

SCOPE OF WORK

Activities

Service provider will be required to carry out the following:

- a. **Heat treatment and characterisation** of metallic materials at heat treatment section of Aerospace Materials lab-MME.
- b. **Mechanical Testing** of aerospace materials at mechanical testing section of Aerospace Materials lab-MME.
- c. **Materials characterisation** of aerospace materials at materials characterisation section of Materials lab-MME.
- d. **Water Jet Cutting machining activities** on metallic sheets & plates to the required size and shapes as per the requirement using the machine available at LPSC.
- e. **Materials Clearance** pertaining to aerospace raw materials, visual inspection of raw materials and preparation of materials clearance certificates.
- f. **Materials Management related activities.**

1. Aerospace Materials Lab:

1.1 Tensile and Hardness Testing

1. Record of test request details on test log book after authorization from engineer-in-charge.
2. Specimen verification, dimensional inspection and marking of Gauge length and grip portion
3. Preparation of machine setup for testing based on nature of specimen and test requirement, i.e., setup preparation, alignment of test fixtures depending on test requirements like room temp test or high temp test, fasteners test or tensile test of flat or round specimen, bend test etc.
5. Test program on software and testing as per standard
6. Post test measurement of dimensions and analysis of results and record of observations and results in logbook.
8. Preparation of draft report.
9. Maintenance of record log book and test report record.

1.2 Impact Testing

1. Record of test request details on test log book after authorization from engineer-in-charge.
2. Verification of Specimen and Record of specimen details on log book
3. Impact Test Setup preparation depending on room temperature or LN2 Temperature Test
4. Impact Testing on Machine with proper safety precaution

5. Record of observation and result on log book
6. Preparation of draft report.
7. Maintenance of record log book and test report record.

1.3 Metallography

1. Record of test request details on test log book after authorization from engineer-in-charge.
2. Verification of Specimen and record of specimen details on log book
3. Preparation of metallographic specimens comprising cutting, polishing, preparation of etchants, etching and microscopic analysis.
4. Cutting of odd shaped samples for failure analysis with extreme care for keeping the fracture surface preserved.
5. Record of observation and result on log book
6. Preparation of draft report.

1.4 Heat treatment

1. Record of heat treatment request details on log book after authorization from engineer-in-charge.
2. Verification of work piece, assessment/verification of duration and record of specimen details on log book
3. Heat treatment operations comprising loading of specimens, programming controllers, record of temperature at specific durations and unloading of work pieces and cooling as per requirement.
4. Hardness testing of heat treated work pieces.
5. Preparation of draft report.

1.5 Thermo-Mechanical Simulator

Thermo-mechanical simulator is multi-functional equipment capable of testing various test like, hot compression test, rapid tensile testing, HAZ simulation Test etc. Major activity need to be performed before test are as follows.

1. Verification of each auxiliary unit of TMS- Compressor, chiller, hydraulic pumping unit, vacuum pump etc for its functional check.
2. Preparation of Test Setup depending on requirement using Hydrawedge MCU or Pocket Jaw MCU. Changing of MCU is very laborious work and require continuous working of at least two technician for two day to change from one module to other Module.
3. Depending of test- selection of test fixture and preparation for testing
4. Specimen preparation- Dimensional inspection, fixing of thermocouple through spot welding on each specimen.
5. Carefully fixing of specimen on machine setup.
6. Programming of machine and testing.
7. After test specimen verification and record of observation on log book.
8. After each test, test chamber need to be cleaned by removal of water (which was used for fast cooling during test), drying with compressed air as need to maintain vacuum during test.

In addition to this, appropriate weekly and monthly preventive maintenance of all the equipment's and its subsystems in Material Lab and attending to repairs as and when required.

1.6 Materials clearance & management of Semicryo & CUS Materials:

- 1) Procurement of raw materials and positioning of FIM at different work centres.
- 2) Preparation of RMCC related materials.
- 3) Verification of heat treatment certificates, graphs, calibration certificate etc. of the heat-treated materials.
- 4) Coordination with Workshop and Materials Lab for realization of specimen and characterization of heat-treated samples for the qualification of heat treatment process.
- 5) Compilation of materials related records, coordination with QC & QA for RMCC clearance.
- 6) Proper filing and tracking of RMCC records.
- 7) Inward verification of materials being received from import & indigenous sources.
- 8) Coordination with QC for the inward verification and characterization of import materials for generation of MAC.
- 9) Identification of materials at Stores, Cutting, Preparation of FIM for issues and sending to Work centres.
- 10) Despatch of materials to various heat treatment agencies.
- 11) Coordination with QC for the physical verification and XRF checking of materials for issues and sending to work centres.
- 12) Preparation of Stores issue voucher, dispatch requests, coordination with Stores for dispatch of the materials.

1.7 Materials clearance & management of Earth storable & CE20 Materials:

- 1) Inward inspection of different types of raw materials, forgings, castings etc arriving from various Indian & foreign manufactures and assigning the raw material code number after verifying heat number, lot number etc. with respect to the test certificates provided by the manufacturer.
- 2) Assigning the unique identification code to each material in coordination with QC-Materials.
- 3) Updating the stock of raw material and keep the records properly.
- 4) Identify the raw material as and when the requirement comes from different projects
- 5) Segregating the FIM with respect to the drawing and FIM list duly approved by SRQA
- 6) Conducting the XRF analysis to ensure the correct material is to be dispatched with respect to the drawing as part of newly introduced PMI in coordination with QC team
- 7) Coordination with stores to cut the raw material as per the FIM requirement and properly marked the raw material code to each piece to avoid material mix up
- 8) Prepare RMCC and get it approved from QC and SRQA agencies before dispatch
- 9) Preparation of issue vouchers of all the materials issued.
- 10) Follow up with stores and fabrication group to ensure the timely delivery of FIM.
- 11) Fabrication of tensile test, notch toughness test, fracture toughness, hydrogen measurement and micro/macro structure analysis specimens for material characterization.

- 12) Heat treatment of raw materials in house facilities, preparation of raw materials for heat treatment and characterisation of each heat treatment batch.
- 13) Characterization of Al. Alloy billets supplied by manufacturers as per P.O. requirements and get necessary production clearance.
- 14) Conducting additional testing of available materials to meet programme requirements. Verification of Process cum Quality Assurance Plan (QAP) of each P.O.
- 15) Purchase, store and accounts follow up of each purchase files.
- 16) Preparation all the technical reports related to technical specification, indigenization, development etc.
- 17) Inventory control.
- 18) Compilation of materials related records, coordination with QC & QA for RMCC clearance.
- 19) Proper filing and tracking of RMCC records.
- 20) Inward verification of materials being received from import & indigenous sources.
- 21) Coordination with QC for the inward verification and characterization of import materials for generation of MAC.

2. Waterjet cutting facility:

- 1) Water jet cutting of various materials related to ongoing projects.
- 2) Preparation of machine setup depending on requirements, programming and carrying out minor maintenance from time to time.
- 3) Cleaning of equipment and fixtures after use and upkeeping of records.

Qualification:

1) Diploma holder

Diploma in Mechanical Engineering.

2) ITI holder

ITI Fitter/Turner/Machinist.

Experience:

- 1) Minimum two years experience.
- 2) Deputed Personnel shall possess sufficient knowledge for coordinating activities as listed in Scope of work
- 3) **Working Hours:**
08.45 Hrs. To 17.15 Hrs with 6 days per week. If required, work shall be arranged on holidays and beyond normal working hours at the same rate as agreed for the normal working hours

Activity list & man hours.

Following is the estimate of works and related work units to carry out the activities mentioned below, by the deputed personnel at Thiruvananthapuram LPSC/ISRO Centre.

ESTIMATE FOR CONTRACT DIPLOMA PERSONNEL

1. Metallographic sample preparation, micro structural examination, micro hardness, bulk hardness evaluation & impact testing of metallic samples			
Sl. No.	Description	Total quantity (Nos.)	Total work units (for 2 years)
1.1	Metallography of soft metallic samples	200	1200
1.2	Metallography of hard metallic samples	800	3200
1.3	Preparation of samples for TEM samples	50	600
1.4	Microhardness evaluation of materials, welds & coatings	100	50
1.5	Preparation of samples & reports for SEM	400	400
1.6	Up keeping of records, periodic review of calibration documents for equipments in characterization lab and making arrangements for calibration	10 lots	160
1.6	Chemical analysis of Metallic samples		
1.6.1	Sample preparation and evaluation of chemical composition by OES	120	240
1.7	Bulk hardness testing of metallic samples (5 readings per sample) and heat-treated work pieces.	2400	600
1.8	Impact testing of Metallic materials		
1.8.1	Impact tests at room temperature	600	150
1.8.2	Impact tests at 77 K	200	50
2	Assisting Engineers for various tests on Thermo Mechanical Simulator [verification of samples, welding thermocouples to samples, preparation for tests and preparation of test certificates](pertaining to hot compression, tension, and plane strain compression tests, weld simulation, heat treatment studies and various tests for simulation of process sequences)	1000	4000
3	Assisting Engineers in Material clearance & materials management activities		
3.1	Material acceptance certificate (MAC) generation and verification: Verification of test certificates, inward inspection of raw materials at stores and generation of MAC for approval.	1600	1200
3.2	Raw material clearance certificate (RMCC) generation and verification: Verification of drawings with respect to material grade, size, quantity, condition, clearance status, physical verification of materials at stores, transferring of RMC No. and generation of RMCC for approval.	5000	5000
3.3	Despatch clearance of import materials (No. of heats): Verification of test certificates received from suppliers with respect to P.O., specification and preparation of report for approval.	400	400
3.4	Inward inspection of import materials (No. of heats): Visual and dimensional inspection of import materials received at stores with respect to TC, allotment of RMC	400	400

	numbers.		
3.5	Punching/marking of RMC Nos. on each cleared materials	12000	4000
3.6	Quality assurance plan (QAP) and material procurement specification	1000	1200
3.7	Retrieving of reports and certificates	10000	2500
3.8	Digitisation and documentation (No. of sheets)	12000	2000
3.9	Arranging FIM for XRF analysis	20000	12000
3.10	Preparation of FIM list, clearance paper & issue of materials	2000	4000
3.11	Material cutting for FIM & Test specimens	16000	2000
3.12	Preparation of drawings for fixtures/tooling's for material testing requirement.	1100	1300
3.13	Compilation of data, test results & preparation of presentation sides for internal meetings/NCRB's for material related issues.	1000	1300
3.14	Preparation of request formaterial testing.	800	1200
3.15	Preparation of list of materials for issuing to project /system teams	1200	1500
3.16	Preparation of raw materials receipt/status/verification.	1600	2000
3.17	Preparation of material test specimen, compilation of results pertaining to material related NC and qualification of new sources related to material.	2000	2000
4.	Tensile tests at room temperature (preparation of test set up, verification of samples, carrying out tensile test, preparation and compilation of results & graphs, &preparation of test certificates)	2000	500
4.1	Tensile tests at high temperature (preparation of test set up, verification of samples, carrying out tensile test, preparation and compilation of results & graphs, &preparation of test certificates)	600	2000
5.	Assisting Engineers in the Qualification, acceptance,sampling inspection of materials related to fasteners and sample level testing of fasteners for final acceptance	5000	600
6.	Comparative studies for Russian materials in terms of mechanical properties and processing characteristics	4000	3000
7.	Generation of materials related data through mechanical testing, characterization & simulative test.		3600
Estimated total work units requirement			64,350.00

The service provider need deploy minimum thirteen Diploma personnel on all the working days, to carry out the tasks specified above.

ESTIMATE FOR CONTRACT ITI PERSONNEL

1. Heat Treatment of Metallic Materials			
Sl. No.	Description	Total quantity (Nos.)	Total work units (for 2 years)
1.1	Heat treatment of AA 2219 work pieces (Solution treatment & aging)	24 batches (480 Nos.)	768
1.2	Heat treatment of Inconel-718 work pieces (Solution treatment & aging)	24 batches (120 Nos.)	720
1.3	Heat treatment of XH67MBI-O work pieces (Aging)	40 batches (280 Nos.)	600
1.4	Heat treatment of various types of steel work pieces (Solution treatment & or sub-zero treatment & aging/tempering)		
1.4.1	Heat treatment of steel work pieces of size/ruling section: <50 mm or equivalent	80 batches (1600 Nos.)	1600
1.4.2	Heat treatment of steel work pieces of size/ruling section in the range: 50-100 mm or equivalent	20 batches (1000 Nos.)	600
1.4.3	Heat treatment of steel work pieces of size/ruling section: >50 mm or equivalent	50 batches (500 Nos.)	2000
1.5	Evaluation of chemical composition by portable XRF analyser (in house & on site)	2000	500
Estimated total work units requirement			6788.00

The service provider need deploy minimum One ITI person on all the working days, to carry out the tasks specified above.