

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPALLI-620 014

CONTROLS AND INSTRUMENTATION/FB

**TECHNICAL SPECIFICATION****OF****LOAD CELL****FOR BOTTOM ASH MEASUREMENT SYSTEM****PROJECTS:-****TAMILNADU GENERATION & DISTRIBUTION CORPORATION LTD.****TANGEDCO NORTHCHENNAI THERMAL POWER PROJECT,****1X800MW, STAGE-III BTG,****CUSTOMER No. 1818****UPPUR SUPER CRITICAL THERMAL POWER PROJECT,****2X800MW, UNIT 1&2****CUSTOMER No. 1821-1822****SPECIFICATION REF. CI:1818:BASH LC:SPEC / REV. 00**

REV.NO	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
00	22/09/17	Initial Release	SR <i>S. Rajan</i>	KB <i>KB</i>	AKP <i>AKP</i>

SECTION - 1

I. GENERAL

- a. The various aspects covered in this specification are as follows :-
- b. The general points are covered in Section – 1 – General.
- c. The specification requirements are covered in Section – 2 – Specifications.
- d. The documents to be submitted along with the offer / after placement of order are covered in Section – 3.
- e. The Inspection / Testing and Packing requirements are covered in Section – 4 Testing, Inspection and Packing.
- f. If any special or non-standard tools are required for installation, operation or maintenance, the same shall be supplied along with the product.
- g. The entire system and accessories should not contain any asbestos material.
- h. The equipment shall be guaranteed for a period of 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier.
- i. Despatch clearance will be issued along with PGMA with DU Nos. for the ordered items to vendor after the receipt of technically accepted Inspection Report. Vendor shall mark the PGMA with DU Nos. on the casing of the packing and in the packing slip.
- j. Since the vendor's works alone is approved by BHEL, vendor shall manufacture this item in their own works only and shall not off-load the jobs to any other suppliers without the written approval by BHEL.
- k. The complete product should be packed in such a way that it should not get damaged during transportation.

SECTION – 2

I. INTRODUCTION

The specification is intended for procurement of full bridge strain gauge based fatigue rated load cell transducer which will convert the compression force acting on it to equivalent electrical millivolt signal proportional to the excitation voltage supply.

II. SCOPE OF SUPPLY

- a) Compression type donut shaped fatigue rated load cell with full bridge strain gauge transducers.
- b) Cables & connectors associated with the load cells,
- c) Calibration / Test certificates for the load cells and cables

III. LOAD CELL

a) General arrangement:-

The compression type donut shaped load cell transducer will be positioned in-between the base washer and the fastener. The fastener shall be placed over the load cell. The fastener shall be installed by torque wrench. The load cell construction shall be suitable to withstand the twisting force applied on the top of the load cell. The safe mounting torque value, which is the maximum torque which can be applied concentric with the primary axis without producing a permanent shift in performance characteristics beyond those specified, shall be quoted, if applicable, in the detailed specification table.

This arrangement transfers the load of each hanger rod to the supporting beam via the load cell. The load cell assembly shall be designed to operate at temperature compensated range of the hanger rod.

The load cell is continuously loaded throughout its operating period and is an integral part of the structure. Hence, the load cell transducer shall be compression type fatigue rated in donut shape. Load cell shall be hermetically sealed, pressure insensitive and temperature compensated for the range specified.

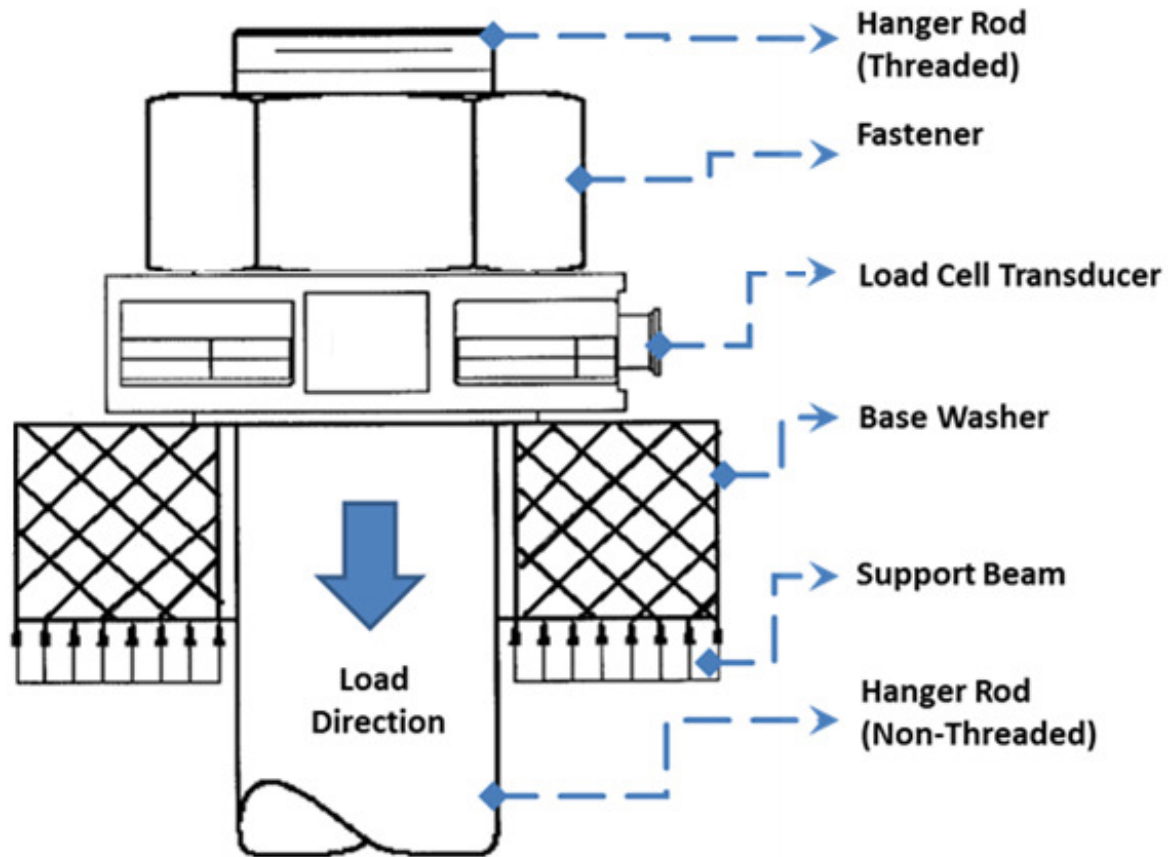
The dimensions of the load washer shall be customizable and shall be built on the material such as Stainless Steel (SS-304) or equivalent, capable of withstanding the load up to 200% of rated capacity or better.

The load cell internal along with the temperature sensor chip shall be thermally & electrically insulated from conduction of heat, high voltage / current through mechanical structures via suitable methods. The removable cable connector of the load cell shall have ample space above & below such that it is not interfering with supporting structure during installation.

b) Technical Requirement For Fatigue Rated Load Cells:

SPECIFICATION	VALUE	UNIT
<i>Rated capacity</i>	50,000	Kgf
<i>Force type</i>	Compression	
<i>Strain Gauge Configuration</i>	Full Bridge	
<i>Load Cell Internal Construction</i>	Shear Web Design	
<i>Rated Output</i>	2.0 ± 0.02	mV/V
<i>Accuracy Class</i>	Class C3 or Better	
<i>Non Axial Loading</i>	Insensitive upto 4° of non-axial concentric load	
<i>Maximum Safe Mounting Torque</i>	Vendor to Specify	
<i>Non-Linearity</i>	0.5	±% of Rated Output
<i>Repeatability</i>	0.5	±% of Rated Output
<i>Hysteresis</i>	0.5	±% of Rated Output
<i>Zero Balance</i>	1.0	±% of Rated Output
<i>Creep in 30 minutes</i>	0.1	±% of Rated Output
<i>Temperature Effect on Zero Scale</i>	0.1	±% of Rated Load/°C
<i>Temperature Effect on Span Scale</i>	0.1	±% of Applied Load/°C
<i>Bridge Output Resistance</i>	700 ± 1%	Ohms
<i>Compensated Temperature Range</i>	+10 to +120 or Better	°C
<i>Storage Temperature Range</i>	0 to +100 or Better	°C
<i>Humidity</i>	90	%RH @ 50 °C
<i>Safe Overload</i>	150 or Better	% of Rated Capacity
<i>Ultimate Overload</i>	200 or Better	% of Rated Capacity
<i>Excitation, Recommended</i>	10	Volt DC
<i>Number of Cycles of Operation</i>	1,000,000	Fully Reversed Cycles
<i>Surface finish plating</i>	Electro less nickel	
<i>Internal Diameter</i>	80 mm or more	±1 mm
<i>Overall height</i>	75 mm or lesser	±1 mm
<i>Overall Outer Diameter</i>	200 mm or lesser	±2 mm
<i>Long Term Stability (1 Year)</i>	0.5	±% of Rated Output
<i>Insulation Resistance</i>	<i>Vendor to Specify</i>	GΩ at 50VDC
<i>Signal Response Time (10% - 90%)</i>	100 or better	Milli second
<i>Material of Construction</i>	Stainless Steel SS-304 or equivalent	
<i>Deflection at Rated FSO</i>	<i>Vendor to Specify</i>	mm
<i>Weight of Load Cell</i>	<i>Vendor to Specify</i>	Kg
<i>Connector Position</i>	<i>Radial/Tangential</i>	Detachable cable
<i>Connector Type [6 Pin Circular]</i>	<i>Amphenol or Similar</i>	
<i>Environmental Protection</i>	<i>IP65 or Better & Hermetically Sealed</i>	
<i>Serial numbering Load Cell</i>	<i>Punched / Engraved</i>	
<i>Marking of Load Cells</i>	<i>BHEL Logo with serial number of load cell</i>	
<i>Cable</i>	15m (minimum), Annealed and Tinned copper conductor, 5 conductors with shield, Copper screened, PTFE insulated.	
<i>All the test certificates for individual Load cells shall be <u>traceable to NABL / Indian Standards</u></i>		

c) Load cell arrangement drawing:-



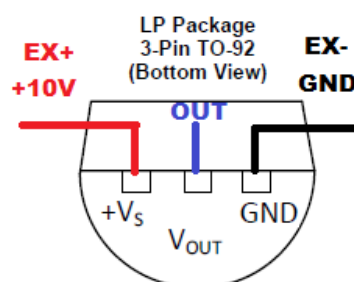
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IV. TEMPERATURE SENSING:

The load cell should be capable of measuring the internal temperature of the material using **LM35CZ/NOPB** 3 pin temperature sensing IC.

This temperature sensing chip have to be mounted via suitable thermal conductive glue inside the load cell structure. The thermal adhesive shall be capable of holding the chip stuck to the surface at maximum to minimum temperature levels that load cell shall be operating. The chip have to be installed where the strain is expected to be minimum inside the load cell surface. This would prevent the chip from detaching from the load cell internal structure after repeated cycles of compression and expansion of the load cell internals during its operation.

The power supply to the chip to be sourced from the load cell excitation supply. Wiring scheme for the chip installation is as follows with no passive component requirement:



V. LOAD CELL CABLE:

- a) Load cell cable consisting of excitation +, excitation –, signal +, signal –, one conductor for transmission of the temperature sensor output and bare shield shall be supplied along with the load cell by the manufacturer.
- b) Cable shall have run length up to 15 meters (minimum) terminated by circular removable connector on one side and free leads on the other side.
- c) Cable shall be minimum of 5 conductors, 0.5 sq.mm annealed, tinned, copper conductor, multi stranded, with shield, FRLS, copper screened and PTFE insulated.
- d) Shielding shall be 36 gauge braided tinned copper with nominal coverage of 85% or better.
- e) The colour code of the cables shall be: Red [Ex+], Black [Ex-], Green [S+], White [S-] and Yellow for Temperature Output signal cable.
- f) Cable Shield not to be connected to the Load Cell Body.
- g) Load cell cable shall be suitable for carrying the milli-volt signal from load cell without any distortion or signal loss.

VI. PRE - QUALIFYING REQUIREMENT:

- a) The vendor shall be Original Equipment Manufacturer (OEM) and shall have a minimum of five years of continuous experience in the field of Design, Manufacture and Supply of Load cells.
- b) Vendor should have in-house design, manufacturing and testing capability for Strain Gauge based Donut type load cell of 50 Tonne capacity and above.
- c) Vendor should have supplied Strain gauge based Load cell of 50 Tonne capacity and above for weight measurement application in industry. Reference List for such supplies shall be attached. The reference list shall be complete with all details like make, type, model number, rated capacity of the load cell, application, year of PO etc. Sample copies of PO shall also be submitted.
- d) One sample of 50 Tonne Strain gauge based Donut type load cell meeting the enquiry specification shall be manufactured and supplied to BHEL Trichy for testing purpose within 2 months from RFQ.
- e) Commissioning and after sales support shall be available in India.

SECTION-3

I. DOCUMENTS TO BE FURNISHED BY THE VENDOR

- a. Along with the offer (Offer shall be given in duplicate. Each copy shall contain the following)
 - Fully filled up Sub-delivery enquiry deviation format. (Any deviation from the enquiry specification shall be clearly brought out in this format with technical reasons. Only deviations indicated in this format and accepted by BHEL in writing will be considered in the event of an order. Deviations indicated elsewhere in the offer will not be considered.)
 - GA drawings of Load cell
- b. Documents to be given after placement of order (Three sets of the following documents/drawings shall be sent to BHEL within 15 days from the date of placement of order for approval (in Adobe Acrobat reader - “*.pdf” format). Comments, if any, on the vendor drawings shall be incorporated and revised drawings shall be submitted within 15 days from the receipt of the BHEL commented drawings at vendors end).
 - GA drawings of the load cell
 - Datasheet for load cell and cable
 - O&M instructions including erection guidelines
 - Vendor quality plan in BHEL /Customer format after incorporation of BHEL comments and indicating PO number.

SECTION-4

I. INSPECTION AND TEST REQUIREMENTS

- The vendor shall submit the Vendor Quality Plan (VQP) and the VQP shall be as per the “BHEL format”. The same will be subjected to BHEL/ customer approval after purchase order.
- Following tests shall be considered as a minimum for the load cell. The detailed test procedure for these tests shall be submitted for BHEL approval after purchase order.
 - Non-Linearity
 - Hysteresis
 - Repeatability
 - Zero balance
 - Temperature effect
 - Creep
 - Bridge resistance
 - Offset
 - Zero drift
 - Thermal drift
 - Insulation
- Following type tests shall be considered as a minimum for the load cell. The detailed test reports for these tests shall be submitted after purchase order.
 - Ultimate overload
 - IP -65 protection
 - Non-axial loading up to 50% of rated capacity

Other Requirements:

- Wherever ‘CHP’ (Customer Hold Point) / ‘W’ (witness) is indicated in the approved VQP, vendor shall offer the material for inspection by BHEL and / or Customer.
- Vendor shall give 21 days’ notice for arranging inspection by BHEL/ Customer.
- Wherever ‘CHP’ / ‘V’ (verification) is indicated against verification of Type test, clearance from Customer, vendor shall ensure the same prior to inspection and submit the same during inspection.
- Material can be despatched only after obtaining M.D.C.C (Material Despatch Clearance Certificate) from BHEL/Customer. No material shall be despatched without MDCC.
- Vendor shall submit copy of all test certificates / documents as indicated in the approved VQP along with inspection call.
- Testing and Inspection charges for all the tests, if any, shall be included in the product cost and no separate charges will be considered.