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**Ref. No: APM/2019/003/CLR**

**Split Hopkinson Pressure Bar (SHPB)**

**DATE: 24.05.2019**

**DUE DATE: 13.06.2019**

- 1) Quotations are invited in duplicate for the various items shown in Enclosed list (Annexure - I).
- 2) Quotations are invited as TWO-BID system, i.e., **technical bid and financial bid**.
- 3) The Quotations duly sealed and super scribed on the envelope with the reference No. and due date, should be addressed to the undersigned so as to reach him on or before the due date stipulated above.
- 4) The Quotations should be valid for sixty days from the due date and the period of delivery required, warranty terms etc. should also be clearly indicated. A minimum of two year warranty required.
- 5) Brochure detailing technical specifications and performance, list of industrial and educational establishments where the items enquired have been supplied must be provided.
- 6) Compliancy certificate is to be provided indicating conformity to the technical specifications.
- 7) If the item is under DGS&D Rate contract No. and the price must be mentioned. It may also please be indicated whether the supply can be made direct to us at the Rate contract price (Please note that we are not Direct Demanding Officers). If so please send copy of the RC.
- 8) Relevant literature pertaining to the items quoted with full specifications (and drawing, if any) should be sent along with the Quotations, wherever applicable. Samples / machine/ equipment if called for should be submitted / demonstrated at free of charges, and collected back at the supplier's expenses.
- 9) Packing and delivery charges must be clearly indicated.
- 10) The rate of sales / General Taxes and the percentage of such other taxes legally leviable and intended to be claimed should be distinctly shown along with the price quoted. Where this is not done, no claim for Sales / General Taxes will be admitted at any stage and on any ground whatsoever. The taxes leviable should take into consideration that we are entitled to have concessional Sales Tax applicable to nongovernment Educational Institutions run with no profit motive for which a concession. Sales Tax Certificate will be issued at the time of final settlement of the bill.
- 11) Goods should be supplied carriage paid and insured.
- 12) Goods shall not be supplied without an official supply order.
- 13) Payment: Every attempt will be made to make payment within 30 days from the date of receipt of bill / acceptance of goods, whichever is later.
- 14) In case of LC, 90% of the payment will be made after completion of the supply. The balance 10% of the payment will be made after satisfactory installation of the software.
- 15) IIT Madras is exempt from payment of Excise Duty and is eligible for concessional rate of custom duty. Necessary certificate will be issued on demand. IIT Madras will make necessary

arrangements for the clearance of imported goods at the Airport/Seaport. Hence the price should not include the above

- 16) Acceptance and Rejection: - I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.

Yours faithfully  
C. Lakshman Rao,  
Department of Applied Mechanics.

### **Technical Specifications for Split Hopkinson Pressure Bar (SHPB) System Electronic unit**

The Split Hopkinson Pressure Bar (SHPB) System is used for testing different materials at high strain rates in compression. Original equipment manufacturer (OEM) is required to supply Split Hopkinson Pressure Bar electronic unit to IIT Madras and it should meet the following technical requirements.

- 1) Strain gauges should be mounted suitably on Incident bar and transmitter bar of SHPB to measure the strains generated during testing. Strain gauge mounting locations on incident and transmission bars should be specified by OEM in the design document and operational manual for compression testing. Necessary precaution should be taken while mounting the strain gauges to avoid measuring bending disturbances.
- 2) A six-channel strain gauge amplifier with high frequency response should be provided by the OEM to amplify strain gauge outputs. The output of the amplifier should be connected to a computer through an analog to digital data acquisition card so as to enable acquisition of the data while testing and also for further post processing. The calibration certificate for the six-channel strain gauge amplifier should also be supplied.
- 3) A laser interrupt based velocity measurement system with necessary accessories should be supplied with the SHPB system to measure the velocities of the striker bar. The velocity measurement system should be suitably placed on the SHPB system so as to measure the velocities of the striker bar just before the impact with incident bar. Necessary accessories required for velocity measurement system as well as its calibration report should be provided.
- 4) OEM is required to supply suitable strain gauges along with consumables required for mounting them like mounting cement, cleaning agents etc. for both room temperature as well as high temperature testing. OEM has to give technical details & source of supply of supplied strain gauges. Details of strain gauge mounting techniques to be elaborated in the operational manual.
- 5) The Original Equipment Manufacturer (OEM) should supply a latest version, user friendly software, that works on windows operating system (XP and above) for controlling the instrument, data acquisition and post processing of the measured data. The required number of industrial processing unit for data acquisition should be provided with Split Hopkinson Pressure Bar (SHPB) System with minimum requirements as specified below:
  - 8 GB RAM Memory, 1 TB HDD, DVD Writer, 19" LED Monitor
- 6) The control software should have features like wave dispersion correction, post processing the data to present it as engineering stress-strain curve as well as true stress-strain curve, strain rate measurement, adiabatic temperature correction etc.

- 7) The display system should be configured to indicate incident and transmitted pulses, velocity of the incident bar. Any additional parameters to be displayed have to clearly indicate in technical bid and before incorporating in the design approval of the IITM to be obtained.
- 8) Necessary support systems should be provided to the entire SHPB bar assembly via beam assembly and legs for mounting on the test floor. Necessary precautions should be taken to minimize the passage of vibration to the test floor.
- 9) The necessary tool kit required for operation and maintenance of SHPB system should be supplied with the SHPB system. The OEM has to supply necessary consumables required for testing and maintenance of SHPB system like molybdenum disilicide paste etc. with the SHPB system.
- 10) Pre-inspection and training at IITM for Students on data acquisition & signal processing from SHPB tests at room temperature in compression. Sample preparation techniques involved, strain gauge mounting, calibration procedures involved, basic troubleshooting, and pulse shaping for achieving the desired strain rates should also be covered in the pre inspection training.

#### **Deliverables for Split Hopkinson Pressure Bar (SHPB) Electronic unit**

<b>S. No</b>	<b>Description</b>	<b>Quantity</b>
1	Strain gauges for mounting on incident bar and transmitter bar along with consumables required for mounting them like mounting cement, cleaning agents etc.	As required
2	Six-channel strain gauge amplifier with high frequency response and its calibration certificate, Bandwidth minimum 100kHz	01
3	Laser interrupt based velocity measurement system and its calibration certificate	01
4	Analog to digital data acquisition card to enable data acquisition through computer	01
5	Control software	01