INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR** ELECTRONIC WEIGHING SYSTEMS	IPSS: 2-07-087-13 (*First Revision*)
	CORRESPONDING IS DOES NOT EXIST	Formally - IPSS: 2-07-087-93

0. FOREWORD

0.1 Interplant standardization activity in steel industry is being pursued under the aegis of Steel Authority of India Ltd (SAIL). This Interplant Standard (first revision) was prepared by the Standards Committee on Computerization and Automation, IPSS 2:7 with the active participation of the representatives of steel plants, established manufacturers in this field & reputed consulting organizations. Originally, the standard was published in 1993. Based on recent developments, it is revised and adopted in February, 2013.

0.2 Interplant Standards on design parameters primarily aim at achieving rationalization and unification of parts and assemblies of process and auxiliary equipment used in steel plants and these are intended to provide guidance to the steel plant engineers, consultants and manufacturers in their design activities.

0.3 The definitions of various terms used in this standard shall be as per the following:

IS 9281(Part 1):1979	Electronic Weighing Systems: Part 1 Terms and Definitions
IS 9281(Part 2):1979	Electronic Weighing Systems: Part 2 Methods of Measurements
IS 9281(Part 3):1981	Electronic Weighing Systems: Part 3 Requirements (with amendment 1)
IS 9281(Part 4):1983	Electronic Weighing Systems: Part 4 Code of Practice for Use and Installation.

1. SCOPE

1.1 This Interplant Standard covers the requirements of different weighing systems as specified below:

Group I -

i) Road Weigh bridge
ii) Rail Weigh Bridge
iii) In motion Rail Weighing System (load cell based)
iv) Platform weighing system

Group II –

i) Hopper Weighing System
ii) Weigh Feeder System
iii) Belt Weighing System

Group III -

i) In motion Rail Weighing System with rail mounted transducers

Group IV -

i) Crane Weighing System

2. ENVIRONMENTAL CONDITIONS

2.1 These shall be as per the standard IPSS:2-07-001-87 `Guide for tests for hardware and enclosure for different environments'.

2. DESIGN

3.1 Power Supply

a) Rated Voltages **:** 415/240 V, 50 Hz

b) **Permissible Variations:**

Voltage	:	± 10%
Frequency	:	- 6%, + 3%
Combined variation	:	± 10%
Waveform distortion	:	5%
Phase unbalance	:	2%

c) **System short circuit level**: User specified

d) System neutral : Solidly grounded, unless otherwise specified

3.2 Load Cell

Type	:	Strain gauge (Compression, Tension or Shear beam)
Accuracy	:	± 0.03% or better
Output signal	:	1.0 to 3.5 Mv / V (minimum 20 mV at full load) with supply of 10 - 24V dc
Non-linearity	:	± 0.03%
Hysteresis	:	± 0.03%
Repeatability	:	± 0.02%
Creep	:	± 0.03% (in 30 min)
Safe operating temp.	:	70^{o}C
Temp. Compensation	:	55^{o}C
Safe overload capacity	:	200% min of rated capacity
Breaking load	:	300% min of rated capacity
Surge Suppressor Protection	:	Required
Lateral load	:	10% min of rated capacity Side load discrimination of 500:1 for shear beam type
Zero balance	:	± 1% of range
Temp. effect on: a) Output b) Zero	 : :	 ± 0.003% per deg C ± 0.006% per deg C
Insulation Resistance	:	Min 1000 Mega-Ohms at 50 V dc
Enclosure protection	:	IP-67 min
Load Cell Cable	:	4/6 core, with shield
Test Certificates	:	Conforming to OIML/NTEP/DIN

Installation	:	Installation to be decided based on site/technical requirement.
Mounting accessories		Complete mounting kit suitable for offered load cell.

3.3 **Weighing Electronics** - The Weighing electronics shall be micro-processor based and shall facilitate signal processing, indication of various weighing signals, diagnostics, storage of weighing data, real time clock and provide necessary auxiliary output as per user's requirement.

3.3.1 Mode of operation:

i) IBM compatible PC based - Data processing shall be done in PC and report print out shall be generated as per user requirement.

ii) Intelligent terminal based - The application software shall reside in digitizer (EPROM). Input data will be entered through keyboard and hard copy print out will be taken from printer in desired format.

Tamper Proof:

i) All weighments measured automatically by the system and recorded in the memory should be tamper proof.

ii) Real time clock should generate date and time. This should be tamper proof and printed along with the weight.

iii) Provision for password facility to user to be there.

Peripherals - Printers with Standard Interfaces shall be ruggedized and of continuous duty type. VDU, Keyboard, etc. shall be with Standard interface.

Communication Ports - All communication in system for VDU, Printers, etc. shall be through RS-232C or profibus or TCP/ IP shall be provided.

Digital Weigh Display:

- Digital display on panel
- Optional Remote display

Protection & Earthing - The load cell and electronics shall be protected against voltage surges and lightening. Isolated earthing shall be provided as per relevant electrical standards with proper size and material used for electrode and copper strip (used for connection from electrode to weighing system) etc. The IPSS Standard on earthing shall be generally followed.

Shunt protection for load cell to be provided. Enclosure protection for Junction boxes to be as per IP-65.

4. GROUP I

4.1 Rail Weigh Bridge, Rail Weigh Bridge (Static) & Platform Weighing System:

Type	:	Surface mounted/ Pitless type
Accuracy	:	+0.05%
Resolution	:	0.025%
Platform Size	:	As required
Auto Calibration	:	Required
Auto Zeroing	:	Required
Diagnostics	:	a) Overload b) System self diagnostics c) Load Cell failure d) Power supply failure e) Electronics hardware failure

4.2 In-Motion Weighing

Capacity	:	As required
Type	:	Rail mounted pitless
Resolution	:	$\pm$ 0.025% FSD
Calibration accuracy	:	$\pm$ 0.05% FSD
Overall accuracy (Dynamic mode)	:	$\pm$0.5% for each wagon $\pm$ 0.2% for each rake
Platform size	:	As required
Weighing speed	:	10 km/hr
Unidirectional/ Bidirectional	:	Bidirectional weighing
Single/ Multiple draft	:	As applicable
Auto Calibration	:	Required to be provided

Auto balancing	:	Required to be provided
Advance over speed warning	:	Over speed signaling to be provided on a mast near the weighbridge to indicate nominal speed, marginal overspeed and overspeed for guidance of loco-drivers to take corrective actions, if necessary (optional). Print out of overspeed in computer hard copy in case of in-motion weighment. Weighing shall be inhibited if speed continues to be abnormal over the bridge and appropriate message display shall be printed along with an audible alarm in weigh house.
Real time clock	:	Required with battery back up
Auto storage of Weighing record	:	Adequate non-volatile memory required for automatic storage of complete weighment report of gross weight and other operator entries pertaining to at least 2000 wagons (or as specified). It shall be possible to retrieve these data by authorized persons in the form of hard copy.
Diagnostics test Facilities	:	Indication/annunciation of following abnormalities - a) Overload b) System self diagnostics c) Load Cell failure d) Power supply failure e) Electronics hardware failure f) Overspeed g) Track switch failure h) Load cell excitation failure

Track Switch Logic : Appropriate logic for -

a) Automatic elimination of Loco's and brake vans weights from weighment report.

b) Identification & weighing of all type of wagons in sequential and coupled conditions.

c) Anti Roll back protection.

Track Switch	Switches to be inductive proximity type with protection IP-67

5. GROUP II

5.1 Hopper Weighing System

Hopper capacity	:	As desired
Weigh cycle period	:	To be specified by user
Material, grain size & moisture content	:	To be specified by user
Overall accuracy	:	±0.05% or better
Resolution	:	0.05% of FSD
Electronics		Microprocessor based weighing electronics for signal processing, load cell excitation, etc. To provide potential free contact for various set points (entered from setter panel or, key-board) such as 90% & 100% of set weight discharge. Auto zeroing, Auto Calibration required.
Taring and calibration		Auto taring, zero and span adjustment to be provided
Mode of operation		Automode - To discharge the set weight automatically and close the vibro-feeder. Manual - To discharge the material from hopper manually.
Digital display/ indication	:	- Current weight in hopper - Indication on 90%, 100% of set weight discharged - Overload indication - Empty indication - Auxiliary display for set weight

- Cumulative discharged weight

- Auto/Manual selection

Output	:	4- 20 mA dc o/p required
Interlocking details	:	To be provided by the user.
Test & calibration		Dedicated dead weight shall be symmetrically suspended on side from each hopper for the purpose of testing and calibration. Suitable screw jacks shall be provided underneath each dead weight for the purpose of releasing and supporting the dead weights.

5.2 Weigh Feeders System

Capacity		User specified
Accuracy		+ (0.1 - 0.5)%
Duty		Continuous duty
Material quality		Quality of the material including grain size, bulk density, moisture content, etc. shall be specified by the user.
Rate of discharge		Range to be specified by the user.
Rangeability	:	1 : 10
Feeder details		Vendor shall specify Belt width, Speed, Centre-to-centre distance between pulleys, Feeder length etc.
Belt Scrappers		To be provided
Belt Skirts		As required
Weighing electronics		Micro-processor based weighing electronics for signal processing, indication of various weighing signals such as flow rate, Belt speed and cumulative weight etc. and controlling rate of discharge as per set rate. Auto zeroing, Auto Calibration required.
Taring and calibration	-	Auto taring, zero and span adjustment to be provided

Following controls shall be provided through weighing control panel:

- Feeder start/stop push button

- Feeder rate increase/decrease push buttons for providing set points to controller

- Indicating lamps for equipment status including zero speed/over speed

- Operation mode selection switches

- Read/set, alarm accept, emergency off, reset push buttons

Speed drive system	Drive motor, coupling, gear boxes, bearings, thyristor controls, VVVF etc.
Tacho-generator	Pulse type tacho-generator
Drive motor	The drive motor shall be thyristor controlled variable speed ac/dc motor totally enclosed with min IP-55 protection, insulation class `F' and naturally / fan cooled. Motors shall be mounted in such a way that it can be removed easily and rapidly. Speed control and range of drive shall be 1:10. Drive capacity shall be furnished by the vendor. MCC equipments shall be provided in separate cubicle. Field and O/L protection should be provided.
Mode of operation	Provisions for Local/Remote; Gravimetric/ Volumetric
AUTO	Weigh Feeder start/stop and set point commands shall be given through other control stations.
SEMI-AUTO	Start/stop and set point shall be given from control room manually.
LOCAL	Start/stop and set point shall be given through local control panel.
Local Control Box	(Local control box shall be normally avoided if Remote control cubicle is located at a convenient place nearby). Local Control Box shall consist of conveyer ON/OFF push buttons, emergency OFF switch, Feed rate

	increase/decrease. Read set, tare/ span adjustment indication of set rate and flow rate, LCB shall be with IP-65 / 54 enclosure protection. Read/set, alarm accept, O/L reset push button shall be provided.
Belt Snapping Protection	Required

5.3 Belt Weighing System

Capacity	As required
Duty cycle	Continuous
Accuracy	± (0.1 - 0.5)%
Application information	Belt width, Belt length, Belt speed, Belt-inclination, idler-trough angle, etc. to be provided by the user.
Material	Type, moisture content, size etc. to be furnished by the user.
Speed and calibration	Digital pulse tacho-generator with min. IP-65 protection (output-data to be furnished by the vendor).
Taring and calibration	- (Auto taring, zero and span adjustment to be provided. - Standard weight and chain shall be provided by the vendor.
Type	Single Idler/ Multi idler
Electronics	Micro-processor based electronics with following facilities: Facilities to take care of uneven belts, sticking of materials on belts, wear and tear of the belt, structural vibrations, etc. Flow rate measurement Auto tare Digital displays for - Flow rate, cumulative weight, Belt speed, platform weight (on demand).

Signaling for over range, system fault diagnostic, load cell failure, tacho failure etc.

Enclosure of electronics shall be IP-54.

6. GROUP III

6.1 In motion Rail Weighing System with rail mounted transducers

6.1.1 Rail Mounted Sensor

Creep	:	± 0.03% (in 30 min)
Safe operating temp.	:	70°C
Temp. compensation	:	55°C
Safe overload capacity	:	150% min of rated capacity
Breaking load	:	300% min of rated capacity
Lateral load	:	10% min of rated capacity Side load discrimination of 500:1 for shear beam type.
Zero balance	:	± 1% or range
Accuracy	:	±0.03%
Temp. Effect on -		
a) Output	:	± 0.003% per deg C
b) Zero	:	± 0.006% per deg C
Insulation resistance	:	Min 1000 Meg-Ohms at 50 V dc
Enclosure protection	:	IP-67 min
Shunt protection	:	Required
Load Cell Cable	:	4/6 core, with shield
Test Certificates	:	Conforming to OIML/NTEP/DIN
Installation		Installation to be decided based on site/ technical requirement.
Mounting accessories		Complete mounting kit suitable for offered transducer.

Junction box : Enclosure protection as per IP-65

6.1.2 In-Motion Weighing - As per clause 4.2.

7. GROUP IV

7.1 Crane Weighing System

7.1.1 Load Cell (Strain Gauge type) - The specification shall be as per clause 3.2 above.

7.1.2 Crane Weighing System:

Capacity : As required

Installation : To be decided based on actual arrangement of crane hoist. The system shall be suitable for easy maintainability and replacement.

Overall accuracy : ± 0.5% or better

Weighing electronics : Microprocessor based weighing electronics in modular design with digital displays having following features -

- Auto tare/Manual tare adjustment
- Calculation of net weight, part weight
- Signal processing, filtering
- Adequate storage facilities
- Suitable display driver unit for large digital display
- Digital display on operator control panel for net weight, (part weight in teeming cranes).
- Fault annunciation
- Standard interface for peripherals

Large digital display : 300 mm character height or suitable height, 5/6 digit displays.

Electronics cubicle	:	- Shall be mounted on Anti vibration pad for 2 g vibration. - IP-65 (Min) enclosure protection - Suitable provision for heat dissipation
UHF communication (Optional)	:	UHF trans-receivers to facilitate communication with process control computer shall be provided.
Cable reeling drum (if applicable)	:	Spring loaded cable reeling drum without slip rings suitable for auto winding and pay off of appropriate length of load cell cables depending on lift (Max height) of hoist.
Festooning arrangement	:	Adequate festooning arrangement along with cables shall be provided from junction box on crane bridge to trolley, additional interconnecting chains between festoon support sleeves should be provided to prevent tension in cable.

8. GENERAL POINTS

8.1 Installation Guidelines;

i) Stabilized power supplies (preferably with UPS) shall be provided.

ii) High degree of protection shall be provided against all forms of electromagnetic and Radio frequency interference.

iii) All weighing systems shall be stamped by vendors as per weights and measure rule, as in force.

iv) Training - User specified.

v) Guarantee - 1 Year guarantee from the date of acceptance of the system.

vi) Protection & Earthing - The load cell and electronics shall be protected against voltage surges & lightning. Isolated earthing shall be provided with proper size and material used for electrode and copper strip (used for connection from electrode to weighing system) etc as per IS 3043:1987 `Code of Practice for Earthing (first revision)'. The supplier will get it inspected and approved by the user during and after completion of earthing pit.

vii) Documentation - 6 sets of detailed circuit diagram of all electronic cards and modules, interconnection diagrams, component layout, component details, explanation of functioning of each card and module, trouble shooting chart, operational and maintenance manuals to be provided. 1 set complete tracing of all drawing to be given to user.

Calibration procedure for the weighing system in step by step manner, using standard weight on any other hydraulic/pneumatic device to be given to the user.

viii) Tangent Level Track:- A minimum of 100 Meter level tangent rail track length shall be available on either side of the in-motion rail weighbridge .

ix) Gradient - A provision of 500 Meters of rail track length shall be provided on either side of the weighbridge with a gradient not exceeding 1 in 400.

x) No portion of the weighbridge shall lie on a curve.

8.2 Tools & Tackles - As per user's requirement/ manufacturer's recommendation.

8.3 Performance Acceptance Test

- All necessary tests shall be carried out by the supplier to demonstrate the performance of equipments offered to conform to the relevant standards and specifications.

- The repeatability of the system will be checked in the various operating regimes specified as above, after period of 3 days, 7 days and 15 days after initial calibration.

- The user shall facilitate smooth and timely conduction of Acceptance test.

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