ON BOARD WEIGHING SYSTEMS

REFERENCES

Specifications Relating to Non-automatic Weighing Devices (1998).

NAWDS Field Inspection Manual (all relevant STPs).

GENERAL

Most on-board weighing systems (OBWSs) are non-automatic weighing devices mounted on a mobile vehicle frame. These devices are subject to all relevant STPs from the *Field Inspection Manual for Non-Automatic Weighing Devices* (NAWDS FIM). OBWSs may require additional tests beyond what a typical non-automatic weighing device may be subject to. These additional tests are outlined in this STP and in the case of conflict, they should take precedence over similar tests in other STPs.

The following tests are suitable for use during initial and subsequent inspections of non-automatic OBWSs unless otherwise noted. If conducting in field approval tests, the appropriate test procedures should be obtained from the Mass Approvals Laboratory.

This test procedure covers specific tests for the following OBWSs:

- Front end loaders (buckets or grapples) (08-22)
- Waste weighing trucks (08-20)
- Forklifts and lift trucks (08-10)
- Other OBWS (08-XX)

Due to the specific nature of OBWS for anhydrous ammonia (NH_3), they are not covered by this procedure. Please refer to NAWDS STP-27 for standard test procedures applicable to NH_3 OBWSs.

ON-BOARD WEIGHING SYSTEMS

GENERAL PERFORMANCE (all devices)

Preliminary Notes

Extreme environmental conditions should be avoided when performing outdoor testing.

There are several different types of OBWSs currently in use. The inspector shall ensure that the OBWS presented for inspection is approved for the intended application and shall be familiar with, and authorized to conduct the tests of this type of OBWS machine.

Static Operating Mode Test

Many OBWSs are designed to weigh while the load-receiving element (LRE) is in motion. An OBWS designed to operate while in motion must have a static operating mode for test purposes unless exempted by Notice of Approval (NOA). The NOA should identify the intended use of the device and how to access the various modes.

Static tests are only applicable to OBWSs that are able to weigh statically. Static tests are designed to be performed without any motion of the weighing system; the device must be in a "weigh only mode" during the test, i.e. operating like a conventional non-automatic weighing device, providing weight indications in accordance with the load placed on the LRE. Static tests may require ancillary equipment to contain the loads. If these containers are used in conjunction with or attached to the LRE, the testing is to be performed with the lightest container available, the weight of which must not exceed 20% of the device's capacity (Max).

The vehicle's engine shall be running while the static tests are being performed (unless the device is not intended to be operated with the engine running).

Normal Operating Mode Test

Normal operating mode tests are to be performed in the "normal operating mode" of the device, which can be either static or dynamic, depending on the type of device.

OBWSs designed to operate in a dynamic mode shall be tested while in this mode.

The OBWS should be conditioned before testing. To condition the device, it should be run through several complete weighing cycles with a representative load. Some approvals may restrict device use until the system has completed a certain number of cycles. In these cases, the inspection certificate shall be so restricted.

ON-BOARD WEIGHING SYSTEMS

Test Standards and Test Loads

The OBWS may be tested with known local standards or with substitute test loads developed on a suitable reference scale or with a combination of the two. Systems that dump the load as part of the weighing cycle may be tested using substitute test loads, which may be developed in several different manners. It is up to the Inspector, in consultation with the Gravimetric Specialist if required, to choose the most appropriate test load.

Recoverable Substitute Test Loads

A recoverable test load is a stable load which is recovered after each dumping operation (with a crane, for example) and checked for any weight variations before being reused. This method has the advantage of requiring less material. If the test load is made up of sand bags or similar, the inspector must ensure that the bags will not let the fill material (e.g. sand) seep out and that they are sturdy enough to be used for the test. If the recoverable test load consists of test standards, the test standards must not be subject to rough handling that may cause damage or affect the calibration.

Unrecoverable Substitute Test Loads

An unrecoverable test load is a stable load which is not recovered after each dumping operation. A typical unrecoverable test load is an unrestrained bulk commodity or similar. The test load must have been weighed on a scale (that meets the appropriate requirements of the NAWD Specifications) of a higher resolution than that of the device under test (DUT). The unrecoverable test load does not have to be recovered once dumped in the vehicle, making the performance of the tests easier and faster.

Product Test Loads

In some cases, it may be desirable to perform a product test to confirm proper calibration of the system with various material loads. A front end loader for example may be tested with the various products it is intended to be used with. Product testing may involve weighing a load of product and then transferring that load to a second static weighing device (reference scale) in order to determine the actual weight of the load. In these cases, extreme care must be taken to ensure that all weighed product is transferred to the reference scale. If any product is lost during the cycle, the weighing results are considered invalid and must not be used for assessing the device under test.

Reference Scale

Material Weighing With Container

A reference scale (REF) and a container (e.g. waste bin) are used to conduct this test. The test container rests on a reference scale (that meets the requirements of the NAWD Specifications) and is filled with the right amount of material needed to perform the test. The DUT then performs a complete weighing cycle and brings the container back on the reference scale, which must be of higher resolution than that of the DUT and meet all specifications for linearity, sensitivity and repeatability.

ON-BOARD WEIGHING SYSTEMS

Material Weighing Without a Container

A reference scale and a loose product (e.g. gravel or sand) are used to conduct this test. A suitable load receptor such as a gravel truck is parked on a vehicle scale (that meets the requirements of the NAWD Specifications) that is used as the reference scale. The DUT then performs a complete weighing cycle of a load and transfers it to the load receptor on the reference scale. The reference scale must be of higher resolution than that of the DUT and shall meet all specifications in regards of linearity, sensitivity and repeatability.

Uncertainty of the Test Load

If using only a test load rather than test standards to test the device, the uncertainty of the test load must be determined. In general, the better the reference scale used to develop the test load, the less the uncertainty inherent in the load.

The uncertainty (Ui) of the test load, due to lack of repeatability, is given by the following formula:

$$U_i = F \times SR[Max - Min]n$$

where:

F = Confidence factor (2.57 for a 90% confidence level @ 5n).
SR = Sensitivity reciprocal of the device used to develop the test load.
Max = maximum reading obtained during repeatability testing.
min = minimum reading obtained during repeatability testing.
n = number of repeatability tests performed (minimum 5).

Since there is an uncertainty on the test load, this value must be included in the tolerance that will be applied to the device under test.

This implies that the limit of error (LOE) applicable to the device must include the value of the uncertainty of the test load as follows:

LOE when evaluated using a test load = device LOE + Ui of test load

Note: When SR | Max-min | n for the test load $\leq$ 1/27 of the device LOE at that load use:

LOE when evaluated using a test load = device LOE

Alternate Method

When the relationship between the verification scale interval of the DUT and the reference scale (REF) is 5:1 or greater and the reference scale has a repeatability equal to or better than 1***e***, the results of the test may be read directly from the reference scale, accounting only for any known error of the reference scale. There is no need to establish the uncertainty of the test load as outlined above.

ON-BOARD WEIGHING SYSTEMS

TESTS FOR SPECIFIC TYPES OF ON-BOARD WEIGHING SYSTEMS

Additional test procedures for specific types of OBWSs are listed on the following pages.

FRONT END LOADER SYSTEMS

REFERENCE

Specifications Relating to Non-automatic Weighing Devices (1998).

PURPOSE

This test may be performed on weighing systems mounted on front end loaders typically used to weigh gravel, rock and fill. These systems are almost exclusively dynamic weighing systems of Class IIII with restricted use. Please consult the NOA for more information.

EQUIPMENT

- Reference scale (REF, optional)
- Suitable local standards
- Suitable test loads
- Appropriate means to load and unload the DUT and capture any test product in use as required

CONSIDERATIONS

Ensure that the device class is appropriate for the intended application. Ensure the NOA allows for use in the intended application.

The limits of error apply to the net load of the product being weighed.

PROCEDURES

General Performance and Repeatability

Purpose

This test applies to all OBWSs and is intended to verify the accuracy of the DUT when full weighing cycles are performed.

ON-BOARD WEIGHING SYSTEMS

Settings

(1) The automatic zero tracking mechanism (AZTM) may be in any state for this test.

(2) The vehicle must be levelled.

(3) The DUT must be adjusted as close to zero as possible and pre-loaded (exercised) statically at least 3 times with a load as close to Max as practicable. Minimum warm up requirements stipulated by some manufacturers or in the NOA must be followed.

Constant Speed Procedure

Before performing any tests, pre-condition the device. The DUT must have been left in the existing ambient conditions for approximately one hour. If any significant part of the DUT is undergoing a temperature change from the time the vehicle's engine is turned on, let the temperature stabilize as much as possible before performing the following procedures:

- Set the DUT for a full weighing cycle.
- Perform three (3) complete weighing cycles by applying loads corresponding to each change in tolerance, but as a minimum, verify with a test load equal to approximately the following:
    - (1) 5% of Max.
    - (2) 50% of Max.
    - (3) 95% of Max.
- Perform these cycles at maximum and minimum speeds if the speed of the operation can be varied. Ensure that the speed remains constant throughout each test.
- For a multiple range and multi-interval weighing device, perform the complete weighing cycles for each individual range and at each turning point of the tolerances.

Interpretation of Results

The DUT must provide all weight registrations within the applicable in-service limits of error.

ON-BOARD WEIGHING SYSTEMS

Varying Speed Procedure

If the speed (LRE lift speed and engine revolutions per minute) can be varied during the weighing operation, perform the complete weighing cycles by applying loads corresponding to each change in tolerance, but as a minimum, verify with test loads approximately equal to the following and vary the speed from minimum to maximum several times during the operation:

(1) 5% of Max.

(2) 50% of Max.

(3) 95% of Max.

Interruption of Operation

If possible, interrupt a complete weighing cycle between the start and stop switches. Attempt to restart the weighing cycle.

Interpretation of Results

The DUT must either:

- provide a weight registration within the applicable limit of error; or
- disable all registrations and request that the operation be cancelled and repeated from the start.

Note: If an interruption occurs after the load has been dumped, the net weight value must be retained.

Repeatability

If possible, compare the results for a given load of approximately 50% Max. In order to test repeatability, the weigh cycle must be cancelled and the bucket lowered for each successive weight reading. If this is not possible due to the design of the DUT, repeatability will have to be confirmed through three successive weighings of a stable and recoverable load (e.g. standards).

Interpretation of Results

The maximum difference between the results for the same load must not exceed the applicable limits of error as prescribed by the Specifications. In addition, all results must be within applicable limits of error if using a known test load.

Note: The error of any single weighing result must not exceed the maximum limit of error for the given load.

ON-BOARD WEIGHING SYSTEMS

Blanking Display / Over Capacity Test

Purpose

Weighing devices shall not indicate or print weight values that exceed Max (capacity) + 5% Max. If the units of registration can be changed without having to perform a recalibration of the device (lb/kg switch), then perform this test for each unit which the device is capable of registering.

Procedure

Capacity

- Stabilize and zero the device at nominal conditions.
- Load the device to Max (capacity).
- Add loads until the device ceases to display weight values.
- Complete a weighing cycle as required after each additional load is added to the LRE.
- Record and attempt to print the value of the last weight indicated (WI).
- Repeat the test for other units of measurement that the device can display.
- Ensure that $WI \leq Max + (5\% \, of \; Max)$

Tare (when applicable)

- Remove the load and set the device to zero.
- Use a tare (T) of approximately 20% Max (i.e. load receiving container - LRC).
- Add loads to the LRC until the device ceases to indicate/print weight values.
- Complete a weighing cycle as required after each additional load is added to the LRE.
- Record the last weight indicated (WI).
- Ensure that $WI + T \leq Max + (5\% \, of \; Max)$

Note: Certain approved devices may incorporate a full or partial additive tare feature. Additive tare extends the weighing capacity of the scale. This must be taken into consideration when performing the blanking display test (see the NOA for more information).

ON-BOARD WEIGHING SYSTEMS

Zero

Zero may be required after each transaction or at timed intervals. These requirements will be identified in the NOA and must be tested during inspection.

If the scale limits the amount that can be zeroed by the semi-automatic zero-setting mechanism but the operation can be repeated several times, zero the maximum weight possible equal to or under 5% of Max as follows:

$$WI + Zl \leq Max + (5\% \, of \; Max)$$

An additional zero test should be performed as follows (only if the scale can zero loads in excess of 4%):

- Remove the load and set the device to zero.
- Add a load in excess of 5% of Max (e.g. 20%).
- Record and zero the load (Zl).
- Add loads until the device ceases to display/print weight values.
- Record the value of the last WI.

Interpretation of Results

The device is deemed to comply with the requirement if it cannot display or print weight values in excess of 105% of Max (capacity).

In other words, the device is deemed to comply with the requirement if the following conditions are met:

Capacity:	WI	≤ 105% Max
Tare:	WI + T	≤ 105% Max
Zero:	WI + Zl	≤ 105% Max

When over capacity, the device registration must blank within prescribed limits, or display a clear message that cannot be confused with a weight value. In no case shall an overweight be printed.

Note: In some cases, it may not be possible to load the machine to an overload condition due to the products being measured or the physical size of the LRE. If the nature of the product being weighed cannot overload the DUT, there is no need to pursue this test.

ON-BOARD WEIGHING SYSTEMS

Off-Level Effect (initial inspection only)

Purpose

This test is to be performed on all OBWSs. The purpose of this test is to verify that the DUT performs adequately when it is off level.

Procedure

- Use a suitable method (inclined surface, wedges, etc.) to tilt the vehicle by an angle of three (3) degrees or 5% by elevating one of the wheels or sets of wheels (e.g. the front left-side wheel). If the NOA specifies a different angle of tilt, follow the angle specified in the NOA.
- Set the DUT for a full weighing cycle.
- Perform one (1) complete weighing cycle by applying loads corresponding to each change in tolerance, but as a minimum, verify with a test load equal to approximately 95% of Max on the LRC.
- Perform each cycle at maximum and minimum speeds if the speed of the operation can be verified. Ensure the speed remains constant throughout the test.
- For a multiple range weighing device, perform the complete weighing cycle at each step where the tolerance changes and this, for each range.
- Repeat the last two steps above with the vehicle tilted at the lesser of the angle at which the DUT either provides an error message or blanks its registrations and the safest maximum angle at which the vehicle can be tilted (as prescribed by the applicant), this time by elevating:

  (1) the rear wheels together;

  (2) the front wheels together;

  (3) the right wheels together; and

  (4) the left wheels together.

Interpretation of Results

The DUT is deemed to comply with requirements if it satisfies the following conditions:

- it has provided weight registrations within applicable limits of error when tilted by an angle of three (3) degrees, or as specified in the NOA; and
- it either provides weight registrations within applicable in-service limits of error when tilted by an angle greater than three (3) degrees, or as specified in the NOA, or blanks all registrations when tilted. The device must not provide weight indications which are not within the applicable limits of error.

ON-BOARD WEIGHING SYSTEMS

See NAWDS STP-23 for more information on calculating off level conditions.

Eccentric Loading (initial inspection only)

A load equal to approximately 30% of MAX may be loaded first to one side of the LRE, then to the other. The results obtained should be within the absolute value of the LOE for that load. It is recognized that it may be very difficult to concentrate the loads from side to side in this type of LRE.

Considerations and Restrictions

Front end loader scales are calibrated for use with a specific implement (LRE). Due to the design and operation of these devices, they must only be used with the same LRE with which they have been calibrated. The LRE may be a bucket, forks, a grapple, etc., provided it is appropriate for the intended product being measured. In most cases, the LRE will be identifiable with a manufacturer's marking. The certificate of inspection should identify the LRE and restrict the device usage for the inspected LRE only. If multiple LREs are used with the device, the device must be certified with each separately.

Sealing requirements will be specified in the NOA, and will typically include the instrumentation, tilt sensors, pressure sensors and proximity sensors. Sensors must be sealed in place to ensure they are not replaced or adjusted after inspection.

Product Test

A product test may be performed to verify the performance of the DUT. A suitable reference scale REF and a container to place the product on the scale will be required. Typically, a gravel truck and a vehicle scale are used. The reference scale must have a verification scale interval ***e*** that is at least 5 times smaller than the DUT and repeatability of the reference scale at the gross test load must be less than 1***e***. Test the scale and note any inherent errors.

Place the gravel truck on the scale and tare or zero the scale. Load the DUT to as close to Max as possible (ensuring that the load can be contained by the gravel truck). Note the reading on the DUT. Transfer the load to the gravel truck. The truck may have to be removed from the reference scale to accomplish this). If the truck has been removed to facilitate loading, ensure it is placed back in the same location when placed back on the reference scale. Note the reading of the reference scale and adjust for any inherent error in the scale.

The adjusted weight indicated by the reference scale is now compared to the DUT. The weight must be within the range.

The weight obtained on the reference scale is the known value. In order to allow for the uncertainty in reading the reference scale, reduce the allowable DUT product test LOE by $1\boldsymbol{e}_{REF}$.

ON-BOARD WEIGHING SYSTEMS

Examples

where:

REF - reading from the reference scale (corrected for any inherent error in the reference scale)

e_{REF} - Verification scale interval of the reference scale

DUT - reading from the device under test

e_{DUT} - Verification scale interval of the DUT

assume:

e_{DUT} =100 kg (10 000 kg x 100 kg) Class IIII

e_{REF} =10 kg (100 000 kg x 10 kg) Class IIIHD

Example 1

REF = 5000 kg

DUT LOE ±1e (100 kg) @ ≤50e (5000 kg)

DUT must indicate 4900 kg + 10 kg (4910 kg) to 5100 kg - 10 kg (5090 kg) with a known load of 5000 kg

4910 ≤ DUT indication ≤ 5090

Example 2

REF = 10 000 kg

DUT LOE ±2e (200 kg) @ ≤100e (10 000 kg)

DUT must indicate 9800 kg +10 kg (9810 kg) to 10 200 kg -10 kg (10 190 kg) with a known load of 10 000 kg

9810 ≤ DUT indication ≤ 10 190

ON-BOARD WEIGHING SYSTEMS

OBWSS FOR THE WEIGHING OF WASTE

Reference

Specifications Relating to Non-automatic Weighing Devices (1998).

Purpose

This test may be performed on OBWSs used to weigh containers of refuse. These systems are almost exclusively dynamic systems. The full container is weighed, then dumped and weighed a second time.

As the container weights (tare) will change, the system must measure both gross and are weights and calculate the net weight. The weighing cycle is typically performed in motion with the gross weight being taken while the container is raised and the tare while the container is lowered. Net weight is calculated as follows:

Net weight = gross weight – tare weight.

Equipment

- Reference scale
- Suitable local standards
- Suitable test loads

CONSIDERATIONS AND RESTRICTIONS

This procedure may be used to perform initial or subsequent inspection of OBWSs for waste disposal and recycling.

The limit of error applies to the net weight of the product disposed of.

Systems using multichannel capabilities for linearity correction of off-angle conditions must be tested at least once in each of the channels. The dead load should be checked to ensure it is the same for all applicable channels. An approximate check can be done by noting the indicated value at level. The device is then cycled through its inclination range and all channels. All channels should display the same value as when at level.

Ensure the device class is appropriate for the intended application and the NOA allows for use in the intended application.

ON-BOARD WEIGHING SYSTEMS

PROCEDURES FOR DYNAMIC TESTING

Eccentricity Test

Purpose

The purpose of this test is to determine the ability of the device to weigh accurately in spite of changes in the position of the load inside the container and, if possible, changes in the position of the container on the LRE.

Settings

- An AZTM may be in any state for this test.
- The lightest container available is used for this test.
- The DUT must be adjusted as close to zero as possible and pre-loaded (exercised) statically 3 times with a load as close to Max as practicable.

Eccentric Loading of the Load Receiving Container

Procedure

- Pre-condition the device. The DUT must have been left in the existing ambient conditions for approximately one hour. If it is found that any significant part of the DUT is undergoing a temperature increase from the time the vehicle's engine is turned on, let the temperature stabilize as much as possible before performing the following steps.

- Set the DUT for a full weighing cycle. The value of the test load shall be as close to 33% of Max as possible.

- Divide the base of the container into four equal rectangular parts. For each of the parts, place the test load into the container, perform one (1) complete weighing cycle and record the results. For small containers, attempt to distribute the test load into each of the four quadrants as much as possible.

Interpretation of Results

The difference between the results for different positions of the load must not exceed the absolute value of the in-service limits of error for that load **and** each individual result must be within the in-service limits of error for that load.

Eccentric Loading on the Load Receiving Element

This test is only applicable to an OBWS which allows the container to be placed in different positions on the LRE (e.g. sliding forks prone to be partially entered in a container's slots). It does not apply to an OBWS that cannot be used with eccentric loading of the LRE. Do not conduct this test if the forks are designed with a notch designed to index or locate the container at a specific location.

ON-BOARD WEIGHING SYSTEMS

Procedure

- Place a stable localized load equal to 33% of Max in the LRC.
- Perform one complete weighing cycle with the container fully seated on the lifting arms of the DUT.
- Perform a second complete weighing cycle in this position if it is possible to lift the container without being fully seated on the lifting arms.

Note: Do not proceed with the second test if the container may move or is otherwise unstable during the weighing cycle.

Interpretation of Results

The difference between the results for different positions of the load must not exceed the absolute value of the in-service limits of error for that load **and** each individual result must be within the applicable limits of error for that load.

GENERAL PERFORMANCE AND REPEATABILITY

Purpose

This test is applicable to all OBWSs and is intended to verify the accuracy of the DUT when full weighing cycles are performed.

ON-BOARD WEIGHING SYSTEMS

Settings

(1) Automatic Zero Tracking Mechanism (AZTM) may be in any state for this test.

(2) The vehicle must be levelled.

(3) The DUT must be adjusted as close to zero as possible and pre-loaded (exercised) statically 3 times with a load as close to Max as practicable.

Constant Speed

Procedure

- Pre-condition the device. The DUT must have been left in the ambient conditions for approximately one hour. If it is found that any significant part of the DUT is undergoing a temperature change from the time the vehicle's engine is turned on, let the temperature stabilize as much as possible before performing the following procedures.

- Set the DUT for a full weighing cycle.

- Perform three (3) complete weighing cycles by applying loads corresponding to each change in tolerance, but as a minimum, verify with a test load equal to approximately the following:

    (1) 5% of Max.

    (2) 50% of Max.

    (3) 95% of Max.

- Perform each cycle at maximum and minimum speeds if the speed of the operation can be varied. Ensure the speed remains constant throughout.

- For a multiple range and multi-interval weighing device, perform the complete weighing cycle for each individual range and at each turning point of the tolerances.

Interpretation of Results

The DUT must provide all weight registrations within the applicable limits of error.

ON-BOARD WEIGHING SYSTEMS

Varying Speed

If the speed can be varied during the weighing operation, perform the complete weighing cycle by applying loads corresponding to each change in tolerance, but as a minimum, verify with test loads approximately equal to the following and vary the speed from minimum to maximum several times during the operation:

(1) 5% of Max.

(2) 50% of Max.

(3) 95% of Max.

Interruption of Operation

If possible, perform one (1) complete weighing cycle using a test load of 50 % of Max, interrupting the operation during the weight measurement for at least five (5) seconds, and resuming at constant speed. If there is more than one weight measurement for any given operation (e.g., weigh [container + waste] and weigh [container alone]), perform this test once for each.

Interpretation of Results

The DUT must either:

- provide a weight registration within the applicable limit of error; or
- disable all registrations and request that the operation be cancelled and repeated from start.

Note: If the interruption occurs after the load has been dumped, the net weight value must be retained.

REPEATABILITY

Compare the results for a given load obtained for the three different weighing cycles.

Interpretation of results

The maximum difference between the results for the same load must not exceed the applicable limits of error as prescribed by the Specifications. In addition, all results must be within tolerances.

Note: The error of any single weighing result must not exceed the maximum limit of error for the given load.

ON-BOARD WEIGHING SYSTEMS

BLANKING DISPLAY - OVER CAPACITY TEST

Purpose

Weighing devices shall not indicate or print weight values that exceed Max (capacity). If the units of registration can be changed without having to perform a recalibration of the device (lb/kg switch), perform individual tests for each unit the device is capable of registering.

Procedure

Capacity

- Stabilize and zero the device at nominal conditions.
- Load the device to Max (capacity).
- Add loads until the device ceases to display weight values.
- Record and attempt to print the value of the last weight value indicated (WI) .
- Repeat the test for other units of measurement that the device can display.
- $WI \leq Max + (5\% \, of \; Max)$

Tare (when applicable)

- Remove the load and set the device to zero.
- Using a tare (T) of approximately 20% of Max, add loads to the LRC until the device ceases to indicate/print weight values.
- Record the value of the last value indicated (WI).
- $WI + T \leq Max + (5\% \, of \; Max)$

Note: Certain approved devices may incorporate a full or partial additive tare feature. Additive tare extends the weighing capacity of the scale. This must be taken into consideration when performing the blanking display test (see the NOA).

ON-BOARD WEIGHING SYSTEMS

Zero

- Remove the load and set the device to zero.
- Add a load in excess of 5% of Max (e.g. 20%). Record and zero that load (Zl).
- Add loads until the device ceases to display/print weight values and record the last value indicated (WI).

If the scale limits the amount that can be zeroed by the semi-automatic zero-setting mechanism but the operation can be repeated several times, zero the maximum weight possible equal to or less than 5% of Max.

$$WI + Zl \leq Max + (5\% \, of \; Max)$$

Note: This test is to be performed if the scale can zero loads in excess of 4%.

Interpretation of Results

The device is deemed to comply with the requirement if it cannot display or print weight values in excess of 105% of Max (capacity).

In other words, the device is deemed to comply with the requirement if the following conditions are met:

- Capacity: WI $\leq$ 105% Max
- Tare: WI + T $\leq$ 105% Max
- Zero: WI + Zl $\leq$ 105% Max

When over capacity, the device registration must blank within prescribed limits or display a clear message that cannot be confused with a weight value. In no case shall an overweight be printed.

OFF-LEVEL EFFECT (INITIAL INSPECTION ONLY)

Purpose

This test is to be performed on all OBWSs. Its purpose is to verify that the DUT performs adequately when it is off level.

ON-BOARD WEIGHING SYSTEMS

Settings

(1) The AZTM may be in any state for this test.

(2) Initial Zero Setting Mechanism (IZSM):

- If the IZSM range does not exceed 20% of the Max, tests will be performed with the IZSM set at the upper limit of its range.
- If the IZSM range exceeds 20% of Max, tests will be performed twice. A first series of tests using the lightest container available and the second series with the IZSM set to the upper limit of its range.

Procedure

- Pre-condition the device. The DUT must have been left in the ambient conditions for approximately one hour. If it is found that any significant part of the DUT is undergoing a temperature increase from the time the vehicle's engine is turned on, let the temperature stabilize as much as possible before performing the following procedures.
- Use a suitable method (inclined surface, wedges, etc.) to tilt the vehicle by an angle of three (3) degrees or 5% by elevating one of the wheels or sets of wheels (e.g. the front left-side wheel).
- Set the DUT for a full weighing cycle.
- Perform one (1) complete weighing cycle by applying loads corresponding to each change in tolerance, but as a minimum, verify with the following:

  (1) A test load approximately equal to 5% of Max in the LRC.

  (2) A test load approximately equal to 95% of Max in the LRC.
- Perform each cycle at maximum and minimum speeds if the speed of the operation can be varied. Ensure the speed remains constant throughout.
- For a multiple range weighing device, perform the complete weighing cycle at each step where the tolerance changes and this, for each range.

ON-BOARD WEIGHING SYSTEMS

- Repeat the last two steps above with the vehicle tilted at the lesser of the angle at which the DUT either provides an error message or blanks its registrations and the safest maximum angle at which the vehicle can be tilted (as prescribed by the applicant), this time by elevating:

  (1) The rear wheels together.

  (2) The front wheels together.

  (3) The right wheels together.

  (4) The left wheels together.

Interpretation of Results

The DUT is deemed to comply with requirements if it satisfies the following conditions:

- it has provided weight registrations within applicable in-service limits of error when tilted by an angle of three (3) degrees; and
- it either provides weight registrations within applicable in-service limits of error or blanks all registrations when tilted by an angle greater than three degrees. The device must not provide weight indications which are not within the applicable limits of error.

FORK LIFT AND LIFT TRUCK ON-BOARD WEIGHING SYSTEMS

REFERENCE

Specifications Relating to Non-automatic Weighing Devices (1998).

Procedure

Ensure the device is approved for use in trade.

On-Board Weighing Devices installed in forklift and lift truck applications are generally static weighing devices. These should be tested using the appropriate STPs for non-automatic weighing devices.

CONSIDERATIONS AND RESTRICTIONS

If the device may be subject to off level use, off level interlocks must be checked. The device must either continue to weigh within acceptable limits of error or it must not indicate a weight value.

The device should be cycled through several lift/lower cycles to ensure that the calibration of the device is not adversely affected.

Specific product or usage may be restricted in the NOA.

ON-BOARD WEIGHING SYSTEMS

OTHER ON-BOARD WEIGHING SYSTEMS

Procedure

Ensure that the device is approved for use in trade.

Test as for non-automatic weighing devices using appropriate STPs for non-automatic weighing devices.

CONSIDERATIONS AND RESTRICTIONS

If the device may be subject to off level use, off level interlocks must be checked. The device must either continue to weigh within acceptable limits of error or it must not indicate a weight value.

Specific product or usage may be restricted in the NOA.