 types of activities.
- 2.2 Vendor may also enter into an agreement / or outsource certain activities to another qualified / to be qualified competent vendor approved by URSC, having required infrastructure and willing to participate. However, the responsibility of all activities lies with the Lead vendor.
- 2.3 “Lead Vendor” is the one who delivers the final product, i.e., a fully assembled spacecraft structure. Lead vendor should essentially meet the requirements of Type- 1 & Type-5 activities. The Lead vendor shall clearly mention the type of activities they are planning to subcontract

and the details of sub-contracted vendor including facilities available with sub-contractor as part of EOI submission.

- 2.4 Lead vendor is responsible for the final delivery of products within delivery schedule and inter-coordination between their sub-contracted vendors.

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# Chapter-3

## Facilities for primary bonding activities

### (Type-1 activities)

The type of work under this category involves manufacturing of various spacecraft structural components. Their names and typical sizes are given below:

- a) Composite or Aluminium Honeycomb Sandwich panels (size: 2 m x 2.5 m, thickness range: 15 mm to 60 mm)
- b) Composite Honeycomb Sandwich Cylinder / Shell (size: 500 mm to 1200 mm (OD)x 500 mm to 3300 mm (Length))
- c) Composite Angles and Edge clips (Size: 80 mm x 80 mm x 2000 mm (L))
- d) Composite Doublers (size varying from [45 mm x 45 mm] to [1000 mm x 200 mm])
- e) Composite Brackets [ size: 200 mm x 250 mm x 200 mm (W)]
- f) Composite Tubes (size: Dia. 10 mm to 100 mm and Length: 2000 mm)
- g) Composite Laminates / face sheets [size: 2500 mm x 2000 mm x 3 mm (t)]

Major facilities required for type-1 activities are explained in subsequent paragraphs.

### 3.1 Cold storage (Mandatory facility)

- 3.1.1 CFRP prepregs, film adhesives and foaming adhesives are required to be stored in Cold storage maintained at a temperature of -18 Deg. C.
- 3.1.2 The temperature inside the cold storage facility should be maintained at -20 Deg. C.

- 3.1.3 The temperature of cold storage shall be controlled and monitored. It shall also have recording / data acquisition facility for logging of the data.

**!!!! Attention Vendors!!!!**

Cold Storage facility is a mandatory facility for vendors who are expressing their interest for primary bonding activities.

## **3.2 Surface treatment Facilities**

### **(Desirable facilities)**

Constituent parts of sandwich panels like Aluminium Honey Comb cores, Aluminium face sheets, embedments, etc., have to be surface treated before primary bonding. Surface treatment facilities have to be qualified / certified / authorized by any ISRO centers or appropriate certifying agencies like NADCAP, DGCA/DGQA, etc., Following surface treatment facilities are required:

- 3.2.1 **Vapour Degreasing facility:** For cleaning of Aluminium Honeycomb cores, edge inserts, Aluminium face sheets, embedment, etc., by placing / hanging them in solvent vapours viz., Try Chloro Ethylene (TCE) or equivalent solvent. may be used to generate vapours for cleaning.
- 3.2.2 **Sulpho-Chrome etching or equivalent:** Required for surface preparation of Aluminium Alloy face sheets. The facility shall be useful for space / aerospace grade bonding qualities.
- Above surface preparation facilities shall be able to handle 1.2 m x 3.6 m x (0.25 mm to 0.5 mm) thick Aluminum face sheets & 2.5 m x 1.2 m x 50 mm (t) Aluminium Honeycomb cores.
  - Pre-cleaning tanks, etching tanks and post cleaning tanks shall be able to accommodate core and face sheets of above size.

3.2.3 **Painting booth for Primer application:** Further to Sulpho-chrome etching, all Aluminium face sheets have to be coated with suitable primer for protecting the etched surface and thereby enhancing the bonding quality. It is preferable to have closed type painting booth with vacuum suction facility.

3.2.4 **Chromic acid anodizing with hot water sealing:** For Aluminium doublers, inserts, brackets, etc., of maximum size 0.3 m x 0.3 m x 0.3 m.

**!!!! Attention Vendors!!!!**

Vendors who are expressing their interest for primary bonding activities, it is desirable to have these surface treatment facilities. However, in case, they do not have, they may get the support from other industries by way of sub-contracting. But, providing end-to-end solutions is the responsibility of the vendor. URSC in no way will be responsible for such third-party activities.

**3.3 Processing bay or lay-up area of Clean Room facility  
(Mandatory facility)**

3.3.1 Processing of CFRP elements requires AC clean room of one lakh class complied to ISO Class 8 with temperature of  $22 \pm 2$  Deg. C and humidity control of RH factor of  $60 \pm 10$  %.

3.3.2 The bay shall have entry with Air shower and other associated features to maintain dust free AC clean room.

3.3.3 Nominal size of clean room shall be 10 m (L) X 20 m (W) with a crane facility.

3.3.4 Processing bay shall have granite top working tables covered with detachable cutting pads for prepreg cutting and lay-up.

3.3.5 Clean room shall have a trolley, OHT crane (3T) and Fork lift (5T) facility for moving the metallic tools and moulds.

3.3.6 The clean room shall have portable vacuum pumps to generate a coarse vacuum of 0.8 bar(g) for product de-bulking.

**!!!! Attention Vendors!!!!**

AC Processing / Lay-up bay is mandatory for vendors who are expressing their interest for primary bonding activities.

### 3.4 Autoclave facility (Mandatory facility)

- 3.4.1 Most of the Structural components require Autoclave equipment for their curing.
- 3.4.2 Autoclave shall have fully automatic/semi-automatic control system for better curing of components.
- 3.4.3 It is required to cure plain as well as embedded honeycomb sandwich using an Autoclave. For this purpose, an Autoclave having working size of minimum Dia. 2.5 m and 4 m length is required. Autoclave shall have digital/analog recording/printing facilities is desirable.
- 3.4.4 Operating temperature shall be 200 Deg. C and Pressure shall be 7 bar(g).
- 3.4.5 Autoclave shall be equipped with a vacuum system to generate a coarse vacuum of 0.8 bar(g).
- 3.4.6 Heating and cooling rates shall be 1 to 2 deg. C per minute.

#### !!!! Attention Vendors!!!!

Autoclave curing facility is a mandatory for vendors who are expressing their interest for primary bonding activities.

### 3.5 Prepreg cutting machine (Desirable facility).

- 3.5.1 Rolls of CFRP Prepreg have to be cut into the required shapes and size for lay-up on the mould / tool.
- 3.5.2 Fully automatic and programmable prepreg cutting machine with direct input from AutoCAD drawings is required to cut prepreg into the plies.
- 3.5.3 Typical bed size shall be 1.7 m x 1.8 m with CFRP prepreg holding system.

### 3.6 Inspection, NDT and testing facilities (Desirable facilities)

- 3.6.1 **Inspection facilities:** Vendor should have 3D coordinate measuring machine/laser tracker of minimum 5 m length x 5 m width x 1.5 m height.
- 3.6.2 **NDT Facilities:** Vendor should have instrumented coin tap test facility, ultra-sonic, A-scan, C-scan & Shearography facilities. All the composite elements should be subjected to 100% NDT.

- 3.6.3 **Testing facilities:** UTM machine with 100 kN capacity with automatic recording facilities for testing of process control coupons.

### **3.7 Video Recording Facility (Desirable facility).**

- 4.7.1 Automatic Video recording facility for recording layup activities in processing bay.
- 4.7.2 Recorded video files shall be shared to URSC.

#### **!!!! Attention Vendors!!!!**

Vendors who are expressing their interest for primary bonding activities, it is desirable to have above facilities. However, in case, they do not have, they may get the support from other industries by way of sub-contracting. But, providing end-to-end solutions is the responsibility of the vendor. URSC in no way will be responsible for such third party activities.

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# Chapter-4

## **Facilities for machining of composite and aluminium honeycomb sandwich panels (Type- 2 activities)**

The Honeycomb sandwich panels are bonded structures and machining is different from solid machining. As Honeycomb sandwich panels are spacecraft flight components and these machined components are sent for further bonding process, contaminating the panel by any means is not allowed. Typical panel size for machining is around 2.5 m x 2 m. Considering the above said points, the following requirements are to be met during the machining.

### **4.1 Precautions to be taken during machining of composite and aluminium honeycomb sandwich panels.**

- 4.1.1 Oil free machining environment to be maintained by preventing dripping of lubricants on panel from the machine and dust free environment to be maintained by air-conditioning the machine area.
- 4.1.2 The machined sandwich panels are sent for bonding process further, so coolants or any oil should not be used for machining and sandwich components are to be machined only by dry machining.
- 4.1.3 The Honeycomb sandwich panels are very weak in compression, clamping of panels for machining to be done only by vacuum and mechanical clamping is not allowed.
- 4.1.4 As mentioned earlier, since the Honeycomb sandwich panels are adhesive bonded construction, the Machining process should not damage (debond) the basic adhesive bonding of sandwich

component, specifically while machining through holes, cut outs and profile.

- 4.1.5 Uniform machining feed rate is not applicable as in conventional machining, since the sandwich components are embedded with different density honeycomb core, thick aluminium sheets and solid blocks. Care to be taken to vary feed rates manually, in real time according to the nature of embedments. The machining parameters, feed and speed will be mentioned in process document.
- 4.1.6 Input for one component from two drawings to be merged by manual CNC program and checked thoroughly by graphics simulation. No trial components would be given and machining has to be carried out directly on flight components.
- 4.1.7 All the primary bonded sandwich panels have to undergo, blind, through holes, cutouts machining with positional tolerance of  $\varnothing$  0.1 mm and component profile machining to the required shape and size.

## 4.2 Infrastructure required for machining of composite and aluminium honeycomb sandwich panels.

- 4.2.1 **The below mentioned CNC machine / router and its facilities are MANDATORY facilities for machining of composite and aluminium honeycomb sandwich panels (Type-2 activities).**
- 4.2.2 Three axis CNC machine / router with probing facility and vacuum clamping bed. This is a mandatory facility for Type-2 activities. Minimum size of the machine is:
- X - axis travel length: 3 meter
  - Y- axis travel length: 2.5 meter
  - Z- axis travel length: minimum 300 mm.
- 4.2.3 Positional accuracy requirement as per the VDI DGQ-3441: Positioning uncertainty (P) for X &Y is axis 30 microns for full travel.
- 4.2.4 Positional accuracy requirement as per the VDI DGQ-3441: Positioning uncertainty (P) for Z axis is 40 microns for full travel.

- 4.2.5 Machine shall have in built vacuum clamping system with bed size: 2.5 m X 3 m for clamping Sandwich panels during machining. Mechanical clamping of sandwich panels is not allowed.
- 4.2.6 Spindle speed: 10,000 RPM
- 4.2.7 Large size automated Vacuum sucking system to suck the CFRP and aluminium dust generated during the machining.
- 4.2.8 Suitable area with air conditioned dust free environment to store the bare panel and finished components.

#### **4.3 Scope of the work & Vendors' responsibility for machining of composite and aluminium honeycomb sandwich panels.**

- 4.3.1 Structural and Integration layout drawing study and manual CNC programming for machining of Structural and integration interface holes, cut-outs and profile etc.
- 4.3.2 Preparation of vacuum clamping layout for through machining using soft copies of drawings and vacuum bed model on CAD module.
- 4.3.3 Checking of CNC program in all respects by manual and graphics simulation method.
- 4.3.4 Machining of actual flight Honeycomb sandwich components in all respects on top and bottom side using appropriate special cutting tools.
- 4.3.5 Machining of different type of test coupons from the bare panel.
- 4.3.6 Vendor is required to collect the bare honeycomb panel from URSC and transporting to the machining location safely with proper packing to avoid damage, since panels are prone to damage.
- 4.3.7 After pre-delivery inspection by URSC, delivery of finished honeycomb panel to URSC safely with proper packing to avoid damage, since panels are having finished edges and prone to damage.
- 4.3.8 Procuring of special cutting tools for machining of sandwich panel.
- 4.3.9 Procuring of gauges and measuring pins etc.

#### **4.4 Quality requirement machining of composite and aluminium honeycomb sandwich panels.**

- 4.4.1 Components should not be contaminated during machining either by machine or by lubrication oil. Components should be machined without any type of coolant. Contaminated product is likely to be rejected.
- 4.4.2 Component should not get de-bonded by machining operations. Sufficient care shall be taken for selection of proper special cutting tools and cutting parameters for machining.
- 4.4.3 Mechanical damages should not happen during component handling, machining and vacuum clamping. Mechanical damaged product is likely to be rejected.
- 4.4.4 Rejection of component by any means is not allowed, as bare panels are already subjected to many man and machine hours. Rejection may attract a suitable penalty clause.
- 4.4.5 Positional accuracy of inserts to be maintained within  $\varnothing$  0.1 mm.

#### **4.5 Care during bare panel, finished components handling and storing.**

- 4.5.1 Bare sandwich panels to be stored in vertical position in specially designed racks. Panels should not be stored horizontally and if any objects fall on the panel it would damage as the panels are very weak in compression.
- 4.5.2 Finished components to be packed by soft material and to be stored on the table, not to be kept on floor.
- 4.5.3 Transporting of finished components are to packed with bubble plastic sheet, foam and no other objects to be kept on the component.

#### **!!!! Attention Vendors!!!!**

Three axis CNC machine with vacuum clamping bed is a mandatory facility for vendors who are expressing their interest for Machining of Composite and Aluminium honeycomb sandwich panels.

# Chapter-5

## Facilities for post bonding of composite and aluminium honeycomb sandwich panels

### (Type- 3 activities)

Sandwich panels after machining require post bonding operations before assembly to the main structure. Post bonding operations shall include insert potting, doublers bonding, edges and cut-outs filling, etc., To carry out these post bonding operations following facilities are required.

#### 5.1 Infrastructure required for post bonding operations (Availability of these infrastructure is mandatory for type-3 activities)

- 5.1.1 AC Clean room of nominal size 12 m (width) x 20 m length x 5 m height. The entry and exits of the bay shall be big enough to take the panels of size 2 m x 2.5 m.
- 5.1.2 There must be at least 6 Nos of working tables of size 2 m x 3 m to carryout insert potting operations.
- 5.1.3 Post Bonding bay shall have table top Tri-Chloro Ethylene (TCE) based ultrasonic degreaser for surface cleaning of inserts and metallic doublers [ sizes ranging from (25 mm x 25 mm x 1 mm (t)) to (150 mm x 150 mm x 1 mm (t))] before potting and bonding respectively.
- 5.1.4 **Chromic acid anodizing with hot water sealing:** For Aluminium doublers, inserts, brackets, etc., Tank size: 0.5 m x 0.5 m x 0.5 m. This is a desirable facility for vendors who are expressing interest for

post bonding activities. They may get the support from other industries for providing end-to-end solutions.

- 5.1.5 Vendor shall have required tools for fixing SS helicoils to Aluminium inserts.
- 5.1.6 The bay shall be supported by various table top or bench level fitting machines like drilling machine, hand shearing machine, lathe machine, grinding machine, etc.,
- 5.1.7 There must be a vacuum cleaner to suck dust particles generated during manual repair or local machining.
- 5.1.8 The post bonding bay shall have pressurized air supply for operating pneumatic power tools and plungers for inserts potting.
- 5.1.9 The bay shall have AC power supply for operating electric driven hand power tools for local drilling, buffing, etc.,
- 5.1.10 The bay shall have accurately measuring weighing balances (Range: 0-2000 g, Accuracy: 0.01g) for weighing adhesive mixtures.
- 5.1.11 The bay shall also have weighing machine having capacity of 100 kg for weighing finished panels with an accuracy of 50 g.
- 5.1.12 The entire bay shall be illuminated suitably for better working.
- 5.1.13 The bay shall be equipped with multiple racks to store and identifying the various types of inserts and doublers.
- 5.1.14 The bay shall have suitable stands or racks to store both incoming and finished sandwich panels.
- 5.1.15 The bay shall have suitable vacuum pump to generate a coarse vacuum of 0.8 bar(g) to have voids free bonding.

**!!!! Attention Vendors!!!!**

Above mentioned infrastructure with required facilities are mandatory (except for Chromic acid anodising) for vendors who are expressing their interest for Post bonding of composite and Aluminium honeycomb sandwich panels.

# Chapter-6

## Thermal testing and Implementation activities

### (Type-4 activities)

Thermal testing and implementation activities are required to be carried out at vendor's premises on spacecraft panels & structural assembly components. Each panel / component shall have all or selected thermal activities as mentioned hereunder. Thermal control element Implementation & Testing activities on manufactured Spacecraft structure / Panel & Components to be carried out before the assembly are listed in the **Table -T1** .

#### 6.1 Thermal Systems Activities:

**Table -T1 : Thermal control element Implementation & Testing activities**

Activity No	Activity	Remarks
T-1	Ambient Thermal Test on Honeycomb panel	<b>Required only for Heat pipe embedded panels</b> Details are given in Section 6.3 T-1
T-2	Selective Thermal painting.	Details are given in Section 6.3 T-2
T-3	Rigid OSR bonding.	Details are given in Section 6.3 T-3
T-4	Heaters and Temperature Sensor Implementation.	Details are given in Section 6.3 T-4

URSC will provide required flight thermal control materials for activities (for activities T-2, T-3 &T-4) as part of Free Issue of Materials (FIM) against the placement of Work Order. All necessary tools/fixtures to be arranged by vendor.

Vendor has to make arrangements to collect the materials from URSC, and realize the panel level thermal testing and implementation activities as per the scope of work at vendor's premises and upon final clearance & acceptance by URSC, panels shall be delivered to URSC as per the terms & conditions.

There will be mandatory inspection points (MIP) from URSC team during different thermal testing and implementation activities, subsequent to the clearance from URSC at each stage or MIP, vendor shall carry out further activities. Realized components will undergo series of acceptance tests, as per the quality management plan, before clearance for services of a panel is deemed cleared.

## 6.2 Details of mandatory infrastructure requirements :

Activity	Equipment / Facility/ Infrastructure Requirement
T-1	<b>Equipments:</b> <ul style="list-style-type: none"> <li>❖ DC power supplies (0-100V, 0-4A or equivalent)</li> <li>❖ Data acquisition and control system (DACS)</li> <li>❖ Level adjustable working platform / surface table of approx. dimension 3.5m x 4.5m</li> </ul>
T-1 T-3 T-4	<b>Cleanroom:</b> <ul style="list-style-type: none"> <li>❖ Clean room particle count shall be better than 1,00,000 (0.5µm/ ft<sup>3</sup>) for panel surface preparation and curing. Size –sufficient to accommodate 4 m x 3 m panel, RH: 55±10%. Temperature: 20±5°C. HEPA/ULPA filter for particle control environment.</li> <li>❖ Particle count monitor, humidity &amp; temperature monitor equipment for measuring the environment inside clean room / air lock room</li> </ul>
	<b>Transit Area (Air Lock):</b> <ul style="list-style-type: none"> <li>❖ Controlled environment (RH 55±5% and temperature 22±2°C, particle count: 3,00,000 (0.5µm/ ft<sup>3</sup> or better) having dimension - 6m (L) x 6m (B) x 3m (H).</li> <li>❖ Door height at the entry of Airlock should have compatible dimension to position the container inside</li> </ul>
T-2	<b>Painting Booth</b> <ul style="list-style-type: none"> <li>• Cross draft; dry or water wash type; 100% filtered fresh air input.</li> <li>• Size –sufficient to accommodate 4 m x 3m panel</li> <li>• RH: 55±10 %</li> <li>• Temperature: 24±4°C</li> <li>• Air velocity: approx. 0.5 m/s</li> <li>• Air filtration: ≤ 5 µm particle size</li> </ul> <b>Spray Painting Gun System:</b> <ul style="list-style-type: none"> <li>• Gravity feed LVMP (Low Volume Medium Pressure) gun with less than 2 mm nozzle size; approx. 3 bar operating pressure. Air compressor: 5</li> </ul>

	bar / Equivalent with oil & water filter <ul style="list-style-type: none"> <li>• <b>Blower:</b> Controlled filtered fresh air, with an air velocity of approx. 0.5 m/s towards exhaust inside the painting booth.</li> </ul>
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**Note:**

- A detailed SOP to carry out the test and Thermal implementation activities and the quantum of work will be provided with RFP

## 6.3 Statement of Work

### T-1 Ambient Thermal Test on Honeycomb panel embedded with Heat pipes

**Description :**

- Preparation of test plan and instrumentation document in consent with URSC
- Fabrication of thermocouples using fabrication unit
- Periodic Calibration / validation of thermocouples and heaters (before every test), as per standard procedure by URSC / ISRO
- Thermal test instrumentation on the heat pipe panel
- Conduct of tests as per test cases and procedure provided by URSC / ISRO
- Preparation of test report as per the format provided by URSC / ISRO.

**Experience / Expertise:**

- Vendor shall have experience / expertise in generating test instrumentation drawings using AutoCAD, document preparation, activities such as implementation of tape heaters, thermocouples, insulation and conducting thermal performance tests, monitoring and storing the temperature data in data acquisition system. Vendors who have experience in handling space quality heat pipes / heat pipe panels will be preferred.
- The work involved in this service support activities are very sophisticated, critical, specific and challenging, demanding special skill set with precision and accuracy. The quoted vendors will be given a detailed presentation by the URSC/ISRO to make them understand the criticalities and test methodologies of the proposed activity.
- ISRO will evaluate all received eligible offers based on merit, content of each offer, experience of the vendor. Offers without the above information or offers with incomplete / inaccurate / false information will be rejected.

### **Major items required for each test**

- Consumables like thermocouples, heaters, polyimide sheets, transfer adhesive sheets, insulation materials, Litmus papers
- Spirit levels to ensure horizontality of the panel during the test
- Panel support blocks
- DC power supplies
- Data Acquisition & Control System (DACS)

### **Vendor responsibilities**

- a) Vendor is responsible for the periodic calibration / validation of the thermocouples and heaters.
- b) Vendor is responsible for test planning, instrumentation, monitoring the data, data acquisition, data checking, post-test analysis, report generation and submission to URSC as per standard test procedure.

## **Thermal Implementation (T-2, T-3 & T-04)**

- This activity involves preparation of implementation schemes by vendor team. URSC team will provide the required inputs like layouts, implementation requirements, locations as well as other inputs for implementation of thermal elements.
- Vendor shall deploy its team to interact with URSC engineers to begin the preparation of implementation scheme which includes preparation of test plans, drawing preparations, flight and ground materials issue requests. This activity shall require multiple iterations.
- Once all documents are approved, vendor shall store them as Work Order repository.

### **T-2 : Thermal Painting**

This activity involves the masking of the panel, de-anodizing (for doublers) , painting, de-masking as per the drawing. Vendor team is responsible for activity at their premises, record all the relevant data and implementation on the panel. After verification and clearance, it shall be cleared for the next activity. Detailed work instructions will be provided for all this activity

### **T-3 : Rigid OSR Bonding**

The bonding surface of the panel shall be cleaned thoroughly using recommended solvents, 1:1 mylar prints shall be matched and necessary corrections if any shall be

made. Each day requisite number of required OSRs shall be inspected and primed for use within 48hrs. The primed OSR shall be loaded onto the jigs. The jigs shall positioned onto the OSR area with known reference points These OSR segment shall be subjected to IR curing. After all segments are bonded the segments shall be covered with Protective cover.

## **T-04 : Foil Heaters & Temperature Sensor Implementation**

- This activity involves the preparation of heaters & Temperature Sensors for implementation as per the drawing approved by URSC Engineer.

### **❖ Foil Heater Implementation**

- Vendor team is responsible for transferring adhesive layer to the heaters, record all the relevant data and implementation on the panel or subsystem. After verification and clearance, heaters need to be interconnected as per the drawing. This will involve routing of heater harness also.

### **❖ Temperature Sensor (TS) implementation**

T S implementation as per the drawing approved by URSC Engineer. Vendor team is responsible for preparing the temperature sensors and adhesive (like weighing the required amount, mixing etc.), recording all the relevant data and mounting of the sensor as well as adhesive bonding. After curing of the adhesive, verification needs to be carried out. Detailed work instructions will be provided for all these activities.

### **❖ Thermal Control Tapes**

- ❖ **Variety of tapes** with different thermo-optical properties or end use are pasted locally or in a larger area as per design using transfer adhesive.
- These tapes include black tape, Kapton ® tape, low emittance tape, flexible OSR tape, copper tape.

## **6.3 Qualification & Skill Sets of Vendor's Manpower**

The activities in this EOI are skill sensitive and critical to satellite's on-orbit performance. It requires that all the procedures are to be followed meticulously so that the final product always conforms to the required quality standards. In order to

comprehend the sensitivity and importance of each and every step of the activities, the vendors are expected to deploy workforce with the necessary skills.

## 6.4 Modalities of Contract Execution

The realization of different thermal control elements on panel requires preparation of drawings and generation of checklist with constant interaction with engineers at TSG-URSC. This shall be followed up by test instrumentation setup preparation and necessary fabrication readiness at vendor's site. The details of sequence of activities are given hereunder:

<b>Sequence of Thermal Implementation Services on panels (Activities T2 to T-4)</b>			
<b>Sequence</b>	<b>List of Activities</b>	<b>Resources</b>	<b>Location</b>
1	<ul style="list-style-type: none"> <li>Finalization of inputs for panel</li> <li>Drawing preparation</li> <li>Test instrumentation requirements</li> <li>Finalization of FIM requirements</li> </ul>	Vendor staff &  TSG – Engineer In charge	URSC
2	<ul style="list-style-type: none"> <li>Transportation of FIM materials</li> <li>Preparation for component receipt readiness</li> <li>Laboratory readiness audit</li> <li>Preparation of thermal control elements</li> </ul>	Vendor staff	Site
3	Thermal Implementation activities as per work order	Vendor	Site
4	Quality Inspection after each activity	TSG & Vendor	Site
5	Pre-delivery inspection	TSG & Vendor	Site
6	Receiving Inspection at URSC	TSG & Vendor	URSC
7	Clearance of component by QA (including Testing of Co processed Coupons, if any )	TSG	URSC

# Chapter-7

## Facilities for assembly of spacecraft structural components and machining of metallic rings.

### (Type-5 activities)

These activities involve the following:

**Part-A:** Assembly of spacecraft structural components and

**Part-B:** Machining of metallic rings using four axes CNC machine.

Infrastructure and associated facilities required for each of the activities are explained in next paragraphs.

### **Part-A: Facilities required for assembly of Structural Components.**

Entire spacecraft structure needs to be assembled in a clean and AC environment. Activities involve the following:

- Assembly and bonding of machined interface rings with sandwich cylinder followed by fixing of rivets.
- Drilling of tank mounting insert holes using CNC machine
- Potting of tank inserts.
- Assembly of equipment panels, top and bottom decks, intermediate decks, shear web panels, brackets fixing, etc.,
- Bonding of CFRP angles connecting between shearweb panel and cylinder.

Structure assembly activities require usage of special tools, jigs and fixtures. Scope of the vendor includes assembly of spacecraft structure and also the design

and fabrication of required jigs and fixtures, procurement of special tools at Vendor's cost. To carry out the above assembly operations following facilities are required.

**7.1 Infrastructure required for spacecraft structure assembly activities (Below mentioned facilities under this paragraph are mandatory for Type-5 activities except CNC VTL as given in Sl. No. 7.1.2)**

- 7.1.1** High rise AC Clean room of size 15 m (width) x 20 m length x 12 m height. The clean room shall have 5 T OHT crane for handling panels and other fixtures. This is a mandatory infrastructure requirement for vendors who are expressing their interest for Type-5 activities.
- 7.1.2** Four Axis CNC VTL machine having table Dia. 2 m and vertical axis movement (Z) height of 4 m for drilling tank mounting insert holes in the cylinder. This is a desirable facility for type-5 activities. If the vendor is not having this facility, they may get the support from other industries. In which case, responsibility the prime vendor includes safe transportation of structural components, logistics arrangement and co-ordination with sub-contracted vendor.
- 7.1.3** Assembly bay shall have pressurized air supply for operating pneumatic power tools during rivets fixing.
- 7.1.4** The bay shall have AC power supply for operating electric driven hand power tools during local drilling, emerying, etc.,
- 7.1.5** The bay shall have accurately measuring weighing balances (Range: 0-2000 g, Accuracy: 0.01 g) for weighing adhesive mixtures.
- 7.1.6** The bay shall also have weighing machine having capacity of 500 kg for weighing panels and overall structure.
- 7.1.7** The entire bay shall be illuminated by LED / Florescent lamps with required luminous intensity as per applicable standards.
- 7.1.8** Fixing of rivets requires special tools. These tools shall be arranged by the vendor. Specifications and make will be provided by URSC.

- 7.1.9** Assembly bay shall have surface table (size 2 m x 3 m) and equipped with suitable inspection tools like stick micrometer, micrometer and Vernier caliper of various ranges, slip gauges, feeler gauges, steel rules, etc. to measure insitu assembly requirements. It shall also have laser tracker or equivalent to carryout inspection of jigs, intermediate and overall structure assemblies.
- 7.1.10** The bay shall be equipped with multiple racks to store and identifying the various types of edge clips, “L” angles, inserts and other constituent materials.
- 7.1.11** The bay shall have suitable vacuum pumps to generate a coarse vacuum of 0.8 bar(g) to have voids free bonding.
- 7.1.12** Within the bay area there shall be a clear area identified for Structure containerization. There must be a sufficient area to store tools, jigs and fixtures.
- 7.1.13** All sandwich panels and other components are of aerospace grade and are very much delicate in nature. Sufficient care shall be taken while handling of these components.
- 7.1.14** The assembly bay shall have required area for vehicle movement during loading of spacecraft and also to carry out insitu dimensional inspections using laser tracker, theodolites, etc.,
- 7.2 Typical sizes of assembled standard bus structures of typical spacecraft.**

Type of Spacecraft Bus Structure	Class-A	Class-B	Class-C
Size of Spacecraft Structures (m)	1.5 x1.5 x 1.5 (H)	1.5 x 1.6 x 2.4 (H)	1.7 x 2 x 3 (H)

## **Part-B: Machining of Metallic Rings (Desirable facility)**

### **7.3 Facilities required for machining of metallic rings**

Metallic rings of various diameters are required for spacecraft structures. These metallic rings are made with Aluminium Alloy forgings. To carry out these metallic rings machining, following facilities are required. This is a desirable facility for type-5 activities. If the vendor is not having this facility, they may get the support from other industries. In which case, responsibility the prime vendor includes safe transportation of structural components, logistics arrangement and co-ordination with sub-contracted vendor.

**7.3.1** Four Axis CNC Vertical Turning Lathe (CNC VTL) / CNC Vertical Turning Machining Centre (CNC VTMC) of size Dia. 1.5 m to 2 m.

**7.3.2** Machine accuracy:  $\pm 0.05$  mm.

**7.3.3** Z-axis travel length: 500 mm.

**7.3.4** Expertise is required to turn thick Aluminium forgings to a thin metallic rings of thickness 1.5 mm with a required precision / accuracy.

**7.3.5** There shall be sufficient area to store at least 10 Nos of Aluminium forgings and 10 Nos of finished rings at any time. Size of each forged ring is approximate Dia. 2000 mm (OD) x 200 mm (t) x 200 mm (h).

**!!!! Attention Vendors!!!!**

Vendors who are expressing their interest for assembly of structural component and machining of metallic rings i.e. type-5 activities. It is mandatory to have high rise AC hangar / assembly bay. For machining of metallic rings and drilling of tank inserts, they may get support from other industries by way of sub-contracting. But, providing end-to-end solutions is the responsibility of the vendor. URSC in no way will be responsible for such third party activities.

**Table-3: Summary of major facilities and their availability  
with the vendors.**

Category of activities	Name of the activity	Mandatory Facilities	Desirable Facilities
Type-1	Primary bonding of composite aluminum honeycomb sandwich panels.	Cold storage facility for storage of shelf life prepregs	-
		Autoclave for curing facility as given for Type-1 activities.	-
		AC bay for Composite lay-up and Processing AC bay	-
		-	Surface treatment facilities
		-	Prepreg cutting M/c
		-	Inspection and NDT facilities
		-	Video recording facility
Type-2	Machining of composite aluminium honeycomb sandwich panels	3 Axes CNC machine with Vacuum clamping bed and AC room for storing finished panels infrastructure as given for Type-2 activities	-
Type-3	Post Bonding of composite aluminium honeycomb sandwich panels	AC Processing bay with required infrastructure as given for Type-3 activities.	Chromic acid anodizing.
Type-4	Thermal implementation on post-bonded sandwich panels	Refer Section 6.2	-
Type-5	Assembly of spacecraft structural components machining of metallic rings.	AC high rise assy. hangar/bay with required infrastructure as given for Type-5 activities.	-
		-	Four axes CNC VTL for drilling of tank insert holes.
		-	Four axes CNC VTL/CNC VTMC for machining of metallic rings

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# Chapter – 8

## Terms and Conditions for Expression of Interest (EOI)

### **Part-A: Commercial**

#### **8.1 Organisation Portfolio**

- 8.1.1** The applicant may be a Proprietorship, Registered Partnership Firm, Indian Company/Domestic Company-Private or Public Company-Listed or Unlisted. Vendor shall submit the interest in the given EOI response sheet.
- 8.1.2** An Indian Company would be deemed to be owned by Indian Citizen and by an Indian Company if more than 51 percent of equity interest in the company is beneficially owned by Resident Indian Citizens and Indian Companies that are, in turn, ultimately owned and controlled by Resident Indian Citizens.
- 8.1.3** Control has been defined as the right to appoint the majority of the Directors or to control management and policy decisions, including by virtue of their shareholdings or management rights or shareholders or agreement or voting arrangements.
- 8.1.4** The vendor must be registered in India as required by law with minimum three years of continuous operation up to the date of publication of this EOI.
- 8.1.5** The Vendor should also have a valid GST registration. The Vendor should submit Self-attested copies of the Certificates of Incorporation and

other certificates that are legally required for carrying out its business activities in India.

**8.1.6** The above certificates should be valid at the time of EOI submission and should be certified by an authorized signatory. A copy of PAN Card should also be submitted.

**8.1.7** Income Tax Returns of the last three assessment years duly certified by a Chartered Accountant has to be submitted.

**8.1.8** An undertaking (self-certificate) is to be submitted that, the Organization hasn't been blacklisted by any Central/ State Government Department/ Central Government funded organizations/ State Government funded organizations/ World Bank, or other World Bank organizations and is not under any illegal expression by Government of India.

**8.1.9** The vendor, should not have, during the last three years, either failed to perform on any agreement, or been expelled from any project or agreement or have any agreement terminated for breach by the applicant.

**8.1.10** Persons who are individually or institutionally, in any manner, involved with the selection/screening process of the EOI, and employees of ISRO are ineligible for applying.

**8.1.11** An undertaking (self-attested) is to be submitted that there has been no outstanding bankruptcy, judgment or pending legal action that could impair operating as a going Concern. Also the Vendor must be solvent, in the Legal Court of Law.

## **8.2 General**

**8.2.1** **Vendor should note that this EOI is not an offer and is issued with no commitment from URSC.** URSC reserves the right to withdraw the EOI or change or vary any part thereof at any stage. URSC also reserves the right to disqualify any Vendor/proposal, should it be so necessary at any stage.

- 8.2.2** URSC/ISRO is already having MoUs / Contracts for manufacturing and assembly of spacecraft structures with PSU. Apart from PSUs, URSC is aiming to identify new vendors to take up the realisation of spacecraft structures within INDIA to improve through put from outsourcing. **PSUs having MOU with URSC / ISRO for manufacturing and assembly of spacecraft structures shall not respond to this EOI.** Their EOIs will not be considered.
- 8.2.3** Vendor development for any of the activities listed in Type-1 to Type-5 is not in the scope of this EOI. Vendor shall have the required expertise / experience in any of the activities listed in Type-1 to Type-5 at the time submission of this EOI.
- 8.2.4** Timing and sequence of events resulting from this EOI shall ultimately be determined by URSC.
- 8.2.5** By submitting a proposal, each vendor shall be deemed to acknowledge that the Vendor has carefully read all chapters of this EOI, and has fully informed themselves about all terms and conditions.
- 8.2.6** The proposal and all correspondence and documents shall be written in English.
- 8.2.7** **Vendor shall compulsorily fill up the Response format and compliance matrix (Formats 1 to 9 and Formats B1 to B5) as given in subsequent Chapters of EOI document.**
- 8.2.8** Pre-EOI Meeting: A pre-EOI Meeting will be arranged at UR Rao Satellite Centre, Bengaluru at the specified date and time. Vendors are encouraged to attend this meeting for better understanding of the EOI with regard to Technical and Commercial aspects and to clarify doubts if any. Request for preponement or postponement of this meeting will not be considered.
- 8.2.9** **Predatory Pricing:** The Vendor shall specifically take note that “Predatory Pricing” at the Request for Proposal [RFP] stage will not be

accepted and such Bids not meeting even the basic cost of input i.e., Quoting unreasonably low Prices to undercut and obtain the Contract are liable to be ignored/rejected, in order to obtain Quality Products.

**8.2.10 Non-Disclosure Agreement (NDA):** All documents/part drawings part of this EOI and subsequent documents/part drawings issued for evaluation and execution of works and any other communication revealed during the project will be exclusive property of URSC and Vendor shall have no right whatsoever on them and shall not disclose to any other person/party not involved in the execution of the allotted work. The qualifying vendor must take an undertaking on NDA as per the prescribed format.

**8.2.11** Further, the Vendor must not quote any of these works in any publications or to any of their customers/public domain without explicit permission from URSC and adhere to strict confidentiality.

**8.2.12 GST Registration:** Government of India has implemented Goods and Services Tax [GST] w.e.f 01.07.2017. The Vendor should mandatorily possess a valid GSTIN along with the GST Registration Certificate. Please take note of this aspect.

**8.2.13** Cost required to establish the facilities or to design and fabricate jigs, fixtures, special tools with necessary raw materials have to be borne by vendor. No one time cost or additional cost will be paid by URSC under whatsoever headings.

**8.2.14** Vendors may please note that, proposed outsourcing products / activities / operations are not bulk order type. The type and scope of work to be outsourced will be decided by URSC. Even after EOI and RFP stage, final decision of outsourcing rests with URSC and does not have any binding to necessarily / mandatorily outsource the work continuously.

**8.2.15** Based on the EOIs received, URSC will shortlist the Interested and technically suitable Manufacturers for procurement through regular tendering process. **Request for proposal will be sent ONLY to those vendors qualified though this EOI.** Further, it may be noted that there

may or may not be a RFP / Regular tender as a sequel to this EOI. Final decision in this regard rests with URSC.

- 8.2.16** This EOI is neither an agreement nor an offer and is only an invitation by URSC to the interested parties for submission of EOIs. No obligation of whatsoever nature shall arise from the EOI process
- 8.2.17** URSC reserves the right to cancel the present EOI without assigning any reason thereof, if only very limited response is received or the EOI submitted by Interested Manufacturers are not complying with the requirements.
- 8.2.18** URSC reserves the right, at any time, to waive any of the requirements of this Request for EOI document, if it is deemed in the interest of URSC.
- 8.2.19** After examining the EOI, some or all of the Interested Manufacturers may be asked to make presentation to URSC. URSC officials may visit the production plant premises for further evaluation.
- 8.2.20** Wilful misrepresentation of any fact in the EOI will lead to disqualification of Interested Manufacturer.
- 8.2.21** Brief overview of the scope of work given in this document may be further elaborated in the subsequent request.
- 8.2.22** Vendors may please note that URSC reserves the right to outsource either ALL or some parts of activities mentioned in this Expression of Interest (EOI). The final decision rests with URSC.
- 8.2.23** Free Issue Materials (FIM) will be issued against valid bank guarantee / insurance of equivalent value.

## **8.3** **Part-B: Technical**

Vendors are required to read the full document carefully and adhere to the clauses / information provided elsewhere in the document. However, the following points may be noted and are re-iterated for better compliance and suitability of the vendors to this EOI.

- 8.3.1** It is required for the organization to have valid Quality Management Systems (QMS) certificate like ISO 9001:2015 or its equivalent. This is mandatory clause. Valid QMS certificate shall be sent along with EOI.
- 8.3.2** It is desirable that the vendor should have rich heritage of supply of bonded composite structural products to aerospace industries. Proof of supply shall be sent along with EOI. Supply of composite products to non-aerospace industries like automotive, sports, transport, will not count for heritage of supply.
- 8.3.3** Vendors should mandatorily have the required facility / factory to support manufacturing and assembly of spacecraft structures including Thermal testing and implementation activities. If vendors are required to sub-contracting to another industry for some specific operations, responsibility of inter co-ordination and logistics with sub-contracted vendor lies with the lead vendor who has responded to EOI.
- 8.3.4** Prospective vendors are mandatorily required to have facilities mentioned for various activities viz., primary bonding, machining of honeycomb sandwich panels, post bonding, assembly activities and machining of metallic rings. Information regarding available infrastructure, facilities, make and size equipments, etc., with the vendor shall be clearly mentioned in their EOI. Catalogues of such equipments may also be attached along with EOI. All facilities and equipments will be physically verified and inspected by URSC to arrive at vendor's suitability.
- 8.3.5** This EOI is aimed at to have the support from prospective vendors who are already having required facilities with spare capacity and trained / experienced

work force to take up activities related to spacecraft structures manufacturing, assembly including Thermal testing and implementation activities.

- 8.3.6** Vendors may please note that all raw materials are of aerospace grade and are costly in nature. Hence, sufficient care should be taken for ensuring proper storage / usage of these materials. Failure to which, vendor may attract a suitable risk clause.
- 8.3.7** Quality of the product is paramount and realising the quality product from prospective vendors is essence of EOI. Manufacturing, assembly of structural components, thermal testing and implementation activities on sandwich panels should be as per URSC qualified processes. Hence, vendors are requested to follow all quality protocols, rigorous in-process inspection, vigilant online quality control, mandatory check & inspection points, stage clearances, etc., may please be followed strictly.
- 8.3.8** Transportation of fully assembled and finished spacecraft structure with thermal implementation requires special containers having controlled temperature environment and vibration isolators. Specially made low level bed long trailer is required to transport this container (assembled with structure) to URSC stores. It is the responsibility of the vendor to arrange these containerization and transport requirements.
- 8.3.9** Activities listed in this EOI require design, fabrication, procurement of jigs, fixtures and special tools. It is responsibility of the vendor to arrange the required raw material for the above and URSC will not provide any raw materials for these tools and fixtures. URSC will only provide raw materials to the flight hardware as Free Issue Materials.
- 8.3.10** Activities listed in this EOI requires vendor or their outsourced vendor to have technical manpower with required experience / expertise in the desired field. Vendors are required to provide the details of the manpower (both Engineers and technicians) as per the Format-6.

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## Chapter – 9

### EOI Response formats and Compliance statements.

The proposal should be submitted as an Expression of Interest (EOI) as a collation of filled formats **(Format-1 to 9 and Format-B1 to B5)** clearly providing the details requested with documentary proof/supporting documents as Annexures. All inputs may be furnished in English language and neatly typed document in the said formats.

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## Format-1:

### Main Covering Letter

(To be printed on Company letter head)

[Date]

To,

**SENIOR HEAD, PURCHASE & STORES**

**U R Rao Satellite Centre**

**HAL Airport Road, Vimanapura Post**

**Bangalore -560017, Karnataka**

Dear Sir,

**Ref: Expression of Interest for “Structure Manufacturing and assembly activities”**

Having examined the Expression of Interest (EOI), the receipt of which is hereby duly acknowledged, we, the undersigned, intend to submit a proposal in response to the Expression of Interest (EOI).

We attach hereto the response as required by the EOI, which constitutes our proposal. Primary and Secondary contacts for our company are:

	<b>Primary Contact</b>	<b>Alternate Contact</b>
<b>Name</b>		
<b>Title</b>		
<b>Company Name</b>		
<b>Address</b>		
<b>Phone</b>		
<b>Mobile</b>		
<b>Fax</b>		
<b>E – mail</b>		

We confirm that the information contained in this response or any part thereof, including its exhibits, and other documents and instruments delivered or to be delivered to URSC is true, accurate, verifiable and complete. This response includes all information necessary to ensure that the statements therein do not in whole or in part mislead URSC in its short-listing process.

We fully understand and agree to comply that on verification, if any of the information provided here is found to be misleading the short listing process, we are liable to be dismissed from the selection process or termination of the contract during the execution of the contract.

We agree for unconditional acceptance of all the terms and conditions set out in the EOI document.

It is hereby confirmed that I/We are entitled to act on behalf of our company/ corporation/ firm / organization and empowered to sign this document as well as such other documents, which may be required in this connection.

Dated this

(Signature) (In the capacity of)

(Name)

Duly authorized to sign the EOI Response for and on behalf of:

(Name and Address of Company) Seal / Stamp of Vendor

Witness Signature:

Witness Name:

Witness Address:

### **CERTIFICATE AS TO AUTHORIZED SIGNATORIES**

I, .....the Company Secretary of .....certify that  
.....Who signed the above response to EOI is authorized to do so and  
bind the company by authority of its board / governing body.

Date:

Signature:  
(Company Seal)

## Format-2.

### General Details of vendor

1	Name of the Vendor	
2	Year of Establishment	
3	Core capabilities of the Vendor, standard products from vendors if any	Type here the brief profile of the Vendor
4	Head office location and address with contact number & email id:	
5	Local address in Bangalore if any with contact number & email id:	
6	Addresses of manufacturing and/or operational setup in India  <b>(Highlight the address where URSC representative shall visit for inspection)</b>	
7	Corporate website URL, if any:	

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## Format-3

### Financial statement

Auditor certified statements for the last three years FY 2021-2022, FY 2022-2023& FY 2023-2024 in Annexure-B (please provide the profit and loss statement and balance sheet).

Sl. No.	Description	FY 2021-2022	FY 2022-2023	FY 2023-2024
1	Net Revenue from Operations (in INR Crores)			
2	EBTD [Earnings Before Tax and Depreciation]			
3	% of Revenue from Aerospace Segment/Unit			
4	Net worth			
5	Share Capital			
6	% of shareholding by Indian			
7	% of shareholding by Foreign			

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## Format-4

### Activity response formats

Spacecraft structural manufacturing activities are broadly into 5 types viz., Type-1 to Type-5 activities. Vendors are requested express their interest by appropriately marking against each type of activities. They may express for any or all types of works depending on their expertise and availability of required facilities.

<b>Work type</b>	<b>Name of the activity</b>	<b>Vendor's response</b> (Please write <b>YES or NO</b> as your response)
Type-1	Primary Bonding of Spacecraft Structural Components	(if "YES", please ensure to fill form B-1)
Type-2	Machining of Composite and Aluminium Honeycomb Sandwich panels	(if "YES", please ensure to fill form B-2)
Type-3	Post bonding of Composite and Aluminium Honeycomb Sandwich panels	(if "YES", please ensure to fill form B-3)
Type-4	Thermal testing and implementation on sandwich Panels	(if "YES", please ensure to fill form B-4)
Type-5	Assembly of Spacecraft Structural Components and Machining of metallic rings.	(if "YES", please ensure to fill form B-5)

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## Format-B1

### Compliance Matrix to be filled by Vendors for Type-1 activities.

**Name of the activity: Primary Bonding of Spacecraft Structural Components**

Clause No.	Name of the facility	Vendor's remarks (Please write Yes / No, Noted, available with vendor / outsourced vendor, please provide size of the equipment wherever applicable)
3.1	Cold Storage maintained at temperature of - 20 °C, round the clock (24x7). <b>[Mandatory facility]</b>	
3.2	Vapour de-greasing facility, painting booth for primer application, Chromic acid anodizing and Sulpho-chrome etching facility are required for raw material cleansing and surface treatment activities prior to bonding. Vendor should take responsibility of getting surface treatment of components from other DGCA/DGQA/NADCAP/ISRO centers certified industries, if they do not have surface treatment facilities of their own. <b>[Desirable facility]</b>	
3.3	Processing bay or lay-up room or clean room of size 10 m x 20 m, ISO Class 8 (One lakh class) with OHT Crane facility (min 3T). The clean room shall have portable vacuum pumps to generate a coarse vacuum of 0.8 bar(g) for product de-bulking. <b>[Mandatory facility]</b>	
3.4	Autoclave facility of size Dia. 2.5 m x 4 m	

	length (minimum), Pressure 7 bar(g), temperature 200 °C and vacuum of 0.8 bar(g). Autoclave shall have fully automatic/semi-automatic control system for better curing of components. Autoclave shall be able to cure at a heating and cooling rates 1 to 2 deg. C per minute. <b>[Mandatory facility]</b>	
3.5	Fully automatic and programmable prepreg cutting machine of bed size 1.7 m x 1.8 m with CFRP prepreg holding system. [Desirable facility]	
3.6	Inspection facilities like 3D coordinate measuring machine (CMM) and / or Laser tracker of minimum 5 m length x 5 m width x 1.5 m height. NDT facilities like instrumented coin tap facility, ultra-sonic, A-scan, C-scan & Shearography facilities. Testing facilities like UTM machine with 100 kN capacity with automatic recording facilities for testing of process control coupons. [Desirable facility]	
3.7	Automatic Video recording facility for recording lay-up activities in processing bay / layup room / clean room. [Desirable facility]	

## Format-B2

### Compliance Matrix to be filled by Vendors for Type-2 activities.

**Name of the activity: Machining of Composite and Aluminium Honeycomb sandwich panels**

Clause No.	Name of the facility	Vendor's remarks (Please write Yes / No, Noted, available with vendor / outsourced vendor, please provide size of the equipment wherever applicable)
4.2	Three axis CNC machine / router [Mandatory facility] with probing facility and vacuum clamping bed. Minimum sizes are: X - axis travel length: 3 m Y- axis travel length: 2.5 m Z- axis travel length: 0.3 m <b>[Mandatory facility]</b>	
	Built in vacuum clamping system with bed size of 2.5 m X 3 m for clamping Sandwich panels during machining. Mechanical clamping of sandwich panels is not allowed. <b>[Mandatory feature]</b>	
	Spindle speed: 10,000 RPM.	
	Positional accuracy requirement as per the VDI DGQ-3441: Positioning uncertainty (P) for X &Y is axis 30 microns for full travel.	
	Large size automated Vacuum sucking system to suck the CFRP and Aluminium dust generated during the machining.	

	An area of approximately 250 sq. m with air conditioned dust free environment to store the bare panel and finished components.	
4.3	<b>Scope of Work &amp; vendors' responsibility for Aluminium honeycomb sandwich panel machining</b>	
	Structural and Integration Layout Drawing study and manual CNC programming for machining of Structural and Integration interface holes, cut-outs and profile etc.	
	Preparation of vacuum clamping layout for through machining using soft copies of drawings and vacuum bed model on CAD module.	
	Checking of CNC program in all respects by manual and graphics simulation method.	
	Machining of actual flight Honeycomb sandwich components in all respects on top and bottom side using appropriate special cutting tools.	
	Machining of different type of test coupons from the bare panel.	
	Vendor is required to collect the bare honeycomb panel from URSC and transporting to the machining location safely with proper packing to avoid damage, since panels are prone to damage.	
	Delivering the finished honeycomb panel to URSC safely with proper packing to avoid damage, since panels are having finished edges and prone to damage.	
4.4	<b>Quality requirement Aluminium honeycomb sandwich panel machining.</b>	
	Components should not be contaminated during machining either by machine or by lubrication oil. Components should be machined without any type of coolant.	
	Component should not get de-bonded by machining operations. Sufficient care shall be taken for selection of proper special cutting tools and cutting parameters	

	for machining .	
	Mechanical damages should not happen during component handling, machining and vacuum clamping.	
	Rejection of component by any means is not allowed, as bare panels are already subjected to many man and machine hours.	
	Positional accuracy to be maintained within Ø 0.1 mm.	
4.5	<b>Care during bare panel, finished components handling and storing.</b>	
	Bare sandwich panels to be stored in vertical position in specially designed racks. Panels should not be stored horizontally and if any objects falls on the panel it would damage as the panels are very weak in compression.	
	Finished components to be packed by soft material and to be stored on the table, not to be kept on floor.	
	Transporting of finished components are to packed with bubble plastic sheet, foam and no other objects to be kept on the component.	

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## Format-B3

### Compliance Matrix to be filled by Vendors for Type-3 activities.

**Name of the activity: Post bonding of Composite and Aluminium Honeycomb sandwich panels**

Clause No.	Name of the facility	Vendor's remarks (Please write Yes / No, Noted, available with vendor / outsourced vendor, please provide size of the equipment wherever applicable)
<b>All the below mentioned facilities/ infrastructures are mandatory</b>		
<b>5.1</b>	AC Clean room of size 12 m (width) x 20 m length x 5 m height. The entry and exits of the bay shall be big enough to take the bigger panels of size 2 m x 2.5 m.	
	There must be at least 6 Nos of working tables of size 2 m x 3 m to carryout insert potting operations.	
	Post Bonding bay shall have table top Tri Chloro Ethylene (TCE) based ultrasonic degreaser for surface cleaning of inserts and metallic doublers before potting and bonding respectively.	
	Chromic acid anodizing with hot water sealing: For Aluminium doublers, inserts, brackets, etc., Tank size: 0.5 m x 0.5 m x 0.5 m. This is a desirable facility for vendors who are expressing interest for post bonding activities. They may get the support from other industries for providing end-to-end solutions.	

Vendor shall have required tools for fixing SS helicoils to Aluminium inserts.	
The post bonding bay shall have pressurized air supply for operating pneumatic power tools and plungers for inserts potting.	
The bay shall have accurately measuring weighing balance (Range: 0-2000 g, Accuracy: 0.01 g) for weighing adhesive mixtures.	
The bay shall also have weighing machine having capacity of 100 kg for weighing finished panels with an accuracy of 50 g.	
The bay shall have suitable vacuum pump to generate a coarse vacuum of 0.8 bar(g) to have voids free bonding.	
The bay shall be supported by various table top or bench level fitting machines like drilling machine, hand shearing machine, lathe machine, grinding machine, etc.,	
There must be a vacuum cleaner to suck dust particles generated during manual repair or local machining.	
The bay shall have AC power supply for operating electric driven hand power tools for local drilling, buffing, trepanning, etc.,	
The entire bay shall be illuminated LED / Florescent lamps with required luminous intensity as per applicable standards.	
The bay shall be equipped with multiple racks to store and identifying the various types of inserts and doublers.	
The bay shall have suitable stands or racks to store both incoming and finished sandwich panels.	

## Format-B4

### Compliance Matrix to be filled by Vendors

#### For type-4 activities.

**Name of the activity: Thermal testing Implementation activities on Sandwich Panels.**

Clause No.	Name of the facility	Vendor's remarks (Please write Yes / No, Noted, available with vendor / outsourced vendor, please provide size of the equipment wherever applicable)
6.2	DC Power supplies and Data Acquisition system	
	Level adjustable working platform/ surface table of size 3.5m x 4.5m	
	Clean room of size 10 m x 10 m	
	Transit area of size 6 m x 6m x 3m Height	
	Painting booth	
6.3	Ambient Thermal testing on honeycomb panel	
	Thermal implementation	
	Thermal Painting	
	Rigid OSR bonding	
	Foil heaters and Temperature Sensors implementation	

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## Format-B5(a)

### Compliance matrix to be filled by Vendors for type-5 activities.

**Name of the activity: Assembly of Spacecraft Structural components and machining of metallic rings.**

**Part-A: Assembly of Spacecraft Structural components**

Clause No.	Name of the facility	Vendor's remarks (Please write Yes / No, Noted, available with vendor / outsourced vendor, please provide size of the equipment wherever applicable)
7.1	High rise AC Clean room of size 15 m (width) x 20 m length x 12 m height. The clean room shall have 5 T OHT crane for handling panels and other fixtures. <b>[Mandatory facility]</b>	
	Three Axis CNC VTL machine having table Dia. 2 m and vertical axis movement (Z) height of 4 m for drilling tank mounting insert holes in the cylinder. <b>[Desirable facility]</b>	
	Assembly bay shall have pressurized (8 bar(g)) air supply for operating pneumatic power tools during rivets fixing.	
	The bay shall have accurately measuring weighing balances (Range: 0-2000 g, Accuracy: 0.01 g) for weighing adhesive mixtures.	
	The bay shall also have weighing machine having capacity of 500 kg for weighing panels and overall	

structure.	
The bay shall have suitable vacuum pump to generate a coarse vacuum of 0.8 bar(g) to have voids free bonding.	
Within the bay area there shall be a clear area identified for Structure containerization. There must be a sufficient area to store tools, jigs and fixtures.	
The bay shall have AC power supply for operating electric driven hand power tools during local drilling, emerying, etc.,	
The entire bay shall be illuminated LED / Florescent lamps with required luminous intensity as per applicable standards.	
Fixing of rivets requires special tools. These tools shall be arranged by the vendor. Specifications and make will be provided by URSC.	
Assembly bay shall be equipped with have surface table (size 2 m x 3 m) and suitable inspection tools like stick micrometer, micrometer and vernier caliper of various ranges, slip gauges, feeler gauges, steel rules, etc. to measure insitu assembly requirements. It shall also have laser tracker or equivalent to carryout inspection of jigs, intermediate and overall structure assemblies.	
The bay shall be equipped with multiple racks to store and identifying the various types of edge clips, "L" angles, inserts and other constituent materials.	

## Format-B5(b)

### Compliance matrix to be filled by Vendors for type-5 activities.

**Name of the activity: Assembly of Spacecraft Structural components and machining of metallic rings.**

**Part-B: Machining of Metallic rings**

Clause No.	Name of the facility	Vendor's remarks (Please write Yes / No, Noted, available with vendor / outsourced vendor, please provide size of the equipment wherever applicable)
7.3	Four Axis CNC Vertical Turning Lathe (CNC VTL) / CNC Vertical Turning Machining Centre (CNC VTMC) of size Dia. 1.5 m to 2 m. [Desirable facility]	
	Machine accuracy $\pm 0.05$ mm	
	Z-axis travel length: 500 mm.	
	Expertise is required to turn thick Aluminium forgings to a thin rings of thickness 1.5 mm with a required precision / accuracy.	
	There shall be sufficient area to store at least 10 Nos of Aluminium forgings and 10 Nos of finished rings at any time.	

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## Format-5(a)

### Compliance Matrix be filled by Vendors for Terms & Conditions (Commercial).

#### **Part-A: Commercial**

<b>Clause No.</b>	<b>Name of the facility</b>	<b>Vendor's remarks</b> (Please write Yes / No, Noted, Comply. Please provide your explanation wherever applicable)
<b>8.1</b>	<b>Organization Portfolio</b>	
	The applicant may be a Proprietorship, Registered Partnership Firm, Indian Company/Domestic Company-Private or Public Company-Listed or Unlisted. Vendor shall submit the interest in the given EOI response sheet.	
	An Indian Company would be deemed to be owned by Indian Citizen and by an Indian Company if more than 51 percent of equity interest in the company is beneficially owned by Resident Indian Citizens and Indian Companies that are, in turn, ultimately owned and controlled by Resident Indian Citizens.	
	Control has been defined as the right to appoint the majority of the Directors or to control management and policy decisions, including by virtue of their shareholdings or management rights or shareholders or agreement or voting arrangements.	
	The vendor must be registered in India as required by law with minimum three years of continuous operation up to the date of publication of this EOI.	
	The Vendor should mandatorily possess a valid GSTIN along with the GST Registration Certificate. The Vendor should submit Self-attested copies of the Certificates of Incorporation and other certificates that are legally	

	required for carrying out its business activities in India.	
	The above certificates should be valid at the time of EOI submission and should be certified by an authorized signatory. A copy of PAN Card should also be submitted.	
	Income Tax Returns of the last three assessment years duly certified by a Chartered Accountant has to be submitted.	
	An undertaking (self-certificate) is to be submitted that, the Organization hasn't been blacklisted by any Central/ State Government Department/ Central Government funded organizations/ State Government funded organizations/ World Bank, or other World Bank organizations and is not under any illegal expression by Government of India.	
	The vendor, should not have, during the last three years, either failed to perform on any agreement, or been expelled from any project or agreement or have any agreement terminated for breach by the applicant.	
	Persons who are individually or institutionally, in any manner, involved with the selection/screening process of the EOI, and employees of ISRO are ineligible for applying.	
	An undertaking (self-attested) is to be submitted that there has been no outstanding bankruptcy, judgment or pending legal action that could impair operating as a going Concern. Also the Vendor must be solvent, in the Legal Court of Law.	
	<b>General</b>	
<b>8.2</b>	This EOI is not an offer and is issued with no commitment. URSC reserves the right to withdraw the EOI or change or vary any part thereof at any stage. URSC also reserves the right to disqualify any Vendor/proposal, should it be so necessary at any stage.	
	URSC/ISRO is already having MoUs / Contracts for	

manufacturing and assembly of spacecraft structures with PSU. In addition, URSC is aiming to have additional vendors to take up the realization of spacecraft structures within INDIA to improve through put from outsourcing. PSUs having MOU with URSC need not respond to this EOI. Their EOIs will not be considered.	
Timing and sequence of events resulting from this EOI shall ultimately be determined by URSC.	
By submitting a proposal, each vendor shall be deemed to acknowledge that the Vendor has carefully read all chapters of this EOI, and has fully informed themselves as to all existing terms and conditions.	
The proposal and all correspondence and documents shall be written in English.	
Vendor shall compulsorily fill up the Response format and compliance matrix ( <b><u>Format-1 to 9 and Format-B1 to B5</u></b> )	
<b>Pre-EOI Meeting:</b> A pre-EOI Meeting will be arranged at UR Rao Satellite Centre, Bengaluru at the specified date and time. Vendors are encouraged to attend this meeting for better understanding of the EOI with regard to Technical and Commercial aspects and to clarify doubts if any. Request for preponement or postponement of this meeting will not be considered	
The Vendor shall specifically take note that “Predatory Pricing” at the Request for Proposal [RFP] stage will not be accepted and such Bids not meeting even the basic cost of input i.e., Quoting unreasonably low Prices to undercut and obtain the Contract are liable to be ignored/rejected, in order to obtain Quality Products.	
All documents/part drawings part of this EOI and subsequent documents/part drawings issued for evaluation and execution of works and any other	

communication revealed during the project will be exclusive property of URSC and Vendor shall have no right whatsoever on them and shall not disclose to any other person/party not involved in the execution of the allotted work. The qualifying vendor must take an undertaking on NDA as per the prescribed format.	
Vendor must not quote any of these works in any publications or to any of their customers/public domain without explicit permission from URSC and adhere to strict confidentiality.	
GST Registration: Government of India has implemented Goods and Services Tax [GST] w.e.f 01.07.2017. The Vendor should mandatorily possess a valid GSTIN along with the GST Registration Certificate. Please take note of this aspect.	
Cost required to fabricate tools including jigs and fixtures have to be borne by vendor. No one time cost or additional cost will be paid by URSC.	
Vendors may please note that, proposed outsourcing products / activities / operations are not bulk order type. The type and scope of work to be outsourced will be decided by URSC. Even after EOI and RFP stage, final decision of outsourcing rests with URSC and does not have any binding to necessarily / mandatorily outsource the work continuously.	
Based on the EOIs received, URSC will shortlist the Interested and technically suitable Manufacturers for procurement through regular tendering process.	

	<p><b><u>Request for proposal will be sent ONLY to those vendors qualified though this EOI.</u></b> It is to inform that there may or may not be a RFP / Regular tender as a sequel to this EOI. Final decision in this regard rests with URSC.</p>	
	<p>This EOI is neither an agreement nor an offer and is only an invitation by URSC to the interested parties for submission of EOIs. No obligation of whatsoever nature shall arise from the EOI process.</p>	
	<p>URSC reserves the right to cancel the present EOI without assigning any reason thereof, if only very limited response is received or the EOI submitted by Interested Manufacturers are not complying with the requirements.</p>	
	<p>URSC reserves the right, at any time, to waive any of the requirements of this Request for EOI document, if it is deemed in the interest of URSC</p>	
	<p>Wilful misrepresentation of any fact in the EOI will lead to disqualification of Interested Manufacturer</p>	
	<p>Brief overview of the scope of work given in this document may be further elaborated in the subsequent request</p>	
	<p>Vendors may please note that URSC reserves the right to outsource either ALL or some parts of activities mentioned in this Expression of Interest (Eoi). The final decision rests with URSC</p>	
	<p>Free Issue Materials (FIMs) will be issued against Material Bank Guarantee / insurance.</p>	

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## Format-5(b)

### Compliance Matrix be filled by Vendors for Terms & Conditions (Technical).

#### **Part-B: Technical**

<b>Clause No.</b>	<b>Name of the facility</b>	<b>Vendor's remarks</b> (Please write Yes / No, Noted, Comply. Please provide your explanation wherever applicable)
<b>8.3</b>	It is required for the organization to have valid Quality Management Systems (QMS) certificate like ISO 9001:2015 or its equivalent. This is mandatory clause. Valid QMS certificate shall be sent along with EOI.	
	The vendor should have rich heritage of supply of bonded composite structural products to aerospace industries. Proof of supply shall be sent along with EOI. Supply of composite products to non-aerospace industries like automotive, sports, transport, will not count for heritage of supply. Provide the detail about work, and work order value with relevant purchase order copies if any.	
	Vendor should have the required facility / factory to support manufacturing and assembly of spacecraft structures including Thermal testing and implementation activities.	
	Prospective vendors are mandatorily required to have facilities mentioned for various operations viz., primary bonding, sandwich panel machining, post bonding, assembly activities and metallic rings	

<p>machining. Sizes of the facilities / equipments shall be clearly mentioned in their EOI. Catalogues of such equipments may be attached along with EOI. All facilities and equipments will be physically verified and inspected by URSC to arrive at vendor's suitability.</p>	
<p>This EOI is aimed at to have the support from prospective vendors who are already having required facilities with spare capacity and trained / experienced work force to take up activities related to spacecraft structures manufacturing and assembly including Thermal testing and implementation activities.</p>	
<p>Vendors may please note that all raw materials are of aerospace grade and are costly in nature. Hence, sufficient care should be taken for ensuring proper storage / usage of these materials. Failure to which, vendor may attract a suitable risk clauses</p>	
<p>Quality of the product is paramount and realising the quality product from prospective vendors is essence of EOI. Manufacturing, assembly of structural components, thermal testing and implementation activities on sandwich panel should be as per URSC qualified processes. Hence, vendors are requested to follow all quality protocols, rigorous in-process inspection, vigilant online quality control, mandatory check &amp; inspection points, stage clearances, etc., may please be followed strictly</p>	
<p>Transportation of fully assembled and finished spacecraft structure with thermal implementation requires special containers having controlled temperature environment and vibration isolators.</p>	

	<p>Specially made low level bed long trailer is required to transport this container (assembled with structure) to URSC stores. It is the responsibility of the vendor to arrange these containerization and transport requirements</p>	
	<p>Activities listed in this EOI require design, fabrication, procurement of jigs, fixtures and special tools. It is responsibility of the vendor to arrange the required raw material for the above and URSC will not provide any raw materials for these tools and fixtures. URSC will only provide raw materials to the flight hardware as Free Issue Materials</p>	
	<p>Activities listed in this EOI requires vendor or their outsourced vendor to have technical manpower with required experience / expertise in the desired field. Vendors are required to provide the details of the manpower (both Engineers and technicians) as per the Format-6.</p>	

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## Format-6

### Availability of technical & experienced manpower with Vendor / or with Outsourced Vendor

Name of the activity	Category and No. of Engineers		Category and No. of Technicians		Whether available with vendor <u>OR</u> with outsourced vendor	Remarks
	Category	Nos	Category	Nos		
Type-1	B.E. / M.E Mechanical		(a) ITI- Fitter (b) DME (c) DCE		Vendor / Outsourced vendor	Experience in the field of composite manufacturing and sandwich panel fabrication using vacuum bagging technique and autoclave curing is required.
Type-2	B.E. / M.E Mechanical		(a) ITI- Machinist (b) DME.		Vendor / Outsourced vendor	Experience in the field of composite and sandwich panel machining using CNC machine and programming knowledge required.
Type-3	B.E. / M.E Mechanical		(a) ITI Fitters (b) DME		Vendor / Outsourced vendor	Experience in the field of general fitting works like finishing, deburring, adhesive mixing, injecting adhesive, buffing, components bonding using adhesive is required.
Type-4	B.E. / M.E Mechanical		(a) ITI-Fitter (b) DME (c) DCE		Vendor / Outsourced vendor	Experience in the field of general fitting works, painting and bonding is required.
Type-5	B.E. / M.E Mechanical		(a) ITI- Fitter (b) DME		Vendor / Outsourced vendor	Experience in the field of assembly of composite parts and sandwich panels using special jigs and fixtures is required.

DME: Diploma in Mechanical Engg. DCE: Diploma in Chemical Engg.

Notes:

- a) It is desirable to have 2-3 years of experience in the relevant fields of manufacturing.
- b) It is desirable to have Mechanical Engineers / Diploma holders in Mechanical Engineering with knowledge / experience in tool design, dimensional inspection, online quality control, material testing, CNC programming, material handling, containerisation, etc.,
- c) For surface preparation activities, chemical / metallurgical engineers are preferred.
- d) Vendors are requested to provide their manpower details as per above table (Form-6)

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## Format-7

### Declaration from “LEAD VENDOR”

(To be printed on Company letterhead)

[Date]

To,

**SENIOR HEAD, PURCHASE & STORES  
U R Rao Satellite Centre  
HAL Airport Road, Vimanapura Post  
Bangalore -560017, Karnataka.**

Dear Sir,

**Ref: Declaration of Lead Vendor for “Structure Manufacturing and assembly activities including Thermal testing and implementation”**

Having examined the Expression of Interest (EOI) and understood the scope of Lead Vendor, we intend to submit our Expression of Interest to participate in the EOI as “LEAD VENDOR”.

Further we declare the following:

- a) We have understood the scope, responsibilities and requirements of “LEAD VENDOR”.
- b) We have understood the scope, responsibilities and requirements for each of the activities mentioned in EOI document.
- c) We are having required facilities marked as mandatory for Type-1 and Type-5 activities.
- d) We will outsource the activities for which we do not have required facility / infrastructure of Type-2 / Type-3 / Type-4 activities to other industries, if required.
- e) We agree to scrutiny by URSC for physical verification / evaluation of our facilities and facilities of our outsourced vendors as per Sl. No. 2.3 of EOI (the list enclosed)
- f) If our outsourced vendors are found not qualified by URSC, then these activities will be outsourced by us, only to URSC qualified / approved vendors during RFP/ RFQ phase. As a “Lead vendor”, we are responsible for the final delivery of products within delivery schedule and inter-coordination between the sub-contracted vendors.
- g) We will coordinate with sub-contracted / outsourced vendors for successful delivery of fully assembled spacecraft structure including Thermal testing and implementation activities.

Date:

Signature:  
(Company Seal)

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## Format-8

### Compliance Matrix to be filled by Vendors for Facilities/Infrastructure

Sl. No	Facility Description	Whether in-house / Outsourced facility	Details of Outsourcing facility	Remarks*

**\* Remarks:**

- 1) Provide Documentary Proof as supporting documents to the topics in the above table.
- 2) Clearly fill the column with the regard to the availability of facilities in-house (OR) outsourcing.
- 3) In case of outsourcing, mention the full address, details and their expertise shall be mentioned.

Signature:

Name of the authorized signatory for the company:

Date:

Place:

Note:

1. If required, necessary sheets can be attached.

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## Format-9

### List of Annexure to be attached along with EOI

Sl. No.	Name of the point	Vendor's response
1	Availability of qualified work force as per format-6. Please provide details of workforce like trade, qualification, number, years of total experience, years of employment/experience, etc.,	
2	In-house / outsourced vendor's experience having completed similar nature of work of purchase orders during the last 3 years. (Provide copies of the orders clearly showing the scope of work, magnitude of the work involved, proof of completion and delivery).	
3	Specify the list of Customers within the State/Country/abroad.	
4	Specify standard product(s) of the company.	

Signature:

Name of the authorized signatory for the company:

Date:

Place:

Note:

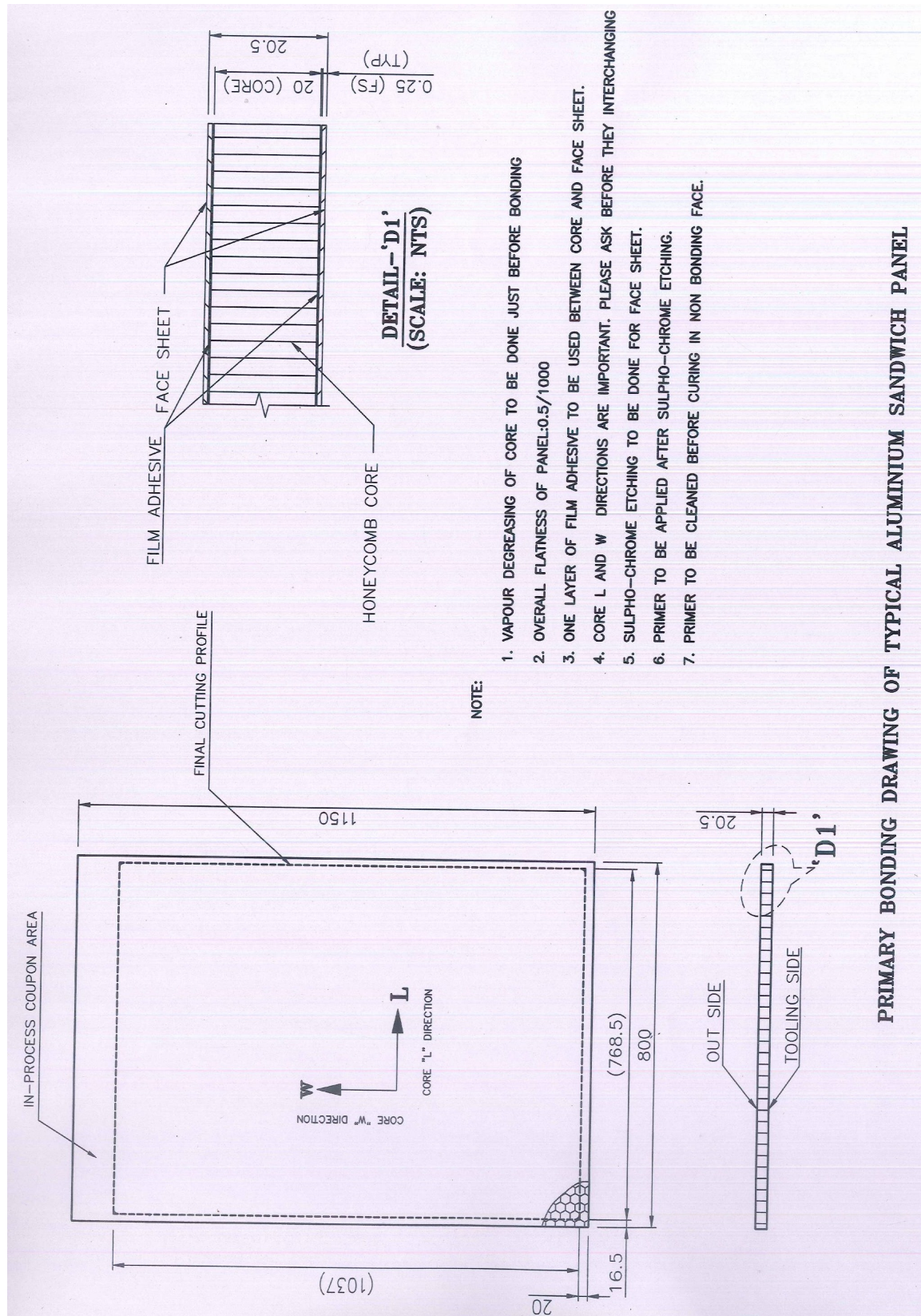
1. If required, Provide Documentary Proof as supporting documents, topics where ever it is deemed necessary sheets can be attached.

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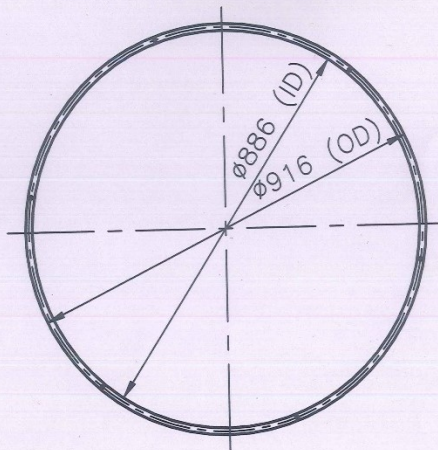
# Chapter-10

## Typical drawings of spacecraft structural products.

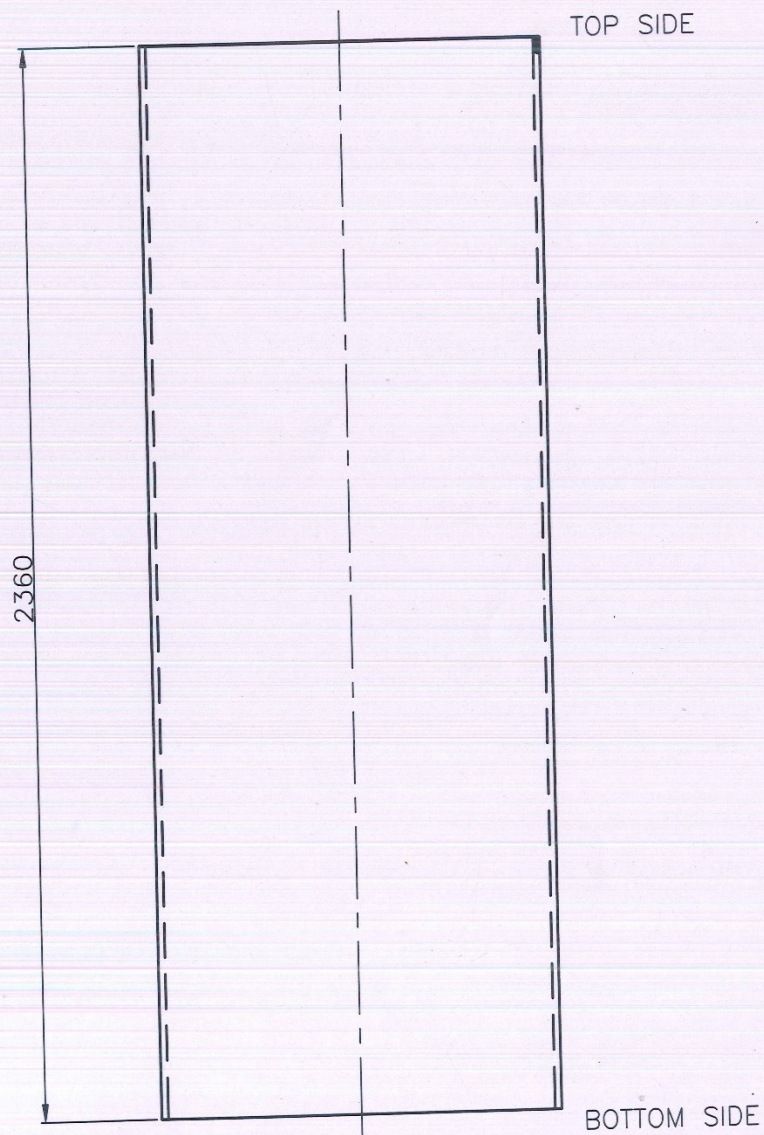
Sl. No.	Name of the Component
1	Typical Aluminium honeycomb sandwich panel
2	Typical CFRP Cylinder
3	Typical CFRP Doubler
4	Typical CFRP angle
5	Typical CFRP Edge Clip
6	Typical CFRP Tube
7	Typical drawing for machining of honeycomb sandwich panels



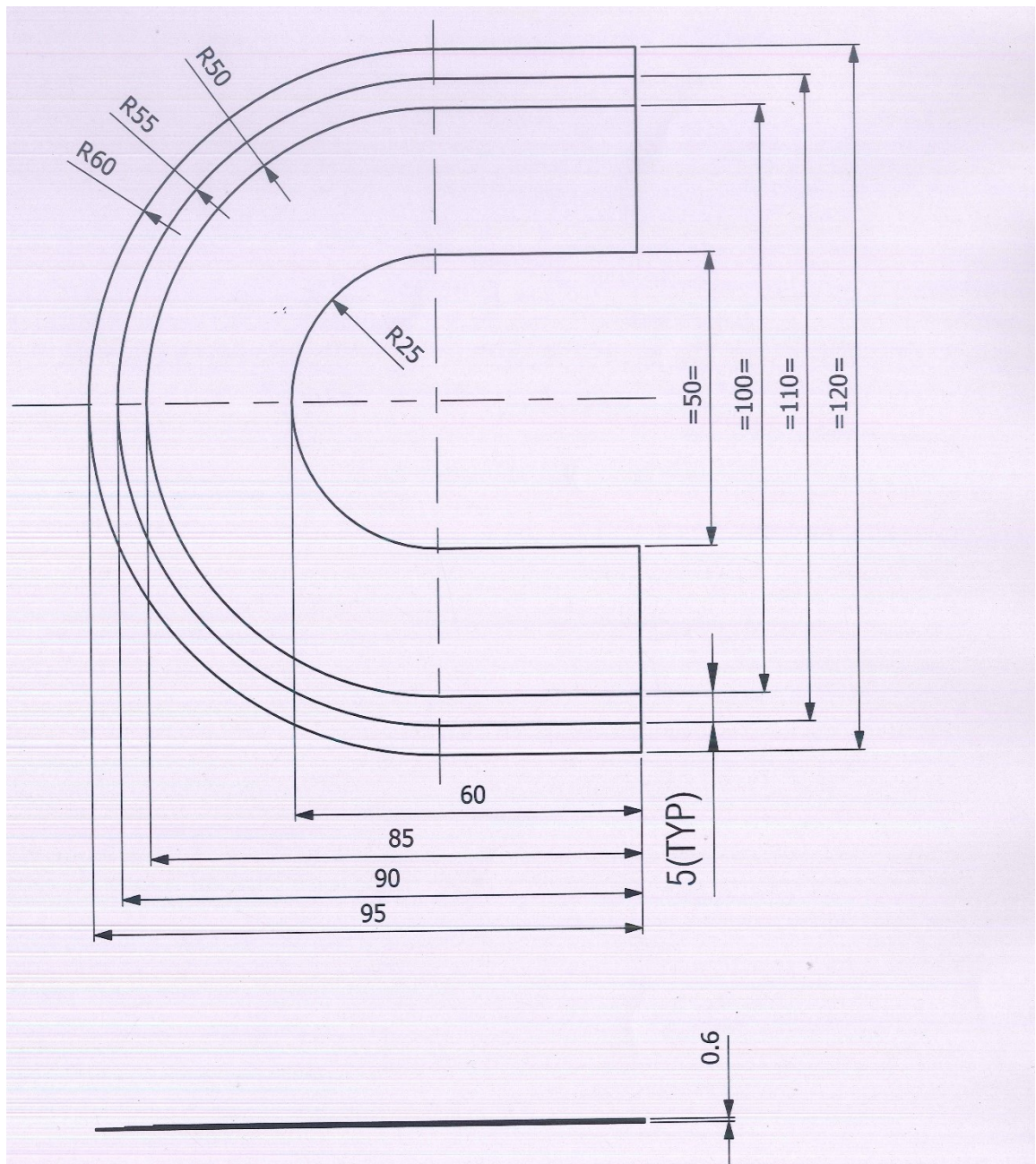
ALL DIMENSIONS ARE IN MM



ALL DIMENSIONS ARE IN MM



TYPICAL PRIMARY BONDING DRAWING OF CFRP SANDWICH CYLINDER



ALL DIMENSIONS ARE IN MM

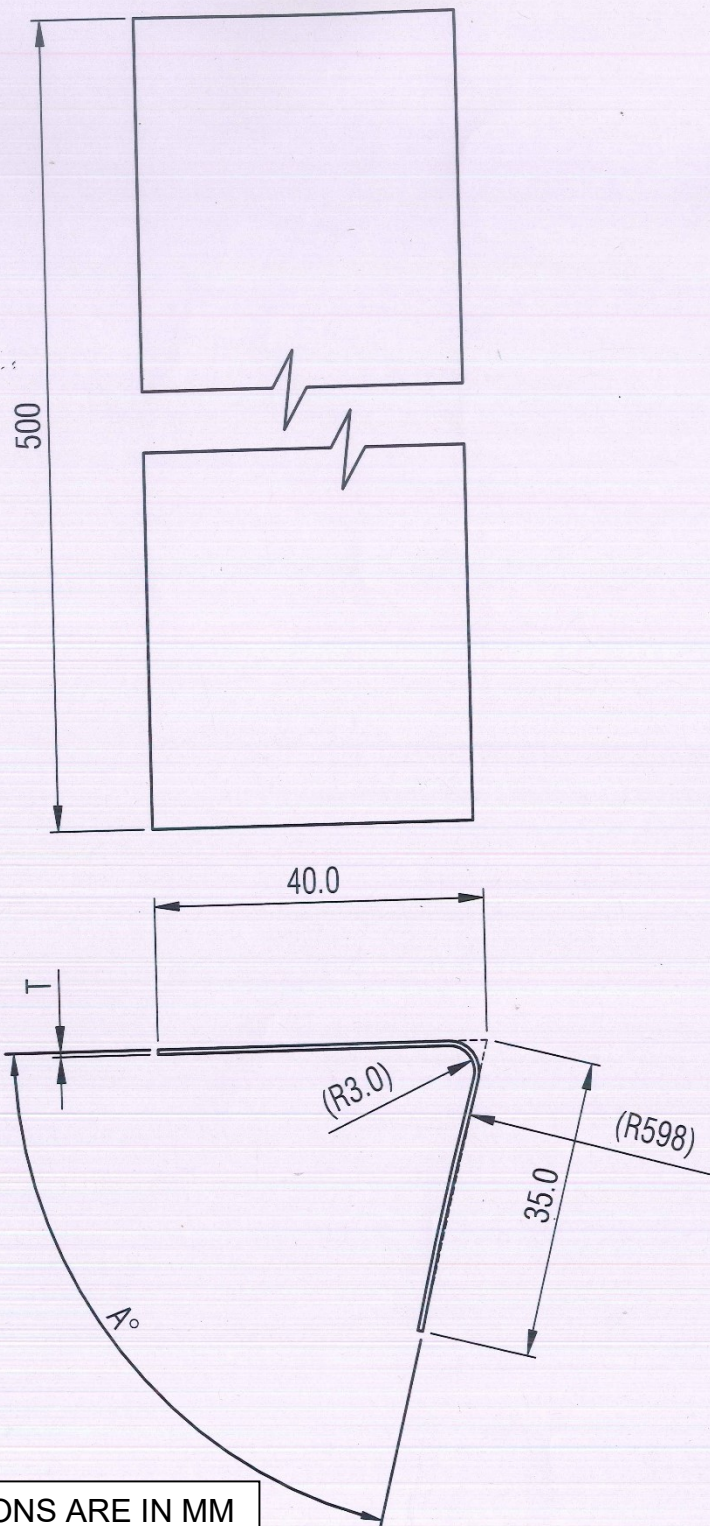
NOTE:

NO. OF LAYERS = 6

LAYUP: (0/90)/±45/(0/90)/±45/(0/90)±45

EACH STEP CONSISTS OF 2 LAYERS

TYPICAL DRAWING OF CFRP DOUBLER

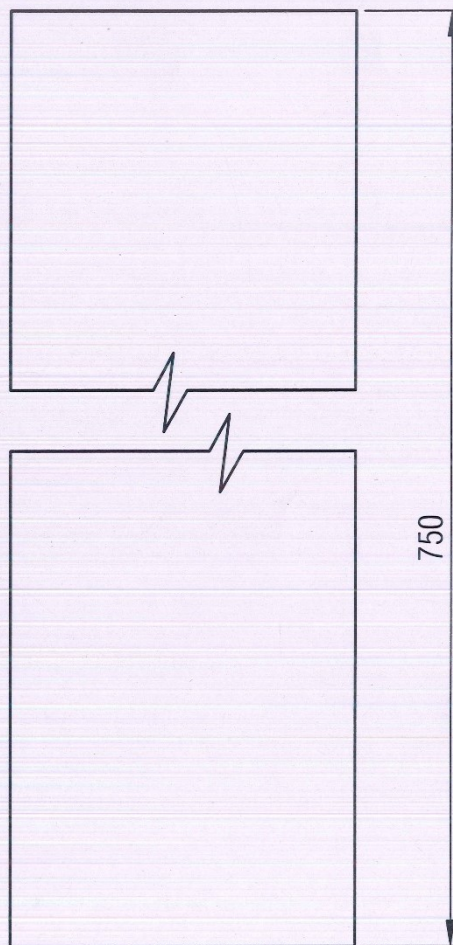
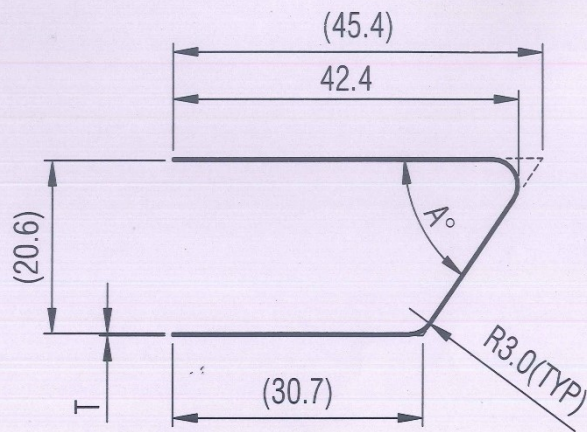


ALL DIMENSIONS ARE IN MM

**NOTE:**

1. LAYUP [(0/90)/ $\pm 45$ /(0/90)/ $\pm 45$ /(0/90)/ $\pm 45$ /(0/90)/ $\pm 45$ ]
2. THICKNESS (T) CORRESPONDING TO 8 LAYERS
3. ANGLE ( $A^\circ$ ) CORRESPONDING TO THE TOOL WITH ANGLE  $77.3^\circ$

**TYPICAL DRAWING OF CFRP ANGLE**

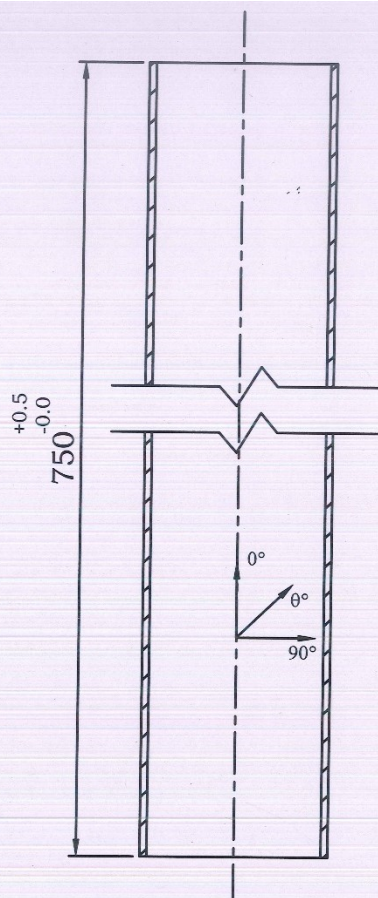


NOTE:

ALL DIMENSIONS ARE IN MM

1. LAYUP [(0/90)/(0/90)]
2. THICKNESS (T) CORRESPONDING TO 2 LAYERS
3. ANGLE (A°) CORRESPONDING TO THE TOOL WITH ANGLE 55°

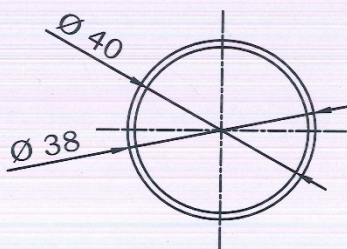
TYPICAL DRAWING OF CFRP EDGE CLIP



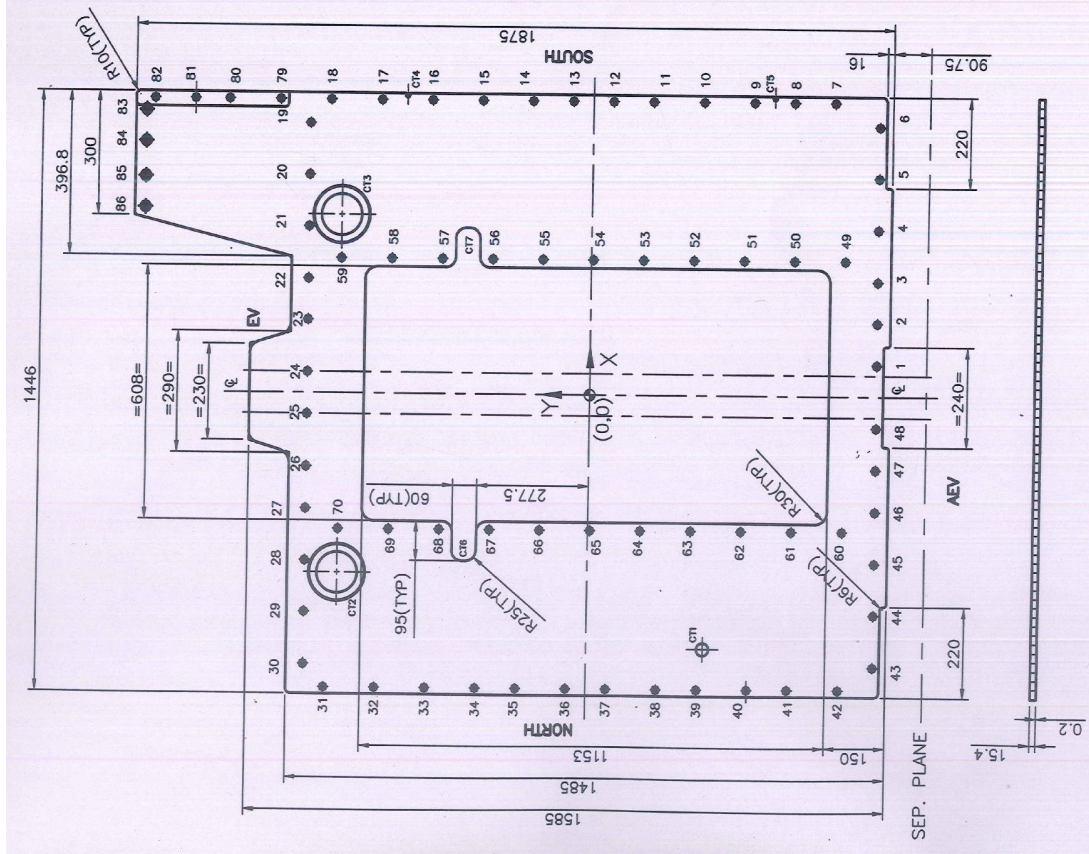
**LAY-UP SEQUENCE**  
(FROM TOOL SURFACE)

SL.NO	PLY ORIENTATION	MATERIAL
1	0/90°	BD
2	30°	UD
3	0°	UD
4	0°	UD
5	0°	UD
6	-30°	UD
7	0°	UD
8	0°	UD
9	0°	UD
10	-30°	UD
11	0°	UD
12	0/90°	BD

ALL DIMENSIONS ARE IN MM



TYPICAL DRAWING OF CFRP TUBE



SL. No.	X	Y	REMARKS
79	707.00	775.00	Ø18 THRO' HOLE, SRSTD-0043 (SECTION-BB)
80	707.00	900.00	
81	707.00	985.00	
82	707.00	1085.00	
83	678.00	1106.00	Ø18 THRO' HOLE, SRSTD-0049 (SECTION-AA)
84	603.00	1106.00	
85	518.00	1106.00	
86	443.00	1106.00	

ALL DIMENSIONS ARE IN MM

SL. No.	X	Y	REMARKS
1	75.00	-710.50	Ø18 THRO' HOLES, SRSTD-0049 (SECTION-AA)
2	175.00	-710.50	
3	275.00	-710.50	
4	400.00	-710.50	
5	525.00	-710.50	
6	650.00	-710.50	
7	707.00	-600.00	
8	707.00	-500.00	
9	707.00	-400.00	
10	707.00	-275.00	
11	707.00	-150.00	
12	707.00	-50.00	
13	707.00	50.00	
14	707.00	150.00	
15	707.00	275.00	
16	707.00	400.00	
17	707.00	525.00	
18	707.00	650.00	
19	650.00	700.50	
20	525.00	700.50	
21	400.00	700.50	
22	275.00	700.50	
23	175.00	700.50	
24	50.00	700.50	
25	-50.00	700.50	
26	-175.00	700.50	
27	-275.00	700.50	
28	-400.00	700.50	
29	-525.00	700.50	
30	-650.00	700.50	
31	-707.00	650.00	
32	-707.00	525.00	
33	-707.00	400.00	
34	-707.00	275.00	
35	-707.00	150.00	
36	-707.00	50.00	
37	-707.00	-50.00	
38	-707.00	-150.00	
39	-707.00	-275.00	
40	-707.00	-400.00	
41	-707.00	-500.00	
42	-707.00	-625.00	
43	-650.00	-710.50	
44	-525.00	-710.50	
45	-400.00	-710.50	
46	-275.00	-710.50	
47	-175.00	-710.50	
48	-75.00	-710.50	
49	324.00	-630.00	
50	324.00	-505.00	
51	324.00	-380.00	
52	324.00	-255.00	
53	324.00	-130.00	
54	324.00	-5.00	
55	324.00	120.00	
56	324.00	245.00	
57	324.00	370.00	
58	324.00	495.00	
59	324.00	620.00	
60	324.00	630.00	
61	324.00	505.00	
62	324.00	380.00	
63	324.00	255.00	
64	324.00	130.00	
65	324.00	5.00	
66	324.00	120.00	
67	324.00	245.00	
68	324.00	370.00	
69	324.00	495.00	
70	324.00	620.00	

TYPICAL DRAWING FOR MACHINING OF STRUCTURAL INSERTS

[illegible]

S.N.O.	NAME	SIZE	CO-ORDINATE		REMARK
			X	Y	
1.	CT-1	DIA 30	-609.0	-289.5	IRU
2.	CT-2	DIA 100	+429.0	+620.5	RX1
3.	CT-3	DIA 30	+429.0	+620.5	RX2
4.	CT-4	10x10	+718.0	+462.5	AIT
5.	CT-5	10x10	+718.0	-450.0	AIT
6.	CT-6	REFER STR	DRAWING		LPSC
7.	CT-7	REFER STR	DRAWING		LPSC

C72_F5D	M4	3	X	-483.17	-372.56	-428.86
			Y	+4853	+4853	+555.5
C73_F5D	M4	3	X	+372.56	+485.17	+428.86
			Y	+4853	+4853	+555.5

349.5	-349.5	+349.5	+349.5	+349.5	+349.5	+349.5
-57.5	-42.5	+457.5	+357.5	+257.5	+157.5	+57.5
						-42.5

		D1	D2	D3	D4	D5	D6
INSETS	M6						
	X	-90	+90	+90	+80	-80	+90
INSETS	N6os	Y	+815	+815	+700	+700	+855
							+855
TTC <sub>BF</sub>	M4						
	X	+375	+375	+400	+400	+395	+400
INSETS	N4os	Y	+720	+555	+464	+381	+249
		R9	R10				
			+376	+376			
			-686	-681			

120	128	136	144	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	280	288	296	304	312	320	328	336	344	352	360	368	376	384	392	400	408	416	424	432	440	448	456	464	472	480	488	496	504	512	520	528	536	544	552	560	568	576	584	592	600	608	616	624	632	640	648	656	664	672	680	688	696	704	712	720	728	736	744	752	760	768	776	784	792	800	808	816	824	832	840	848	856	864	872	880	888	896	904	912	920	928	936	944	952	960	968	976	984	992	1000
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1. COMMON HOLE PITCH TOLERANCE  $\pm 0.2\text{mm}$ .
2. INSERTS LOCATIONS ARE NOT TO BE MEASURED FROM DRAWING.
3. LOCATION OF INSERTS ARE WITH REFERENCE TO 0.0 (ORIGIN).

# TYPICAL AIT DRAWING FOR MACHINING OF INSERTS

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