INSPECTION PREPARATION

Prior to initiating any inspection, the inspector should check the establishment records to determine:

- the number and type of devices located in the establishment;
- any specialized equipment or test product requirements;
- previous enforcement action(s) and/or restrictions.

ENTRANCE INTERVIEW

During the course of the entrance interview, the inspector shall:

- identify themselves to the person in charge of the inspection site by showing their identification card and presenting a business card;
- state the purpose of the inspection visit, briefly explain what the inspection will entail and advise of any special requirements[1] (i.e. equipment, product, slowing or stopping work in a particular area)[2]; and
- identify and adhere to all establishment and departmental safety rules[3].

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1 The inspector has the right to request and receive assistance from the trader or his/her staff, if necessary. The inspector will advise the trader of this requirement at the beginning of the inspection.

2 The inspector will minimize to the extent possible without jeopardizing the completeness of validity of the inspection, disruptions to the trader's business.

3 Occasionally an inspector may be asked to sign a paper agreeing to company safety rules and these will sometimes contain a waiver of company responsibility. The first is acceptable, but the inspector must not sign a waiver of responsibility.

EXIT INTERVIEW

During the course of the exit interview, the inspector shall ensure that the trader understands:

- the results of the inspection (even if no violations were encountered); and
- any follow-up action which must be taken to correct non compliances[4].

The inspector shall provide the trader with a copy of all inspection documentation. The inspector shall ask the trader to sign the inspection report and all associated documentation[5]

4 When seizure or detention action is taken it must be clearly explained to the trader that moving or altering the device is prohibited unless written authority is granted by an inspector; and if such authority is granted, its scope and limitations should be clearly explained and supported by written direction or clearances.

5 If the trader refuses to sign the inspection documents, the inspector should not make an issue of it, but simply note this fact on the inspection report and bring the matter to the attention of the inspector's supervisor at the earliest opportunity.

Conversion Factors (Canadian to Metric)		
To convert from	**to**	**multiply by**
yards	metre	0.914 4
gallons	cubic metres	0.004 546 09
pounds	kilograms	0.453 592 37
feet	metres	0.304 8
feet	millimetres	304.8
inches	millimetres	25.40
square yards	square metres	0.836 127 36
square feet	square metres	0.092 903 04
square inches	square centimetres	6.451 6
square inches	square millimetres	645.16
cubic yards	cubic metres	0.764 554 8
cubic feet	cubic metres	0.028 316 8
cubic inches	cubic centimetres	16.387 064
gallons	litres	4.546 09
quarts	litres	1.136 52
pints	litres	0.568 261
pints	millilitres or cubic centimetres	568.261
1/2 pints	litres	0.284 131
1/2 pints	millilitres or cubic centimetres	284.130 742
fluid ounces	millilitres or cubic centimetres	28.413
ounces (avoirdupois)	grams	28.349 5
tons (short)	kilograms	907.184 74
tons (short)	metric tons	0.907 184 74

NOTE: Some factors may have been rounded off.

Conversion Factors (Metric to Canadian)		
To convert from	**to**	**multiply by**
metres	yards	1.093 6
cubic metres	gallons	219.969
kilograms	pounds	2.204 623
metres	feet	3.280 81
millimetres	feet	0.003 281
millimetres	inches	0.039 37
square metres	square yards	1.196
square metres	square feet	10.764
square centimetres	square inches	0.155
square millimetres	square inches	0.001 55
cubic metres	cubic yards	1.307 951
cubic metres	cubic feet	35.314 667
cubic centimetres	cubic inches	0.061 024
litres	gallons	0.219 969
litres	quarts	0.879 877
litres	pints	1.759 753
millilitres or cubic centimetres	pints	0.001 76
litres	1/2 pints	3.519 5
millilitres or cubic centimetres	1/2 pints	0.003 519
millilitres or cubic centimetres	fluid ounces	0.035 195
grams	ounces	0.035 274
kilograms	tons (short)	0.001 102 3
metric tonnes	tons (short)	1.102 3

NOTE: Some factors may have been rounded off.

LINEAR INTERPOLATION

There are occasions when an inspector may need to interpolate values between two known values. This is common when assessing percentage tolerances, or applying various correction factors to a measured quantity. While not difficult to calculate, it is important that the interpolated value be determined carefully and correctly.

The formula for linear interpolation is:

$$B_{mid} = [(B_{upper} - B_{lower})(A_{mid} - A_{lower})] / (A_{upper} - A_{lower}) + B_{lower}$$

Where:
A_{upper} = Upper Known Value
A_{lower} = Lower Known Value
B_{upper} = Upper Corresponding Value
B_{lower} = Lower Corresponding Value
A_{mid} = Mid Known Value
B_{mid} = Mid Unknown Corresponding Value

The concept may be best described by example:

Example:

Assume you are taking a temperature measurement with a certified thermometer. The thermometer is accompanied with a calibration certificate which lists 'Indicated' and 'True' temperatures. The temperature that you observe (26.50 °C) falls between two adjacent indicated values (20.00 °C & 30.00 °C) on the calibration certificate. How do you find the corresponding 'True' temperature?

Indicated Temp	True temperature
20.00 °C (A_{lower})	20.20 °C (B_{lower})
26.50 °C (A_{mid})	B_{mid}
30.00 °C (A_{upper})	30.25 °C (B_{upper})

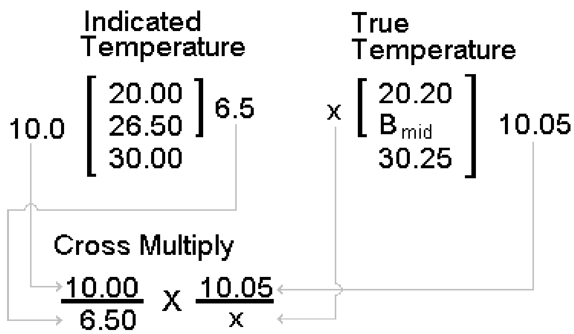
What is the true temperature for an indicated temperature of 26.5 °C?

B_{mid} = [(30.25 - 20.20) (26.50 - 20.0)] / (30.00 - 20.00) + 20.20

B_{mid} = [(10.05)(6.50) / 10.00] + 20.20
B_{mid} = [65.325 / 10.00] + 20.20
B_{mid} = [6.5325] + 20.20
B_{mid} = 26.7325 $B_{mid} \approx$ **26.73 °C**

This formula is useful for setting up a spreadsheet or a small program in a laptop, programmable calculator or PDA. If the interpolation must be calculated manually, the following simplified explanation may make it clearer.

Using a simplified approach:



$$x = [10.05 \times 6.50] / 10.00$$

$$x = 6.5325$$

$$B_{mid} = 6.5325 + 20.20$$

$$B_{mid} = 26.7325 \qquad B_{mid} \approx 26.73\,^{\circ}C$$

LINEAR EXTRAPOLATION

Either of these two approaches may also be used for linear extrapolation (finding a value not contained within, but rather larger or smaller than the data set), although extreme care must be taken to ensure that the extrapolated value is in fact representative and valid. Extrapolation should not be used for calibration values unless authorized by the Regional Gravimetric Specialist.

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BREAK POINT DETERMINATION

There are occasions when an inspector may need to determine the weight value to a finer resolution than the division of the scale will allow. This is a common occurrence for Non-Automatic weighing devices where tolerances may be expressed in terms of partial divisions. It is also used in development of test loads for both Automatic and Non-Automatic Weighing Devices. While not difficult to determine, it is important that this finer resolution be determined carefully and correctly. If a device is equipped with expanded resolution indications, this feature may be used instead of the following procedures.

Break Point (BP) is considered to be the edge of the Zone of Uncertainty within a division. The **Zone of Uncertainty (ZU)** is the point where the electronic indicator is no longer sure which graduation should be displayed. At this point, earlier devices will often flash between two adjacent indications. Newer devices may be equipped with features which will prevent the flashing of indications even though the Zone of Uncertainty has been reached. These devices will then require an additional load change equal to 0.1***d*** or 0.2***d*** before they will display the next indication. See *Zone of Uncertainty Determination* for more information.

It can be assumed that the width of the Zone of Uncertainty is ≤ 0.3***d***, if the device passes the Load Discrimination tests described in NAWDS STP-14.

Break point determination shall be done with error weights of at least 0.1***d***. As environmental conditions can make it very difficult to properly determine Break Points, the inspector may be forced to use larger weights (0.25***d*** - 0.3***d***), or forego break point testing altogether. It is important that it is actually the Break Point of the device being tested and not other external influences acting on the device which cause the indication to change.

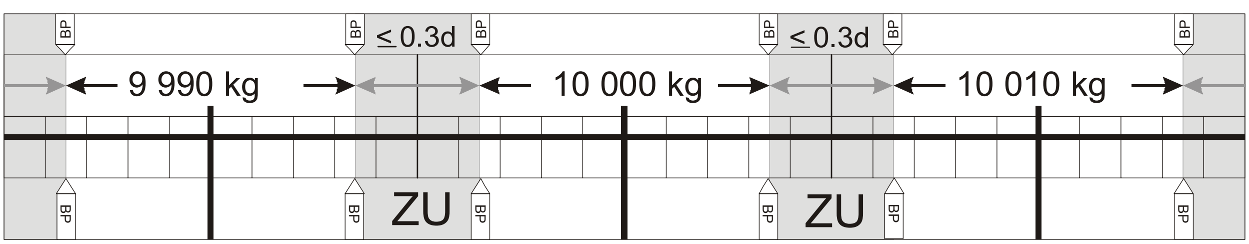

Figure 1

It should be noted that Break Point determination at zero load may be affected by Automatic Zero Setting (AZSM) circuitry. Break Point determination should not be attempted at zero load on devices equipped with AZSM.

Devices equipped with Center of Zero (±0.25***d***) indicators may be assumed to be at the center of zero when the indicator is on. In these cases no further Break Point determination is required at zero load.

If a test load is being developed using a device which does not return to zero (i.e. by load differential), then Break Points should be established at both the upper and lower indicated values.

The following examples illustrate how to determine break points. The examples assume addition of error weights although the procedures are also valid in reverse - that is with removal of error weights.

The formula for break point determination is:

W_{actual} = ($W_{indicated}$ + ½ division) - error weights added

Where:
W_{actual} = Actual Weight on Scale
W_{ind} = Scale Indication

Example:

A vehicle scale with 10 kg divisions indicates 20 010 kg with a load. Using error weights (0.1 d), the inspectors adds 3 kg to make the indicator flash to 20 020 kg. The actual weight of the load on the scale is then calculated as:

W_{actual} = (W_{ind} + ½ division) - error weights added

W_{actual} = (20 010 kg + 5 kg) - 3 kg
W_{actual} = 20 012 kg

The formula for developing a test load by load differential, when the scale does not return to zero, is:

$W_{test} = (W_{cap} - W_{low}) + (E_{low} - E_{cap})$

Where:
W_{testl} = Actual Weight of Test Load
W_{cap} = Loaded Scale Indication
W_{low} = Unloaded Scale Indication
E_{low} = Error Weights added to Unloaded Scale to reach Break Point
E_{cap} = Error Weights added to Loaded Scale to reach Break Point

Example:

A 10 000 kg x 1 kg hopper scale is used to develop a test load at capacity. Due to product containment, the unloaded scale returns to 500 kg indicated. Using sample figures for the break points, the weight of this (partial) test load is determined as:

$W_{test} = (W_{cap} - W_{low}) + (E_{low} - E_{cap})$

$W_{test} = (10\,000 \text{ kg} - 500 \text{ kg}) + (0.4 \text{ kg} - 0.2 \text{ kg})$
$W_{test} = 9\,500 \text{ kg} + 0.2 \text{ kg}$
$W_{test} = 9\,500.2 \text{ kg}$

Alternately, the scale could be pre-loaded at the lower indication (unloaded condition) with a sufficient quantity of test standards to place it in the center of an indicated value. Then, only the loaded break point would need to be found.

ZONE OF UNCERTAINTY DETERMINATION

The width of the Zone of Uncertainty may be determined, if necessary. First, find the Lower Break Point. This is the point where the scale flashes between the lower and next higher divisions. Continue to add Error Weights (0.1***d***) until the display indicates solidly, the next higher division. This is the Upper Break Point. Determine the amount of Error Weights added between the Lower Break Point and the Upper Break Point. This is the width of the Zone of Uncertainty.

For devices which suppress the flashing display as mentioned previously, you must use an alternate procedure. Starting at the lower indication, add Error Weights until the next higher indication is displayed. Note how many error weights were added. Now remove Error Weights until the previous lower division is again indicated. You will note that the Break Points appear to move from a high to a low position. The amount of apparent movement evident is equal to the width of the Zone of Uncertainty.

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