STP-22 Off Level Effect

Reference

Section 21 of the *Specifications Relating to Non Automatic Weighing Devices (1998) (NAWDS).*

Purpose

Section 21 of NAWDS requires that portable or movable weighing devices, of a type other than suspended, measure within the prescribed limits of error when tilted up to 3 degrees in any direction. If they can not measure accurately when tilted, they must be equipped with permanent level indicating means.

General

The Mass Approval Laboratory performs *off level* tests on small devices that are submitted for approval. Consequently, field inspectors do not have to repeat the test on those devices.

Inspectors will perform an *off level* test on larger mobile floor scales that have not been evaluated by the Laboratory. This test is performed when the device is initially inspected.

On-board weighing systems such as those used to deliver Anhydrous Ammonia (NH_3), on-board weighing systems for waste, scales mounted on lift trucks and front end loader scales must be able to perform within applicable limits of error when tilted up to at least 3 degrees. On-board weighing systems are covered in the *Special Test* section below.

Procedure

Off Level Calculation

Measure the distance, X, between the two support points of the scale. Multiply this X value by 5/100 (0.05 or approximately Tan 3°). The result is the required elevation, Y, at the support point to tilt the device by 3 degrees for testing.

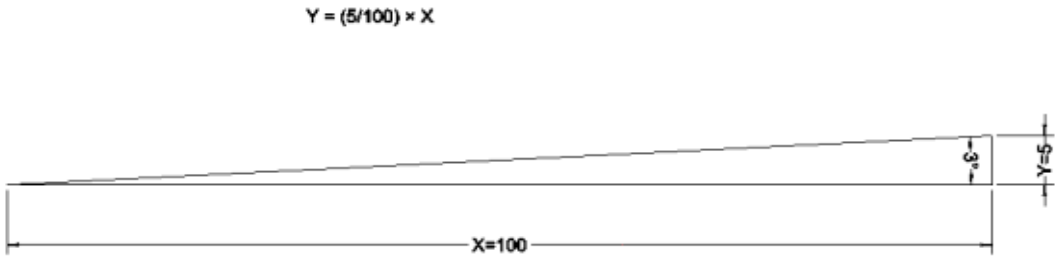

Figure 1: Off level Calculation

Example. If the distance between the two support legs of a device is 60 cm, then the amount one support will need to be raised to tilt the device to 3 degrees is equal to 60 cm multiplied by 0.05 which is equal to 3 cm. Therefore, placing a 3 cm block beneath one leg of the device will tilt it at approximately 3 degrees for further testing.

Portable or movable scales other than on-board systems

Complete scales or load receiving elements other than on board weighing systems must meet one of the following conditions:

- the device weighs within the allowable limit of error (LOE) when off level by up to 3 degrees; or
- the device is equipped with a permanently installed level indicator as a standard feature.

If the device is equipped with a suitable level indicator, the following requirements must be met:

- the level indicating means must be installed on a permanent section of the scale so that its reference will not change; must be easily readable and protected against damage; and
- the level indicating means must be readily observable without disassembly that requires the use of tools.

Clarification:

1. On small devices, the level indicating means may be placed under the platter (if the platter can be lifted easily) or at the back of the scale (if it can be readily observed).
2. A level bubble placed under the platform of a movable floor scale is not acceptable if the platform is relatively heavy and requires tools or assistance to be lifted up in order to access the level indicator.
3. The level indicating means must be permanently attached to a permanent part of the scale. It is not acceptable to attach the level indicator to the platter since it is removable.

Procedure

1. Level bubble sensitivity

If the device is fitted with a level indicator, it must be suitably sensitive. The following test must be performed to establish the suitability of the level indicator:

a. Incline the Device Under Test (DUT) in one direction (arbitrarily referred to as -x) up to the greater of:
   i. the point of limit where the level indicating means still indicates a level condition (see the following illustration); or
   ii. at least 2 parts per 1000 (0.12 degree).
b. Reset the device to zero if necessary; perform an increasing and decreasing load test. Record the results.
c. Repeat the test for the other three inclinations (+x, -y, +y). (see the following illustrations)

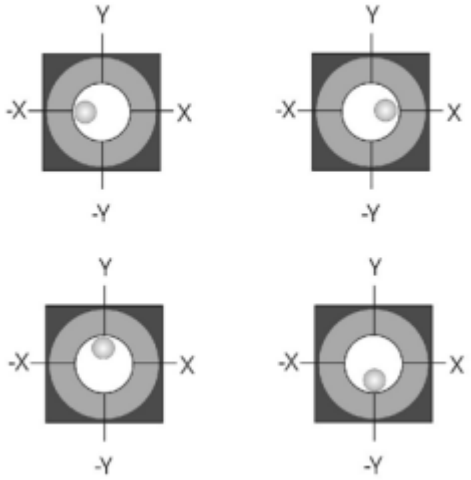

Figure 2- Level Bubble Indications

Interpretation of the Results

The device meets the requirements if, at the limits of inclination in all four directions, it performs within applicable limits of error.

NOTE : Tests are performed with the heaviest load receiving element (when selectable) and up to Max or Max plus additive tare, if applicable.

2. Device without Level Indicator

If the device is not equipped with a level indicator perform the following off level test:

Incline the device in one of the four directions (+x, -x, +y, -y) using a suitable support. The tests are performed when the device is off level by the lesser of:

- 3 degrees; or
- the maximum angle at which the device still provides an indication or registration.

Set the device to zero and perform an increasing and decreasing load test.

Repeat for each of the 4 inclinations (-X, +X, -Y, +Y). Refer to the following illustrations.

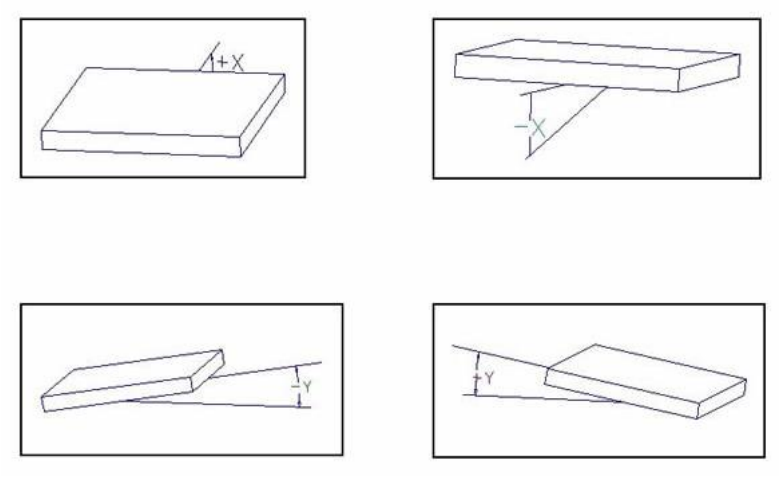

Figure 3 – Off Level 4 axes

Interpretation of Results

The device meets the requirements if it performs within prescribed limits of error when off level in any direction.

Note: If the device cannot perform within the LOE when it is in an off level condition, it must be equipped with a suitable, permanently installed, level indicating means.

3. Special Tests for On-board weighing systems

Definition

An on-board weighing system means a weighing device designed to be an integral part of, or attached or secured to, the frame, chassis, lifting mechanism or bed of mobile equipment such as a truck, tractor, trailer or forklift. It does not include self contained devices which are used on , or from, a vehicle.

a. Level Test

- With the vehicle resting on a level surface, visually inspect, checking for possible binding and additional items secured to the device that may have an effect on accuracy (e.g. mud-flaps and fenders must be secured to the frame of the vehicle, not the device).
- Perform load discrimination tests near zero and at capacity; increasing and decreasing load tests; section/corner tests; repeatability; blanking at capacity and motion detection; return to zero; etc. The device must perform within the prescribed limits of error.

b. Off Level Test

- Visually inspect the device while performing the following tests to ensure that the inclination does not cause a shift that may affect the device accuracy.
- Elevate the front or rear wheels to 3 degrees or the maximum inclination at which a weight indication is still provided, whichever is greater. Perform the tests described under *Level Test* above, except the section and repeatability test.
- Elevate either the driver side or passenger side to 3 degrees or the maximum inclination at which a weight indication is still provided, whichever is greater. Perform the tests described under *Level Test* above, except the section and repeatability test.
- Elevate a single rear wheel combination until the side to side inclination is 3 degrees or the point at which a weight indication is still provided, whichever is greater. This test causes the frame to twist and will reveal defects in poorly constructed devices. Perform the tests described under *Level Test* above, except the section and repeatability test.
- Scales mounted on lift trucks (or similar vehicles) must blank their indications when the lift truck is moving, unless the scale can continue to provide an accurate weight indication. Perform accuracy tests, using different loads within the capacity range of the device, while the machine is moving. The tests must simulate actual conditions of use.

Interpretation of Results

The device meets the requirements if:

- it provides a weight indication when off level up to at least 3 degrees, in any direction;
- it performs within the applicable LOE when off level by the larger of 3 degrees or the maximum angle at which it still provides a weight indication;
- it blanks its indications and prevent the recording of weight values when it ceases to perform within the applicable LOE; and
- in the case of a scale mounted on a lift truck, it provides an accurate weight indication while the lift truck is moving, or blanks its indications to prevent inaccurate readings.

Revision

Rev 1. (Feb 2013)

- comply with CLF criteria