Dear Morayo,

One of the tasks I had from the TC9/SC2 meeting was to attempt to develop revised wording for the Stability of Zero requirements and tests.

Attached is the result of my work on this (the emphasis was to improve the clarity - this is a necessary underpinning before the levels of allowable differences in readings can be finally agreed).

I am working on the other issues arising from the meeting and will send you more on this as soon as possible.

Regards

Chris Davies

**OIML R50 Revision – Proposed “Stability of Zero” wording**

As indicated in discussion notes regarding the April TC9/SC2 meeting, I undertook to attempt to develop some new wording in relation to the clauses relating to Stability of Zero. The following is the result of my work on this.

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21 July 2011

**Background**

OIML R50-1:1997 had requirements for both long and short term stability of zero (clauses 2.5.5.4 & 2.5.5.5 of the 1997 document), and a single test description (A.9.4 of the 1997 document).

Although there is some possibility of improving clarity, it is believed that the test description indicates the taking of readings as shown below (x indicates a reading).

x 3 min x 3 min x 3 min x 3 min x 3 min x 3 h x 3 min x 3 min x 3 min x 3 min x 3 min x

In this case the duration of the first six readings is 15 min, the duration of the last six readings is 15 min, and the duration for all twelve readings is 3.5 h.

The allowable differences according to R50-1:1997 are as follows.

The short term zero stability criteria which says that the difference between the largest and smallest of the first six readings should not exceed

* Class 0.5: 0.0013% x Qmax x 1 h (i.e. % of load totalised in 1 h at maximum flowrate)
* Class 1: 0.0025% x Qmax x 1 h
* Class 2: 0.005% x Qmax x 1 h

The same applies for the last six readings.

The long term zero stability criteria which says that the difference between the largest and smallest of all twelve readings should not exceed

* Class 0.5: 0.0018% x Qmax x 1 h
* Class 1: 0.0035% x Qmax x 1 h
* Class 2: 0.007% x Qmax x 1 h

At the February 2009 TC9/SC2 meeting, there was discussion of a Netherlands proposal to combine the short and long term requirements (made in comments on the 1CD). The Netherlands proposal was to use the following wording:

Stability of zero

The difference between zero-indications over a period of 3 hours of operation at maximum belt speed after zero-setting shall not exceed one tenth of the appropriate maximum permissible errors specified in 2.2.2, Table 2.

However the wording which appeared in the 2CD was:

2.8.5.4 Stability of zero

The difference between the smallest and largest indications obtained in 5 tests conducted at the beginning and repeated at the end of a 3 hour period of operation at maximum belt speed after zero-setting, shall not exceed one tenth of the appropriate maximum permissible errors specified in 2.2.2, Table 2.

A.5.5.4 Short and long-term stability of zero

Zero the belt weigher and disable any automatic zero-setting device. Totalization values are to be taken from the indicator used for zero totalization.

Run the belt weigher with no load, record the initial totalization indication, and the reading after each 3-minute interval for a period of 15 minutes. The difference between the smallest and largest indication obtained shall not exceed one tenth of the appropriate maximum permissible errors specified in 2.2.2, Table 2..

Leave the belt weigher running for 3 hours without further adjustment and then record the totalization indication and after each 3-minute interval for a further period of 15 minutes. The results shall satisfy the previous requirements and the difference between the smallest and largest of all indications shall not exceed one tenth of the appropriate maximum permissible errors specified in 2.2.2, Table 2.

At the February it was agreed to combine the short and long term stability requirements however I have been unable to find documentation that indicates how the requirements were to be combined (I have some recollection of discussions about having a single percentage value applied to the difference between the largest and smallest of the 12 readings obtained rather than separate percentages for ‘short’ and ‘long’ term).

Subsequently in comments on the 2CD Australia suggested the following wording

The wording which appeared in the 3CD was:

2.7.5.3 Stability of zero

The difference between the smallest and largest indications obtained in 10 tests, 5 tests carried out at the beginning of a 3 hour period of operation, and 5 tests carried out at the end, shall not exceed:

1. for the first 5 tests, 0.7 times the appropriate maximum permissible error specified in 2.2.2 Table2,
2. for the second 5 tests, 0.1 times the appropriate maximum permissible error specified in 2.2.2 Table2

for a load totalised at the maximum flowrate for the duration of the totalization.

Each test shall be of 3 minutes duration, without load applied to the instrument. Zero setting shall be carried out prior to the first test, no further zero adjustment shall be carried out before completion of the 10 tests.

A.5.5.4 Short and long-term stability of zero

Zero the belt weigher and disable any automatic zero-setting device. Totalization values are to be taken from the indicator used for zero totalization.

Run the belt weigher with no load, record the initial totalization indication, and the reading after each 3-minute interval for a period of 15 minutes. The difference between the smallest and largest indication obtained shall not exceed one tenth of the appropriate maximum permissible errors specified in 2.2.2, Table 2.

Leave the belt weigher running for 3 hours without further adjustment and then record the totalization indication and after each 3-minute interval for a further period of 15 minutes. The results shall satisfy the previous requirements and the difference between the smallest and largest of all indications shall not exceed one tenth of the appropriate maximum permissible errors specified in 2.2.2, Table 2.

**Analysis**

Relating the allowable difference to a percentage of load totalised at the maximum flowrate for the ***duration of the totalisation*** gives rise to substantial possibilities for differences in interpretation (i.e. should the duration be taken as 3 min, 15 min or 3.5 h?). Commenting on the percentage value is not meaningful until the duration to be used for the calculation is clear.

Also there is some concern that the requirement should not describe the test.

**Conclusion**

To avoid differences in interpretation the percentage and its basis of calculation must be very clearly stated – it is suggested to base the calculation on the “percentage of the load totalised in 1 hour at maximum flowrate”, as this is simple to calculate (n% x Qmax x 1h) and allows easy comparison with the 1997 document.

**RECOMMENDED WORDING**

The following wording is recommended as combining the short and long term criteria in the most simple manner. It is similar to the Netherlands proposal following the 1CD but makes the basis of calculation of limits more explicit. Limits of difference are the same as the long term stability criteria of the 1997 document – other values could be used (e.g. the short term stability criteria) if desired.

**2.7.5.3 Stability of zero [The requirement]**

The difference between zero-indications over a period of 3.5 hours of operation at maximum belt speed after zero-setting shall not exceed the following percentages of the load totalised in 1 hour at maximum flowrate:

* Class 0.2: 0.0007%
* Class 0.5: 0.0018%
* Class 1: 0.0035%

- Class 2: 0.007%

[Note (not for inclusion in the document): these represent 0.2 times the Table 2 mpe value of a load totalised in 3 min at maximum flowrate, 0.04 times the Table 2 mpe value of a load totalised in 15 min at maximum flowrate, 0.01 times the Table 2 mpe value of a load totalised in 1 h at maximum flowrate, and 0.002857 times the Table 2 mpe value of a load totalised in 3.5 h at maximum flowrate].

**A.5.5.4 Stability of zero (2.7.5.3) [The test]**

Zero the belt weigher and disable any automatic zero-setting device. Totalization values are to be taken from the indicator used for zero totalization.

Run the belt weigher with no load, record the initial totalization indication, and the reading after each 3-minute interval for a period of 15 minutes.

Leave the belt weigher running for 3 hours. After this period, without further adjustment, record the totalization indication and continue to record readings after each 3-minute interval for a further period of 15 minutes.

The difference between the smallest and largest of all 12 readings taken over the 3.5 hour period shall not exceed the value specified in 2.7.5.3.

The above test shall be carried out without any load being applied to the instrument. Zero setting shall be carried out prior to commencement of the test, no further zero adjustment shall be carried out before completion of the test (i.e. until all 12 readings have been obtained).

**POSSIBLE ALTERNATIVE WORDING**

If the committee wished to retain separate criteria for short and long term stability, the following could be an alternative wording.

**2.7.5.3 Stability of zero**

When assessed over a period of 15 minutes as described in A.5.5.4, the stability of zero shall not exceed the following percentages of the load totalised in 1 hour at maximum flowrate -

* Class 0.2: 0.0005%
* Class 0.5: 0.0013%
* Class 1: 0.0025%
* Class 2: 0.005%

When assessed over a period of 3.5 hours as described in A.5.5.4, the stability of zero shall not exceed the following percentages of the load totalised in 1 hour at maximum flowrate -

* Class 0.2: 0.0007%
* Class 0.5: 0.0018%
* Class 1: 0.0035%
* Class 2: 0.007%

[The values are the same as in the 1997 document, with the addition of Class 0.2].

**A.5.5.4 Stability of zero (2.7.5.3)**

Zero the belt weigher and disable any automatic zero-setting device. Totalization values are to be taken from the indicator used for zero totalization.

Run the belt weigher with no load, record the initial totalization indication, and the reading after each 3-minute interval for a period of 15 minutes. The difference between the smallest and largest indication obtained in this set of six readings shall not exceed values specified in 2.7.5.3 for assessment of stability over a period of 15 minutes.

Leave the belt weigher running for 3 hours. After this period, without further adjustment, record the totalization indication and continue to record readings after each 3-minute interval for a further period of 15 minutes. The difference between the smallest and largest indication obtained in this second set of six readings, shall not exceed the value specified in 2.7.5.3 for assessment of stability over a period of 15 minutes.

The difference between the smallest and largest of all 12 readings taken over the 3.5 hour period shall not exceed the value specified in 2.7.5.3 for assessment of stability over a period of 3.5 hours.

The above test shall be carried out without any load being applied to the instrument. Zero setting shall be carried out prior to commencement of the test, no further zero adjustment shall be carried out before completion of the test (i.e. until all 12 readings have been obtained).