INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**CODE OF PRACTICE FOR MAINTENANCE OF ELECTRONIC WEIGHING SYSTEMS AND WEIGH BRIDGES**	**IPSS: 2-07-100-15**
	Corresponding IS does not exist	

0. FOREWORD

0.1 Interplant standardization: Standardization activity in steel industry is being pursued under the aegis of Steel Authority of India Limited (SAIL). This Interplant Standard has been prepared by the Standards Committee on Instrumentation and Automation IPSS 2:7, with the active participation of representatives from the steel plants, other concerned organizations and established manufacturer in the field, and was adopted on May, 2015.

1.0 SCOPE

1.1 This Interplant standard provides code of practices for maintenance of various types of Electronic Weighing systems viz. Hopper/ Bin weighing Systems, Belt Weigh Scales & Weigh Feeders, Platform Scales etc. and Weighbridges viz. Road Weigh Bridges, Static & In-motion(both Pit & Pit less Types) Rail Weighbridges etc. used in Steel Plants. This document is to give guidelines for the Maintenance personnel of Steel Plants to carry out proper maintenance of various electronic weighing systems and Weigh Bridges.

1.2 In this document, various maintenance schedules to be adhered to (daily, monthly, yearly) are given to enable the maintenance personnel to carry out the maintenance and inspection jobs and to ensure long life to these equipment, safety to men and material and also to achieve trouble-free service and un-interrupted availability of the weighing systems and weighbridges.

1.3 This Interplant Standard covers the requirement of code of practices for maintenance of different weighing systems as specified below:

Group I –

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

Group II –

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

Group III –

In motion Rail Weighing System with rail mounted transducers

Group IV –

Crane Weighing System

2.0 References

Sl. No.	Standard No.	Description
1.	IS : 9281(Part-1)- 1979 (Reaffirmed 2006)	Electronic Weighing Systems- Part-1: Terms and Definitions.
2.	IS : 9281(Part-2)- 1979 (Reaffirmed 2006)	Electronic Weighing Systems- Part-2: Methods of measurements.
3.	IS : 9281(Part-3)- 1981 (Reaffirmed 2006)	Electronic Weighing Systems- Part-3: Requirements (With Amendment-1).
4.	IS : 9281(Part-4)- 1983 (Reaffirmed 2006)	Electronic Weighing Systems- Part-4 : Code of practice for use and installation.
5.	IPSS : 2-07-087-93	Specification for Electronic Weighing Systems.
6.	OIML : R 60,2000(E)	Metrological regulation for load cells.
7.	OIML : R 50-1, 1997(E)	Continuous totalizing automatic weighing instruments.(Belt Weighers)- Part-1 : Metrological and technical requirements – Tests.
8.	OIML : R 50-2, 1997(E)	Continuous totalizing automatic weighing instruments.(Belt Weighers)- Part-2 : Test Report Format
9.	OIML : R 106-1, 1997(E)	Automatic Rail weigh bridges.- Part-1 : Metrological and technical requirements – Tests.
10.	OIML : R 106-2, 1997(E)	Automatic Rail weigh bridges.- Part-2 : Test Report Format
11.	OIML : R 107-1, 2007(E)	Discontinuous totalizing automatic weighing instruments(Totalizing Hopper Weighers)- Part-1 : Metrological and technical requirements – Tests.
12.	OIML : R 107-2, 2007(E)	Discontinuous totalizing automatic weighing instruments(Totalizing Hopper Weighers)- Part-2 : Test Report Format

3.0 MAINTENANCE PRACTICE:-

It is essential to carry out regular inspection of the various Electronic Weighing systems and Weighbridges and carry out necessary maintenance activities to provide long life to the equipment and achieve trouble-free service. In order to carry out the necessary inspection and maintenance works, necessary safety procedures such as line clearance/equipment shutdown etc. will be strictly adhered to, wherever necessary. The frequency of inspection depends on climate, environment, load conditions and also the age of the weighing systems/ weighbridges. The inspection cum maintenance schedule as per frequency is as given below:-

3.1 **Road Weigh Bridge, Static/ In-motion (Load cell based) Rail Weighbridges and Platform weighing system**:-

WEEKLY Inspection Schedule:-

a) Physically inspect the Weighbridge Structure and its clearance to avoid fouling of structure with sidewalls.
b) Check bridge level.
c) Check UPS operation.
d) Proper sealing of Weighing equipment.
e) Check any abnormality and bridge vibration.
f) Observe weighbridge operation.
g) Check for cleanliness and water logging in bridge vicinity.

MONTHLY Inspection Schedule:-

a) Ensure that all the load cells are mounted properly along with the assembly. Check the clearances of Yokes, Constrainers and alignment of Weighbridge Structure by physical assessment.
b) Check the tightness of load cell base plate bolts, Load cell fixing bolts, covers plates of Weigh Bridge Structural etc. Check load cell base plate.
c) Re-fix all the Yokes / Constrainers etc. for proper alignment, if required.
d) Remove the covers of UPS/ CVT and clean them with the help of hand blower . Inspect the PCBs, Connectors of UPS etc. and rectify the loose connection, if any.
e) Place the covers back and Switch “ON” the UPS / CVT and measure the AC output voltage (230V $\pm$ 5V, 50Hz) with of Digital Multi meter.
f) Observe the response of the Weighbridge by placing loads on the Weighbridge.
g) Check the data communication between the Digital Weight Indicator (DWI) and PC after verifying the Connections.
h) For rail in motion weighbridge, maintenance of track switches:- During OFF condition check the Track Switch supply, physically check the working of track switch lever, Spring tensions, magnet and proximity switch gaps, position of flags, Allen bolt tightening, spring greasing etc. Rectify the deviation / fault if any. During “ON” condition of track switch check the supply, physically operate the Track Switches and observe the voltage levels at Logical “0” and Logical “1” level. Ensure proper working conditions with reference to rib level of rail. Adjust the level of Track Switch lever, if required.

i) Checking and tightening of check rods, track switch brackets etc.
j) Checking of Load cell mounting and adjusting of the same if required
k) Checking and tightening of all Nuts, bolts, Check plates and anchor bolts, as per requirement.
l) Calibration checking and correction/recalibration with Test weights/Test Vans.
m) Checking CUP & CONE wear and tear. Replace when required.
n) Ensure electric earthing.
o) Junction box wiring should be tightened.
p) Comparison of Milli volt from load cell.

YEARLY Inspection Schedule:-

The following jobs are to be carried out, in addition to all the monthly activities for annual stamping of various Weighbridges by Legal Metrology Department.

a) Measure all load cell impedance and output voltage without dead load and measure output voltage with dead load and record.
b) Clean the Digital Weight Indicator by removing the covers and the panel.
c) Verification and Stamping activities of Weighbridges.

Inspection of Road Weighbridge

a) Ensure that Weighbridge Platform is empty and Weighbridge Structure is freely suspended on the Load cells.
b) Switch OFF the Power Supply of DWI and then make it “ON” again to establish the running of Default Program for unit Start Up. The display reading should be Zero.
c) Place the Standard Weights or Standard Slabs on the Weighbridge and note down the readings and then remove the weights from the Bridge and reconfirm Zero reading on DWI with no load on the Platform.
d) Check and note down weighment reading with a loaded truck weighed earlier. Establish the weighment to be within maximum accuracy limits of +/- 3e.

Inspection of Rail Weigh Bridges

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a) Ensure the Rail Weighbridge Platform is empty and Structure is freely suspended on the Load cells. Ensure that the Tie rods / Constrainers are fitted properly.
b) Checking and Adjustment of rail gap between Weighbridge and Approach Rails.
c) Switch OFF the Power Supply of DWI and then make it “ON” again to establish the running of Default Program for Unit Start Up. The display reading should be Zero.
d) Verify the PC Communication with the DWI. Check the weighbridge with Test Van as per the capacity of the Weigh Bridge and note down the readings which shall be within the accuracy limits of +/- 3e .
e) Remove the Test Van from the weighbridge and reconfirm Zero reading of DWI .
f) During Verification allow the Test Van to pass on the Bridge in one direction only with a speed not exceeding 5 Kilo Meter per hour .

Inspection of Platform weighing system

a) Check visual appearance of the load cell, load cell cable, junction box, cable gland connection and indicator.
b) Check clearance around the platform.
c) Check Input impedance and output impedance, it should be as per the data sheet of load cells.
d) Check tightening of the load cells, load cell connections and indicator connection. If not make it the same.

e) Check mV output at each load cell at no load, it should be 0.0mV or +/- 0.1mV is acceptable
f) Measure mV output with Platform weight. It should be recorded. It should not be negative mV, It should not be above the limits
g) Check configuration of the indicator, like capacity, readability, and calibration weight value. The same to be modified if required.
h) Do software calibration or data sheet calibration if calibration disturbed.
i) Ensure zero in the indicator, To Place unknown or pre-weighted material (Approximately 1/4 of capacity of the scale) in the platform.
j) Record indicator reading, and take it out material from the platform to ensure zero, normally the indicator should come back to zero. Repeat 10 times and record the values.
k) Indicator comes back to zero if repeatability of the platform achieved.
l) Repeatability not achieved then load foot to be adjusted and lock nuts to be tightened properly.
m) Minimum require weights for the calibration is 1/3 rd of the capacity of the platform scale.
n) Linearity of the system to be verified by adding standard weights or pre-weighted material up-to full scale capacity of the scale in the interval of 10% of full scale.
o) Platform Scale calibration to be checked up-to maximum capacity of the system.

3.2 **Hopper/ Bin Weighing, Belt Weighing/ Weigh Feeder Systems**:-

Inspection check list of Hopper/Bin/Silo Weighing Systems

a) Check visual appearance of the Load cell installation kits, load cells, load cell cable, junction box, cable gland connection and indicator.
b) Check clearance around the Hopper/ BIN/ Silo.
c) Tag numbers to be checked in all load cells and the same identification should be in junction box also.
d) Check Input impedance and output impedance, it should be as per the data sheet of load cells.
e) Check tightening of the load cells, load cell connections, Load cell installation kits and indicator connection. If not make it the same.
f) Check the mV output at no load, it should be 0.0 mV.
g) Measure individual load cell output.
h) Balancing to be done by providing packing (SS Sheet, Aluminum Sheet), the same to be confirmed by measuring individual load cells outputs. Measure average mV output of load cells and record it.
i) Individual load cell output should be equal or +/- 0.2 mV of Average output of the load cells ,if symmetrical arrangement of the Hopper/ BIN/ Silo.
j) Check configuration of the indicator, like capacity, readability, and calibration weight value. The same to be modified if required.
k) Do software calibration or data sheet calibration if calibration disturbed.
l) Ensure zero in the indicator, To Place unknown pre-weighted material in leg / lug of the load cell, observe indicator reading, and take it out from the leg / lug to ensure zero again in the indicator.
m) Repeatability of the system achieved if indicator comes back to zero, if not achieved balancing to be done by providing packing.

n) To check all leg / lug of the load cells by placing unknown weights, observe indicator reading should be same in all leg / lug if symmetrical arrangement of the Hopper/ BIN/ Silo
o) Minimum require weights for the calibration is 1/3 rd of the capacity of the Hopper/ BIN/ Silo.
p) Linearity of the system to be verified by adding standard weights or pre-weighted material up-to full scale capacity of the system in the interval of 10% of full scale
q) Hopper/ BIN/ Silo weighing system calibration to be checked up-to maximum capacity of the system.

Inspection check list of Belt Weighing/ Weigh Feeder Systems

a) Check visual appearance of the Load cell installation kits, load cells, load cell cable, junction box, cable gland connection and indicator.
b) Check Input impedance and output impedance, it should be as per the data sheet of load cells.
c) Check tightening of the load cells, load cell connections, Load cell installation kits and indicator connection. If not make it the same.
d) Check the mV output at no load, it should be 0.0 mV.
e) Measure individual load cell output.
f) Check the functioning & configuration of the weighing indicator/controller, like capacity, readability, and calibration weight value etc. The same to be modified if required.
g) Check the functioning of the speed sensor.
h) Do software calibration or data sheet calibration. if calibration parameters disturbed.
i) Calibrate the system using test weights/ test Rod/ test chain etc. as applicable.

3.3 **In motion Rail Weighing System with rail mounted transducers**:-

Inspection Check list

a) Check UPS operation
b) Check Proper sealing of Weighing equipment.
c) Check for cleanliness and water logging in weighbridge vicinity.
d) Remove the covers of UPS/ CVT and clean them with the help of hand blower. Inspect the PCBs, Connectors of UPS etc. and rectify the loose connection, if any.
e) Place the covers back and Switch “ON” the UPS / CVT and measure the AC output voltage (230V $\pm$ 5V, 50Hz) with of Digital Multi meter.
f) Observe the response of the Weighbridge by placing test van loads on the Weighbridge.
g) Check the data communication between the DWI and PC after verifying the Connections.
h) Maintenance of track switches:- During OFF condition check the Track Switch supply, physically check the working of track switch lever, Spring tensions, magnet and proximity switch gaps, position of flags, Allen bolt tightening, spring greasing etc. Rectify the deviation / fault if any. During “ON” condition of track switch check the supply, physically operate the Track Switches and observe the voltage levels at Logical “0” and Logical “1” level. Ensure proper working conditions with reference to rib level of rail. Adjust the level of Track Switch lever, if required, measure all load cell impedance and output voltage without dead load and measure output voltage with dead load and record.
i) Clean the Digital Weight Indicator by removing the covers and the panel.
j) Switch OFF the Power Supply of DWI and then make it “ON” again to establish the running of Default Program for Unit Start Up. The display reading should be Zero.

k) Verify the PC Communication with the DWI. Check the weighbridge with Test Van as per the capacity of the Weigh Bridge and note down the readings which shall be within the accuracy limits of +/- 3e .
l) Remove the Test Van from the weighbridge and reconfirm Zero reading of DWI .
m) During Verification allow the Test Van to pass on the Bridge in one direction only with a speed not exceeding 5 Kilo Meter per hour.
n) Checking and changing/ replacement of defective Weigh line sensors, approach rails, defective weighing rails, track switches etc.
o) Checking of termination of Weigh line sensors and Track switch cables at JB & weigh indicator/ console as per requirement.
p) Simulation Checking for Weigh line sensors, Track switches and Power supply .
q) Checking the input / output resistances, voltage signals of Weigh line sensors of Weigh rails.
r) Linearity checking of Weigh rails once in a year.
s) Check for 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 .
t) Check the track 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.
u) No portion of the weighbridge shall lie on a curve.
v) Intermediate Calibration checking and correction/recalibration with Test vans once in 15 days.

3.4 **Crane Weighing System**:-

Inspection Check list

a) Check visual appearance of the load cell, load cell cable, junction box, cable gland connection and indicator.
b) Check Input impedance and output impedance, it should be as per the data sheet of load cells.
c) Check tightening of the load cells installation kits, load cells connection and indicator connection.
d) Check mV output at no load, it should be 0.0mV or +/- 0.1mV is acceptable.
e) Measure individual load cell output. Individual load cell output should be equal or +/- 0.2mV of Average output of the load cells is acceptable.
f) Measure average mV output of load cells and Record it.
g) Check configuration of the indicator, like capacity, readability, and calibration weight value. The same to be modified if required.
h) Do software calibration or data sheet calibration if calibration disturbed.
i) Intermediate Calibration checking and correction/recalibration with Test load once in 15 days