Eskom	Standard	Technology

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FIGURES

TABLES

1. INTRODUCTION

This specification describes the technical requirements for all electro-mechanical or load cell type scales. The old mechanical type and nuclear type scales are not described in this specification due to their inability to measure the mass of bulk solids to within the required accuracy.

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

To provide an Eskom specific generic precedent for the purchase of a retrofit or new mass meter.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 NORMATIVE/INFORMATIVE REFERENCES

The following standards contain provisions that, through reference in the text, constitute requirements of this specification. Parties to agreements based on this specification shall apply the most recent revisions of the standards listed below. Information on currently valid national and international standards may be obtained from the Information Centre at Megawatt Park and Technology Standardization Department.

2.2.1 Normative

[1] United States National Bureau of Standards Belt Conveyor scale specifications, tolerances and other technical requirements

[2] The Trade Metrology Act, 1973 (Act 77 of 1973)

2.2.2 Informative

None

2.3 DEFINITIONS

Definition	Description
Automatic Scale	A mass meter provided with a self-acting mechanism for the measurement of the mass of any material passed intermittently or in a continuous stream over the load receptor, and the automatic summation of the mass of such material.
Conveyor Belt Scale	A mass meter of which the load transmitting device comprises or includes one or more load cells which measure the mass of a load and transmit the value thereof in the form of an electrical signal to a manually operated or self-indicating electronic measuring device which provides analogue or digital indication of the mass of the load.
Electronic Load-Cell Scale	A mass meter of which the load transmitting device comprises or includes one or more load cells which measure the mass of a load and transmit the value thereof in the form of an electrical signal to a manually operated or self-indicating electronic measuring device which provides analogue or digital indication of the mass of the load.
Hopper or Calibration Bin Scale	A mass meter consisting of a load receptor in the form of a hopper or surge bin, a load transmitting device, and a load measuring and indicating device.
Measuring Length	In terms of a conveyor belt scale, it is the distance between the centres of the

Definition	Description
	outer rollers on the belt supporting structure of the load receptor increased by one half of the distances between the centres of those rollers and the centres of the respective nearest rollers not on said structure.
Platform Scale	A mass meter consisting of a load receptor in the form of a platform, a load transmitting device, and a load measuring and indicating device.

2.3.1 Disclosure Classification

Controlled Disclosure: Controlled Disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
m/sec	Meters per second
T	Ton
t/hr	Ton per hour

2.5 ROLES AND RESPONSIBILITIES

None

2.6 PROCESS FOR MONITORING

None

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. REQUIREMENTS

A conveyor belt scale installation will consist of the following:

a. A conveyor system consisting of a belt which travels on a roller track.

b. A dedicated weigh-area built into the conveyor system.

c. A conveyor belt scale installed within the dedicated weigh-area

d. An electrical supply to the scale

3.2 CONVEYOR SYSTEM

a. The conveyor system must be evaluated in order to establish if a scale can be installed within the system.
b. It must be established what modifications if any will be required in order to allow a scale to achieve the specified accuracy.
c. It must be established how many weigh-idlers will be required on the scale to achieve the specified accuracy.

3.3 CONVEYOR WEIGH-AREA

Weigh-area will consist of a dedicated stringer section designed for a scale installation, Approach and retreat weigh-class idler sets and a conveyor belt scale. See diagram below for selection of scale weigh area.

Figure 1: Conveyor Belt Scale

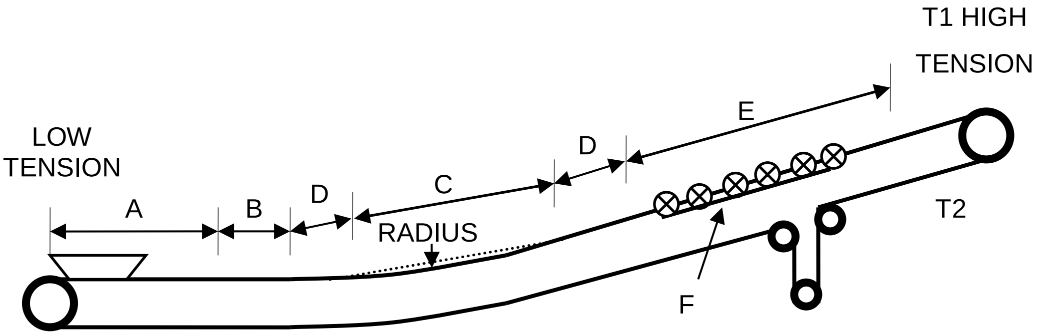
Selection of Weigh Area

* Do not install in radius of conveyor

* Install in low tension area

* Allow material to settle before passing over scale

* Do not allow installation of training idlers within 12 belt widths of scale weigh area



A = Feed settling area cannot install while product is flowing

B = Insufficient space between A & D for installation

C = Radius in conveyor cannot install in a centenary

D = Safety zone before and after radius cannot install (12 belt widths)

a. Stringer section shall be designed/modified to have a deflection ratio of greater than or equal to 1 in 900 for at least six belt widths before and after the scale installation area.
b. Approach and retreat weigh-class idler stations must be installed before and after the scale installation area.
c. At least 3 off but up to 5 off weigh class idler stations must be installed before and after the scale installation area:
   - 3 off for belt speeds < 4,5 m/sec
   - 5 off for belt speeds > 4,5 m/sec
d. Idler stations must be spaced evenly at exactly the same distance apart. (for most applications 1000mm apart would be sufficient to limit the effects of material dynamic forces through excessive indentation angle). This measurement would however be dependant on belt tension, loading and speed.
e. Idler stations to be aligned within 0,8mm on both horizontal and vertical planes
f. Idler stations to be mounted at least 6mm but not more than 8mm higher than existing conveyor idler stations.
g. Idler station troughs to line up within 0,8mm of each other.

3.4 CONVEYOR BELT SCALE COMPRISING OF A LOAD RECEPTOR (WEIGH-FRAME AND IDLER STATIONS)

a. Scale weigh-frame installed square to the mean centre line of the conveyor
b. On-scale idler stations spaced exactly the same distance apart (1000mm for most applications) from each other and the approach and retreat idler stations.
c. On scale idler stations must be aligned to within 0,5 mm of each other and the first approach and first retreat idler station on both horizontal and vertical planes.
d. On scale idler station troughs must line up within 0,5mm of each other

3.5 CONVEYOR BELT SCALE

The conveyor belt scale shall consist of the following components:

3.5.1 Idler Stations

Weigh-class shall consist of the following.

a. A weigh-class idler frame built with a maximum deflection ratio of 1/1000 and within a dimensional tolerance of 0,5mm and a troughing angle tolerance of within 0,2 degrees. Idler station mounting feet must be at least 12mm thick with two slotted holes. Hole centres must be spaced at least 250mm apart. The conveyor belt application will dictate the size and strength of each weigh-class idler station.
b. Weigh-class idler rollers with a TIR of less than or equal to 0,25 mm for applications running below 2,0 meters per second. For applications of over 2,0 meters per second the TIR must be less than or equal to 0,1 mm. Idler sets must be over designed in order to limit deflection with the shaft size being at least one size bigger than the existing conveyor idler rolls for all loadings over CEMA C.
c. Idler shims shall be of galvanised mild steel or stainless steel construction and shall be one piece and of the same length and width as the weight class idler station mounting foot.

3.5.2 Scale Weigh-frame (Load Sensor)

a. Shall be properly designed for the application in which it is to be installed and must have a deflection ratio of less than or equal to 1/1000 at the conveyor maximum surge capacity.
b. Shall be able to accurately weigh a surge of at least 100% above conveyor design capacity.
c. The scale frame shall be accurately built in order to allow proper alignment of on-scale weigh class idler sets and load cells.
d. Loadcell shall be of stainless steel construction with an IP rating of at least 66
e. Be of a 3000 division accuracy class at least.
f. Loadcell electrical cables must not be cut during installation.
g. Cables that are not able to reach the electronic amplifier directly must be junctioned using a proper load cell junction box of at least IP 66 protection class.
h. All load cell cables must be at least six core with a foil screen and a protective braided copper wire screen.

3.5.3 Speed Sensor

a. Shall be capable of accurately measuring changes in belt speed to within 0,1% of actual belt speed.
b. Shall be properly protected from the environment and shall be designed in such a way as to not damage the belt.

3.5.4 Electronic Controller Integrator

a. Shall have a local display that indicates
b. Rate of material flow in t/hr
c. Loading on belt in kg/m
d. Speed of belt in m/sec

e. Totalizer in metric tons
f. Shall have a calibration menu that allows for setting the zero and span condition of the scale.
g. The cumulative effect on the totalizer of the scale when the belt is run empty over at least three full belt revolutions must not exceed one-fifth of the allowable error on throughput of material at the maximum rate of throughput.
h. If a totalizer cut-off is provided this feature must be automatically overridden on accessing the calibration menu. Where the totalizing device does not allow counting down below zero a separate totalizer shall be shown that does allow counting below zero for calibration purposes.
i. The scale calibration must be able to be adjusted by the panel

3.5.5 Menu

The menu shall be:

a. User friendly and easy to operate
b. Easily legible and illuminated
c. Access to parameters shall be password protected
d. Shall have access to a 9 digit non resettable totalizer

3.5.6 Diagnostics

- The system shall include a feature to diagnose problems.

3.5.7 Memory

The scale electronics shall retain in memory the following in the event of a power failure:

a. Parameters set up during commissioning
b. Totalizers for tonnage passed over scale
c. All functions and features critical to the operation of the scale

3.5.8 Communications

- The scale shall meet the minimum requirement for communications between the scale and Eskom's control system.

3.5.9 Enclosure

- The scale enclosure shall have an IP rating of at least IP66 and shall be protected from corrosion.

3.5.10 Power Supply

- The power supply to the scale electronics shall be 220 V AC at 60 HZ and shall conform to all safety and legal requirements.

3.6 CONSTRUCTION

The conveyer belt passing over the load receiving structure of a conveyer belt shall be:

a. Continuous, and any joints shall be smooth;

b. Made of a material suited to the material which is being weighed, as well as to the environment;

c. So finished and arranged, in relation to the rolers, that the material on the load receptor does not move on its own accord on the belt or cannot come into contact with anything which is not part of the load receptor;

d. Of virtual constant mass per unit length and kept at virtual constant tension;

e. Provided the necessary cleaning device.

3.7 METHOD OF TESTING

3.7.1 Tests for Discrimination

When the rate of measurement is increased from 20 % to 100 % and then decreased back to 20 %, the conveyor belt scale shall accurately indicate the load increments and decrements,or where a simulated test is applied to the scale, small additions to or subtractions from, the mass of the load shall result in correct corresponding increases or decreases in the mass being added to the total indication.

3.7.2 Test for Zero Load Error

Before commencement of a load test, the conveyor belt shall be run empty for not less than 10 min and for a number of complete belt revolutions. If the cumulative error, added to or subtracted from the reading of the total indicator at the start of this test, exceeds one-fifth of the applicable allowance of error on throughput of material at the maximum rate of measurement for the period of this test, the scale shall be adjusted and the zero load test repeated.

3.7.3 Test for Accuracy of Output

The quantity of material used for testing the accuracy of output shall not be less than that of the material which would pass over the scale under actual working conditions during 10 min of continuous operation at not less than one half of its maximum rate of measurement, or such longer period as the Eskom representative considers necessary, or if testing facilities do not permit such a test, not more than three separate quantities which collectively represent at least that quantity which would pass over the scale during 10 min of continuous operation at not less than one half of its maximum rate of measurement shall be passed over the scale successively and the total mass of the three quantities shall, in this case, be compared with the combined mass recorded; any of the mentioned tests shall, so far as is practicable, be carried out at various steady rates of measurement in the capacity range of 20 % to 100 %.

3.8 HOPPER OR SURGE BIN SCALES

3.8.1 General

A hopper or calibration bin scale shall conform to any applicable provision consistent with the design of the scale.

For calibration purposes weights or mass pieces shall comply with the following table:

Table 1: Metric Mass Pieces for Course Measurement

1	2
Denomination	**Allowance of error in excess only**
over 1 000 kg	50 g per 1 000 kg
1 000 kg	50 g
500 kg	30 g
200 kg	15 g
100 kg	10 g
50 kg	6 g
20 kg	3 g
10 kg	2 g
5 kg	1 g

2 kg	600 mg
1 kg	400 mg
500 g	250 mg
200 g	150 mg
100 g	100 mg
50 g	75 mg
20 g	50 mg

3.8.2 Provisions for Testing

Where the construction or erection of a hopper or calibration bin scale is such that it is impracticable or dangerous to place certified mass pieces in or on the load receptor, the scale shall be provided with a solid support securely affixed to the load receptor on which a load of certified mass pieces equal to the capacity of the scale, at least 5 t, can conveniently and safely be loaded and unloaded.

Where it is impractical to fit a permanent support, a removable support to the satisfaction of an Eskom's representative, may be fitted.

4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
BMH SC Members	This Document has been approved by BMH SC for Review Date update

5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2012	0.3	A. Matlala	Draft document for Review created from GCSS 0338
May 2013	1	A. Matlala	Final Document for Publication
January 2018	1.1	M. Masina	Document Review Date updated no content changes
February 2018	2	M. Masina	Final Rev 2 Document for Authorisation and Publication

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

M. Masina, November 2007

7. ACKNOWLEDGEMENTS

- None