Canada

Weights and Measures

Inspection Procedure Outlines

Consumer and Corporate Affairs Canada
Legal Metrology

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Métrologie Légale

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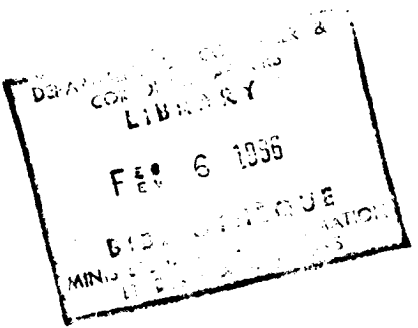

The Inspection Procedure Outlines (I.P.O.'s) are the minimum test requirements for verification of the device or system being inspected during normal zone enforcement. This of course does not rule out the possibility of additional tests, if circumstances warrant them.

INSPECTION PROCEDURE OUTLINES

INDEX

PRIOR TO INITIATING ANY INSPECTION, THE INSPECTOR SHOULD:

1. Check establishment records to determine:
   A. Type of equipment required
   B. Necessary reports
   C. Previous non compliance, restriction or non verification.

2. Identify yourself to trader and explain purpose of visit.

3. Request assistance (i.e. personnel, test product, equipment), and note arrangements for returning any product tested, to storage.

4. Enquire about establishment's rules of clothing and safety.

5. Adhere to ALL establishment and departmental safety guidelines.

6. Identify potential danger areas and situations.

7. Examine serial plate(s) re: location; durability; legibility; Approval No.(s); manufacturer(s); serial no.(s); model no.(s); minimum/maximum flow rates or capacity; initial inspection markings; and any other information as required in the Notice of Approval.

8. Check Approval for special conditions.

9. Check visibility of customer's indicator (where applicable).

10. Ensure minimum graduation and design are appropriate for intended use.

11. Check visibility of load receiving element from indicator (where applicable).

12. Ensure adequate clearance around load receiving element.

13. Check protection from environmental factors such as fans, cleanliness; protection against snow, wind.

14. Check installation for stability; access to weighing element; grouting; plumb and level conditions of levers; etc.

15. Determine number of sections (vehicle and track sales).

16. Check condition of seals (where applicable).

17. Ensure weight or unit marking are correct (metric & imperial), and increment size acceptable.

18. Determine if flow control valves and piping are properly installed (meters).

19. Check that adequate means are provided to prevent air from being metered (meters).

20. Acceptable power supply for electronic devices.

21. Check level (where applicable). Do not correct at this time.

22. Check zero balance (if applicable). Do not correct at this time.

23. Determine load discrimination and Minimum Limit of Error. Look up appropriate limit of error table (acceptance or in-service).

24. Be aware of L.O.E. that apply to the test standards being used and take these limits of error into consideration during the inspection procedure.

I.P.O. #1
TRADE WEIGHTS

Class Code
01

Definition: Weights that are used in trade, which include proportional, precious metal, moisture and cream test weights.

Equipment: Portable balance, local standards.

1. **Visual Examination**

1.1	Material & construction	R72,R74
1.2	Adjusting & reducing holes	R73,R77, R78,R79
1.3	Marking as to nominal value	R20,R81
1.4	Cleanliness	R75
1.5	Loose adjusting materials	R80
1.6	Suitability	R68,R69

2. **Pre-Test Examination**

2.1	Acceptance limits of error	R82,R84 to R88
2.2	In-service limits of error	R83,R84 to R88

3. **Test**

3.1 Substitution method for weights of less than 5 kg (inspector's portable balance).

3.2 Use the District Office balance and substitution method for moisture and cream test weights, precious metal weights and all weights of less than 20 grams or of larger capacity than 5 kilograms.

3.3 Substitution method for those weights which are larger than inspector's portable balance, using trader's equal arm scale (if scale is sensitive, accurate and repeatable).

I.P.O. #2
TEST STANDARDS - CHAINS

Class Code
03

Definition: Test Chains, which are of the roller and link type.

Equipment: Tape measure, sufficient local standards, platform scale, a 4° sloped ramp.

1. **Visual Examination**

1.1 Material- consult Legal Metrology Branch
1.2 Dimensional uniformity
1.3 Marking requirements - consult Legal Metrology Branch
1.4 Cleanliness

2. **Pre-Test Determination**

2.1 Determine the number of links or rollers in the calibrated section.
2.2 Determine the length of the calibrated section. (Manufacturer or chain identification plate.)
2.3 Limits of error
- Length (slack)- Acceptance limits of error 0.5% of stated length (calibrated section only)
In-service limits of error 1.0% of stated length (calibrated section)
- Weight- Acceptance limits of error.
- In-service limits of error.

3. **Test**

3.1 For recommended testing method, refer to the Standard Test Procedures.

I.P.O. #3 Class Code
RETAIL COMPUTING SCALES 08

Definition: Electronic or mechanical computing scales, including pre-pack scales.

Equipment: Weight kit.

1. Visual Examination

1.1 Zero balance condition.....R157,R158,R171, R206
NOTE: Zero balance not required when device is not in use.

1.2 Scale and environment
- leveling means, stability.....R151,R204, SGM1-17
- installation and use.....R68,R69,R89, R200
- visibility of indicators.....R127,R135,R143, R144,SGM1-11
- power source.....R141,SGM1.19.2
- interference, cleanliness.....R142,R146, SGM1-21
- accessories.....R124,R129,R130 R149,R169

1.3 Detailed examination
- design, composition, construction.....R121 to R123, R126,R132,R152 to R155
- display testing.....SGM1-7.1
- adjustment means.....R156 to R158, R207
- tare and prepackaging mode.....SGM1-14,SGM1-16
- damping device.....R168,R205
- motion detection.....SGM1-5

1.4 Provision for sealing.....A19(2),R32 (electronic device only) SGM1-12

1.5 Proper markings.....A8(a),A19(2),R18 R21,R70,R125

2. Pre-Test Determination

2.1 Graduation size.....R126,R128,R173
2.2 Load discrimination.....R196
2.3 Minimum limit of error.....R182
2.4 Acceptance limit of error.....R174,R181,R184
2.5 In-service limit of error.....R175,R181,R184
2.6 Repeatability.....R138,R185
2.7 Return to zero.....R130,R171,R183
2.8 Maximum zero range and zero tracking.....SGM1-13

3. Test

3.1 Balance at zero load.
3.2 Check load discrimination at zero and capacity.
3.3 Shift and corners (can be incorporated into increasing load test ½ capacity)
3.4 (a) Increasing load
(b) Simultaneous computed value test
3.5 Capacity-electronic weight indication blanking out
3.6 Decreasing load
3.7 Return to zero
3.8 Accessory Testing (incorporate into increasing load test)
(a) Check agreement requirements amongst primary, and secondary readouts, and printers.
(b) Check accuracy of gross/net/tare functions.
3.9 Electronic (where applicable)
(a) Free floating signal, motion detection
(b) Tare indications, sample test
(c) Keyboard
3.10 Pre-Pack features
(a) Sustained tare and unit price entry
(b) Tare operates in under-registration with respect to zero
(c) Identification as pre-pack scale

I.P.O. #4 Class Code
POINT OF SALE (P.O.S.) SCALES 09

Definition: Electronic or mechanical computing scales, used in conjunction with a cash register.

Equipment: Weight kit.

1. Visual Examination

1.1 Zero balance condition.....R157,R158,R171
NOTE: Zero balance is only required "before immediate use" and not when device is idle. R206

1.2 Scale and environment
-levelling means, stability.....R151,R204, SGM1.17
-installation and use.....R68,R69,R200
-indicators.....R127,R135,R143 R144,SGM1-11, SGM2-4
-power source.....R141,SGM1-19.2
-interference,cleanliness.....R142,R146, SGM1-21
-training mode.....SGM2-6
-accessories.....R124,R129,R130 R149,R169, SGM2-5

1.3 Detailed examination
-design, composition, construction.....R121 to R123, R126,R127,R152 to R155
-display testing.....SGM1-7.1
-adjustment means.....R156 to R158, R207
-tare and prepack mode.....SGM1-14
-damping device.....R168,R205
-motion detection.....SGM1-5

1.4 Training mode operation; consult store personnel for cash register input.

1.5 Ensure cash drawer is locked or empty.

1.6 Provision for sealing.....A19(2),R32, SGM1-12

1.7 Proper marking.....A8(1),A19(2), R18,R21,R70, R125

2. Pre-Test Determination

2.1 Graduation Size.....R126,R128,R173
2.2 Load discrimination.....R196
2.3 Minimum limit of error.....R182
2.4 Acceptance limit of error.....R174,R181,R184
2.5 In-service limit of error.....R175,R181,R184
2.6 Repeatability.....R138,R185
2.7 Return to zero.....R130,R171,R183
2.8 Acquire random price list of store items to be weighed over scale.
2.9 Maximum zero range and zero tracking.....SGM1-13

3. Test

3.1 Balance at zero load.
3.2 Load discrimination at zero & capacity.
3.3 Shift and corner tests (incorporated into increasing load test)
3.4 (a) Increasing load
(b) Computed Value (incorporated into increasing load test)
NOTE: Computed value can be determined by operator manually entering the unit price through the cash register. This results in a registration on the printed ticket.
3.5 Capacity - weight indication
3.6 Decreasing load
3.7 Return to zero
3.8 Accessory testing (incorporate into increasing load test)
-check agreement requirements amongst scale, cash register readouts and printer
NOTE: Multiple platter single printers are not allowed.
3.9 Electronic
(a) free floating signal (see special approval conditions)
3.10 P.L.U. Computation Check
(a) Place 1 kg on scale platter.
(b) Enter applicable codes for various store priced items, and print results.
(c) Check printout for proper computation.

I.P.O. #5
EQUAL ARM SCALES

Class Code
09

Definition: Equal arm pan-over-beam, and beam-over-pan scales designed for weighing precious commodities, moisture and cream testing and for general trade use.

Equipment: Certificate of error for local standards and sufficient local standards.

1. Visual Examination

NOTE: Weighing machines used to weigh precious commodities are exempt from marking, design, composition and construction criteria if certified before December 31, 1981.....R4n

1.1 Zero balance condition.....R130,R157,R158, R206
NOTE: Zero balance condition is only a requirement "before immediate use", and not required when device is idle.

1.2 Scale and environment-
- -levelling means, stability.....R151,R204
- -installation and use.....R68,R69,R89,R200
- -visibility of indicators.....R127,R143,R144 R167
- -cleanliness.....R142,R146

1.3 Detailed examination
- -design, composition, construction.....R126,R152 to R155, R121,R122,R123, R132
- -adjustment means.....R156 to R158,R207
- -damping device.....R168,R205
- -trade weights.....R72 to R81

1.4 Proper markings..... A8(a),A19(2),R18, R21,R70

2. Pre-Test Determination

2.1 Load discrimination
- (a) beam-over-pan no indicator.....R194
- (b) beam-over-pan indicator.....R195
- (c) pan-over-beam.....R196

2.2 Minimum limit of error.....R182

2. **Test (cont'd)**

2.3 Acceptance limit of error.....R174,R181,R186
2.4 In-service limit of srror.....R175,R181,R186
2.5 Repeatability.....R138,R185
2.6 Return to zero.....R183
NOTE: .02 gram increments are allowed by soms Notices of Approval for moisture and cream test devices.

3. **Test**

3.1 Balance at zero load.
NOTE: If a locking mechanism is employed, engage several times to establish a trus repeatable balance indication.
3.2 Load discrimination
3.3 Shift test at ⅓ capacity (not required if beam-ovsr-pan)
3.4 (a) Must use wsights exactly equal and if not available make a second weight by substitution method.
(b) If an imbalance occurs during load tests, addition of standards equivalent to the applicabls limit of error to the high pan should determine acceptability. Reverse weights to confirm.
3.5 Supplementary indicator (over and under chart) and weighbeam checks. Ensure that if chart is identified with weight values, that they are accurate (by applying or removing appropriate standards).
3.6 Return to zero
3.7 Special testing: Beam Type Moisture Scales (Troemner Type)-for recommended testing method, refer to the Standard Test Procedures.
3.8 Test weights associated with scale by substitution method using appropriate balance (depending on the precision required).

I.P.O. #6
STEELYARD SCALES

Class Code
10

Definition: All mechanical steelyard type scales including double beam meat hanging scales.

Equipment: Sufficient local standards, weight tree.

1. **Visual Examination**

1.1	Zero balance condition	R157,R158,R160
	NOTE: Zero balance not required when device is not in use.	R206
1.2	Scale and environment	
	-installation and use	R68,R69,R200
	-visibility of indicators	R127,R143,R144 R159,R166
	-cleanliness	R142,R146
1.3	Detailed examination	
	-design, composition, construction	R89,R121 to R123,R126,R152 to R155,R163
	-adjustment means	R156 to R158, R207
1.4	Proper markings	A8(a),A19(2), R18,R21,R70

2. **Pre-Test Determination**

2.1	Load discrimination	R194
2.2	Minimum limit of error	R182
2.3	Acceptance limit of error	R174
2.4	In-service limit of error	R175
2.5	Repeatability	R138,R185
2.6	Return to zero	R183

3. **Test**

3.1 Zero balance scale (tare off weight suspension equipment, if used)
3.2 Load discrimination
3.3 Test all counterpoise weights using appropriate balance.
3.4 Increasing Load Test to capacity
3.5 Decreasing Load Test
3.6 Return to Zero

I.P.O. #7
OVERHEAD TRACK SCALES

Class Code
10

Definition: Monorail or combination monorail platform scales.

Equipment: Sufficient local standards, weight tree.

1. Visual Examination

1.1	Zero balance condition	R157,R158,R160, R171,R206
	NOTE: Zero balance not required when device is not in use.	
1.2	Scale and environment	
	-installation and use	R68,R69,R200
	-indicators	R127,R135,R143, R144,R156 to R159 SGM3-7
	-power source	R141
	-interference, cleanliness	R142,R146, SGM3-15.1
	-counterpoise weights	R72 to R81,R89
	-accessories	R124,R129,R130, R149,R169
1.3	Detailed Examination	
	-design, composition, construction	R121,R122,R123, R126,R127,R152 to R155
	-display testing	SGM3-5
	-adjustment means	R156 to R158,R207
	-tare	SGM3-9
	-damping device	R168,R205
	-motion detection	SGM3-4
1.4	Increment of registration	SGM3-15.3,15.4
1.5	Special restrictions - interlock	R170
1.6	Proper markings	A8(a),A19(2),R18, R21,R70,R125
1.7	Provision for sealing (electronic device only)	R32,SGM3-10, SGM3-10.3,15.4

2. Pre-Test Determination

2.1 Load discrimination.....R194,R195,R196
2.2 Minimum limit of error.....R182
2.3 Acceptance limit of error.....R174,R181,R184
2.4 In-service limit of error.....R175,R181,R184
2.5 Repeatability.....R138,R185
2.6 Return to zero.....R183

3. Test

3.1 Balance at zero load.
Monorails should be balanced with weight tree on load receiving element.
3.2 Test counterpoise weights using appropriate balance.
3.3 Load discrimination
3.4 Shift and corner test-platform-¼ capacity centered over each corner or ¼ capacity over each end
-Monorail-¼ capacity over each end
3.5 Increasing load test to capacity
3.6 Decreasing load test
3.7 Return to zero
3.8 Accessory testing-check printer vs. readout, multiple load receiving element, and interlock.
3.9 Test both platform and rail on combination devices.
3.10 Electronic (if applicable)
- automatic zero maintenance
- motion detection
- tare
- keyboard
- multiple displays, readouts, printers
- over capacity

I.P.O. #8 — Class Code 10

PLATFORM SCALES

Definition: Mechanical or electronic union, bench, portable, dormant platform scales.

Equipment: Sufficient local standards and material for strain or substitution weighing.

1. Visual Examination

1.1 Zero balance condition.....R157,R158,R160
NOTE: Zero balance condition not required when device is not in use. R171,R206

1.2 Scale and environment
- -levelling means, stability.....R151,R204, SGM3.4
- -installation and use.....R20,R68,R69, R145,R200
- -indicators.....R127,R135,R143, R144,R159 to R166 SGM3-7
- -power source.....R141
- -interference, cleanliness.....R142,R146, SGM3-15.1
- -counterpoise weights.....R72 to R81,R89
- -accessories.....R124,R130,R149, R169

1.3 Detailed Examination
- - design, composition, construction.....R121 to R123, R126,R132,R152 to R155
- -display testing.....SGM3-5
- -adjustment means.....R156 to R158, R207
- -tare.....SGM3-9
- -damping device.....R168,R205
- -motion detection.....SGM3-4

1.4 Increment of registration.....SGM3-15.3,15.4

1.5 Proper markings.....A8(a),A19(2), R18,R21,R70, R125

1.6 Provision for sealing (electronic device only).....R32,SGM3-10

2. Pre-Test Determination

2.1 Load discrimination.....R194,R195,R196
2.2 Minimum limit of error.....R182
2.3 Acceptance limit of error.....R174,R181,R184
2.4 In-service limit of erorr.....R175,R181,R184
2.5 Repeatability.....R138,R185
2.6 Return to zero.....R183

3. Test

3.1 Balance at zero load.
3.2 Load discrimination
3.3 Shift and corner test (¼ capacity corners or ½ capacity sections)
3.4 Increasing load
  (a) Full capacity beams, fans, dials - quarters, range of use, drop weights
  (b) Counterpoise type - ratio testing, range of use
  (c) Electronic type - incremental build-up, range of use
3.5 Increasing load beyond limit of standards - strain test range of use to capacity, or if sufficient material available - substitution method to capacity
3.6 Capacity indication
3.7 Decreasing load test
3.8 Return to zero
3.9 Accessory testing
  -compare multiple readouts
  -compare readouts to printers
  -compare gross/net/tare
3.10 Test counterpoise weights using appropriate balance.
3.11 Test both platform and scoop on union type scale.
3.12 Electronic (if applicable)
  - automatic zero maintenance
  - motion detection
  - tare
  - keyboard
  - multiple displays, readouts, printers
  - over capacity

I.P.O. #9 **Class Code**
TANK OR HOPPER SCALES **10**

Definition: Mechanical or electronic tank or hopper scales used for static weighing of materials with mechanical (beam, dial) and/or electronic digital readouts.

Equipment: Sufficient local standards to determine break point and limits of error relative to increment size. Material for strain or substitution weighing.

1. Visual Examination

1.1 Zero balance condition.....R157,R158,R160
NOTE: Zero balance not required when device is not in use. R171,R206

1.2 Scale and environment
-leveling means, stability.....R151,R204, SGM3.4
-installation and use.....R145,R197 to R200
-number of delivery outlets.....R68,R69
-indicators.....R127,R135,R143 R144,SGM3-7, R159 to R166
-power source.....R141
-interference, cleanliness.....R142,R146, SGM3-15.1
-counterpoise weights.....R72 to R81,R89
-accessories.....R124,R130,R149, R169

1.3 Detailed Examination
-design, composition, construction.....R121 to R123, R126,R132,R152 to R155
-display testing.....SGM3-5
-adjustment means.....R156 to R158, R207
-tare.....SGM3-9
-motion detection.....SGM3-4

1.4 Increment of registration.....R172(2), SGM3-15.3 SGM3-15.4

1.5 Proper markings.....A8(a),A19(2), R18,R21,R70, R125

1.6 Provision for sealing (electronic device only).....R32,SGM3-10

2. Pre-Test Determination

2.1 Load discrimination.....R194,R195,R196
2.2 Minimum limit of error.....R182
2.3 Acceptance limit of error.....R174,R181,R184, R188
2.4 In-service limit of error.....R175,R181,R184, R188
2.5 Repeatability.....R138, R185
2.6 Return to zero.....R183

3. Test

3.1 Balance scale at zero load.
3.2 Test couterpoise weights using appropriate balance.
3.3 Load discrimination
3.4 Shift and corner test - Care must be taken so as not to cantilever the system.
3.5 Increasing load test to capacity
3.6 Increasing load beyond limit of standards
(a) substitution to capacity
(b) strain load if flow of material not conducive to substitution weighing - to capacity
3.7 Capacity indication
3.8 Decreasing load test
3.9 Return to zero
3.10 Accessory testing
-compare multiple readouts
-compare readouts to printers
-compare gross/net/tare
3.11 Electronic (if applicable)
- automatic zero maintenance
- motion detection
- tare
- keyboard
- multiple displays, readouts, printers
- over capacity

I.P.O. #10 **Class Code**
AUTOMATIC HOPPER SCALES **17**

Definition: Mechanical and electronic pre-determined weighers such as automatic hopper scales, bulk grain weighers, bagging scales, pre-pack check weighing scales.

Equipment: Local standards sufficient to determine break point and limits of error relative to increment size, plus material for strain or substitution weighing.

1. Visual Examination

1.1 Zero balance condition.....R157,R158,R160,
NOTE: Unable to determine, until back balance mechanisms are adjusted. R171,R206, SGM3-8
Partial draft beam
-electronic- some scales are approved to show centre zero at a preset tare value

1.2 Scale and environment
-leveling means, stability.....R151,R204, SGM3.4
-installation and use.....R145,R197,R198 R200
-number of delivery outlets.....R68,R69
-indicators.....R127,R135,R143 R144,R159 to R166,SGM3-7
-power source.....R141
-interference, cleanliness.....R142,R146, SGM3-15.1
-accessories.....R124,R130,R169

1.3 Detailed examination
-design, composition, construction.....R121 to R123, R126,R132,R152 to R155
-display testing.....SGM3-5
-adjustment means.....R156 to R158, R207
-tare.....SGM3-9
-damping device.....R168,R205
-motion detection.....SGM3-4

1.4 Increment of registration.....R172,SGM3-15.3, 15.4,

1.5 Proper markings.....A8(a),A19(2), R18 R21,R70,R125

1.6 Provision for sealing
(electronic device only).....R32,SGM3-10

2. Pre-Test Determination

2.1 Load discrimination.....R194 to R196
2.2 Minimum limit of error.....R182,R188
2.3 Acceptance limit of error.....R174,R181,R184, R188
2.4 In-service limit of error.....R175,R181,R184, R188
2.5 Repeatability.....R138,R185
2.6 Return to zero.....R183
2.7 Special approval conditions

3. Test

Manual Mode- similar to test of non-automatic hopper scales
3.1 Balance scale at zero load.
-mechanical involves removing and adjusting back balance mechanisms, i.e., weights, counterpoise
3.2 Load discrimination
3.3 Increasing load test to capacity
3.4 Increasing load beyond limit of standards
(a) substitution to capacity
(b) strain load to capacity
3.5 Capacity indication
3.6 Decreasing load test
3.7 Return to zero
3.8 Accessory testing
-compare multiple readouts
-counters- compare readouts to printers
-zero off set weight - compare gross/net/tare
3.9 Test back balance weights and counterpoise weights.
3.10 Electronic (if applicable)
- automatic zero maintenance
- motion detection
- tare
- keyboard
- multiple displays, readouts, printers
- over capacity

4. Test

Automatic Mode

4.1 Manual check of automatic mode

a) mechanical
- -place weights (calibrated trader's or local standards) in weight box
- -allow hopper to automatically fill but not discharge by pushing back weigh toggle striking bolt
- -if not balanced, balance with local standards, record error
- -remove standards, discharge material
- -repeat above steps until error established

b) electronic (optional)
- -change set point to less than amount of available standards
- -put machine into automatic mode
- -place standards on scale to beyond set point
- -allow device to cycle
- -remove standards
- -allow to zero cycle
- -repeat at least 3 times
- -check printout for correct print, gross net, tare.

NOTE: NEVER PLACE WEIGHTS INSIDE HOPPER.

I.P.O. #11
CONVEYOR SCALE

Class Code
19

Definition: All mechanical and electronic conveyor scales.

Equipment: Test weights, rollers or chains, stop watch, tape measure, marker, supply of commodity normally weighed on conveyor scale, reference scale, means of collecting measured product.

1. Visual Examination

NOTE: Most conveyor scales bear a permanently affixed plate with instructions of the manufacturer and information relating to the operation of the device.
Conveyor scales are exempt from SGM3.....SGM3.3

1.1 Installation.....R68,R141
- location of scale
- method of loading belt
- belt tension
- spill deflectors
- uniform loading

1.2 Accessories.....R124

1.3 Environmental factors.....R121,R142,R202

1.4 Damping means.....R205
Some mechanical integrating mechanisms have damping means. If so the dash pot should be examined, for free and proper action.

1.5 Proper markings.....A8(a),A19(2), R18,R21,R70, R125

1.6 Provision for sealing (electronic devices only).....R32

2. Pre-Test Determination

2.1 Method of test

2.2 Limits of error.....R193

2.3 Repeatability.....R138,R185

2.4 Special provisions of approval.....R70

3. Test

3.1 Determine belt length (if applicable) and/or speed of belt.
3.2 Zero balance scale.
3.3 Dynamic test
  (a) run chain test or suspended weight test with belt in motion
  (b) material test - mandatory except for control inspections - product weighed over scale is then compared to a previously verified static scale
3.4 Electronic (where applicable)
  (a) display, preset data
  (b) remote indicators

I.P.O. #12
VEHICLE SCALES

Class Code
20-21

Definition: All mechanical and electronic permanent or non permanent vehicle scales.

Equipment: Sufficient local standards and materials for strain test or substitution weighing.

1. Visual Examination

1.1 Zero balance condition.....R157,R158,R160, R206,SGM3-8
NOTE: Zero balance is not required when device is not in use.

1.2 Scale and environment
- -leveling means, stability.....R204
- -installation and use.....R68,R69,R197 to R104,R108,R109
- -indicators.....R127,R135,R143, R144,SGM3-7
- -power source.....R141
- -interference, cleanliness.....R142,R146, SGM3-15.1
- -counterpoise weights.....R72 to R81
- -accessories.....R124,R130,R169

1.3 Detailed examination
- -design, composition, construction.....R121 to R123, R126,R132 to R155
- -display testing.....SGM3-5
- -adjustment means.....R156 to R158, R207
- -tare.....SGM3-9
- -damping device.....R168,R205
- -motion detection.....SGM3-4

1.4 Increment of registration.....SGM3-15.3,15.4

1.5 Proper markings.....A8(a),A19(2), R18 R21,R70,R125

1.6 Provision for sealing (electronic devices only).....R32,SGM3-10

2. Pre-Test Determination

2.1 Load discrimination.....R194,R195,R196
2.2 Minimum limit of error.....R182
2.3 Acceptance limit of error.....R174,R181,R184
2.4 In-service limit of error.....R175,R181,R184
2.5 Repeatability.....R138,R185
2.6 Return to zero.....R183
2.7 Special approval conditions
2.8 Portable vehicle scales (road construction)..R187

3. Test

3.1 Balance at zero load.
3.2 Load discrimination
3.3 Section (shift) test
3.4 Increasing load test to capacity
3.5 Increasing load, beyond limit of available standards
  (a) substitution (not always feasible)
  (b) strain - range of use to capacity if sufficient material available
3.6 Capacity indication
3.7 Decreasing load test
3.8 Return to zero
3.9 Accessory testing
  -multiple load receiving elements, single readout
  -compare multiple readouts and interlock
  -compare readout to printers
  -compare gross/net/tare
3.10 Electronic (if applicable)
  -automatic zero maintenance
  -motion detection
  -tare
  -keyboard
  -multiple displays, readouts, printers
  -over capacity

I.P.O. #13 Class Code
RAILWAY TRACK SCALES - STATIC 24

Definition: Mechanical or electronic railway track scales for weighing individual cars, as well as any combination railway track/truck scale, including electronic split pit scales.

Equipment: At least one calihrated railway test car, local standards (including standards small enough to confirm limits of error) and suitable strain loads.

1. **Visual Examination**

1.1 Zero balance condition.....R157,R158,R160,
NOTE: Zero balance not required R206
when device is not in use.

1.2 Scale and environment
-installation and use.....R68,R69,R208,
R209
-indicators.....R127,R135,R143
-power source.....R141
-interference, cleanliness.....R142,R146,
SGM3-15.1
-counterpoise weights.....R72 to R81
-accessories.....R124,R130,R169

1.3 Detailed examination
-design, composition, construction.....R121 to R123,
R126,R132,R152
to R155
-display testing.....SGM3-5
-adjustment means.....R156 to R1589,
R207
-tare.....SGM3-9
-damping device.....R168,R205
-motion detection.....SGM3-4

1.4 Increment of registration.....SGM3-15.3,15.4

1.5 Proper markings.....A8(a),A19(2),
R18,R21,R70,
R125

1.6 Provision for sealing
(electronic devices only).....R32

2. **Pre-Test Determination**

2.1 Load discrimination.....R194,R195,R196
2.2 Minimum limit of error.....R182(2)
2.3 Acceptance limit of error.....R174,R181,R184
2.4 In-service limit of error.....R175,R181,R184
2.5 Repeatability.....R138,R185
2.6 Return to zero.....R183
2.7 Special conditions of approval.....A23,R70

3. **Test**

3.1 Balance scale at zero load.
3.2 Load discrimination
3.3 (Shift) Section test - test car
3.4 Increasing load - combination track/truck -utilize test car and local standards from weight truck -multiple test cars
3.5 Strain load
3.6 Capacity - test as close to capacity as possible.
3.7 Decreasing load test
3.8 Return to zero
3.9 Accessory testing
-multiple readouts
-readouts to printer
-multiple load receiving elements
3.10 Electronic (if applicable)
-automatic zero maintenance
-motion detection
-tare
-keyboard
-multiple displays, readouts, printers
-over capacity

I.P.O. #14 Class Code
RAILWAY TRACK SCALES - IN-MOTION 24

Definition: Mechanical or electronic railway track scale used for dynamic (in-motion) weighing of railway cars either coupled or uncoupled.

Equipment: Railway test car, sufficient local standards, previously verified static railroad track scale and railway cars of various representative weights.

1. Visual Examination

NOTE: Inspection procedure is identical to IPO #14 for Static Railroad Track Scales, except for the following additional information.

1.1 Suitability for the job
- -approval conditions may restrict kind of commodity to be weighed in-motion, speed of cars, etc.

2. Pre-Test Determination

NOTE: These parameters are identical to IPO #14 for Static Railroad track scales, except for the following additional information.

2.1 Limits of error - dynamic test
- -uncoupled in-motion.....R189(2)
- -coupled in-motion (summation).....R190
- -individual cars in-motion.....R191

3. Test

3.1 Scale must be static tested before dynamic test is performed.

3.2 On a previously verified static scale, pre-weigh up to 100 cars, recording weights and related car serial numbers.

3. Test (cont'd)

3.3 Uncoupled in motion
- a) pass cars over scale within approved speed limits, and record individual weight and serial number of cars
- b) compare readings to static weights previously recorded

3.4 Coupled in motion (complete trains)
- a) pass 100 weighings, within approved speed limits over scale, and record total weight
- b) compare total to readings of 100 static weighed cars

3.5 Coupled in motion (individual cars)
- a) pass 100 weighings over scale, within approved speed limits, and record individual weights and serial numbers
- h) compare readings to individual static weights of 100 cars

3.6 Electronic (if applicable)
- -automatic zero maintenance
- -motion detection
- -tare
- -keyboard
- -multiple displays, readouts, printers
- -over capacity

I.P.O. #15 **Class Code**
SINGLE POINT SUSPENSION SCALES **10**

Definition: Direct pull type spring or gravity operated scales of predominantly mechanical dial type single point suspension.
NOTE: Straight line indicating spring scales are presently not approved.

Equipment: Weight kit

1. Visual Examination

1.1	Zero balance condition	R157,R158,R171
	NOTE: Zero balance not required when device is not in use.	R206
1.2	Scale Environment	
	-stability	R67
	-installation and use	R68,R69,R200
	-indicators	R127,R135,R143 R144,R159
	-interference, cleanliness	R142,R146
1.3	Detailed Examination	
	-design, composition, construction	R121 to R123, R126,R132, R152 to R155,
	-adjustment means	R156 to R158, R207
	-damping device	R168,R205
1.4	Proper markings	A8(a),A19(2), R18,R21,R70, R125

2. Pre-Test Determination

2.1	Load discrimination	R196
2.2	Minimum limit of error	R182
2.3	Acceptance limits of error	R174,R181
2.4	In-service limits of error	R175,R181
2.5	Repeatability	R138,R185
2.6	Return to zero	R183

3. **Test**

3.1 Balance scale at zero load.
3.2 Load Discrimination
3.3 Increasing load test to capacity
3.4 Decreasing load
3.5 Return to zero
3.6 Compare both dial faces.

I.P.O. #16 **Class Code**
CRANE SCALES **10**

Definition: All mechanical, hydraulic and electronic single point suspension scales.

Equipment: Sufficient local standards, material for substitution or strain load testing, and means of suspending standards.

1. Visual Examination

1.1 Zero balance condition.....R157,R158,R171
NOTE: Zero balance not required when device is not in use. R206

1.2 Scale and environment
-stability.....R67
-installation and use.....R68,R69,R200, R202 R208
-indicators.....R127,R135,R143, R144,SGM3-7
-power source.....R141
-interference, cleanliness.....R142,R146, SGM3-15,1
-accessories.....R124,R130,R169

1.3 Detailed examination
-design, composition, construction.....R121 to R123, R126,R132, R152 to R155
-display testing.....SGM3-5
-adjustment means.....R156 to R158, R207
-tare.....SGM3-9
-damping device.....R168,R205
-motion detection.....SGM3-4

1.4 Proper markings.....A8(a),A19(2), A23,R18,R21,R70 R12,R125

1.5 Provision for sealing (electronic devices only).....R32

2. Pre-Test Determination

2.1 Load discrimination.....R196
2.2 Minimum limit of error.....R182,R192
2.3 Acceptance/In-service limit of error.....R174,R175,R181 R184,R192
2.4 Repeatability.....R138,R185
2.5 Return to zero.....R183
2.6 Special approval conditions

3. Test

3.1 Balance scale at zero load.
3.2 Load discrimination
3.3 Multiple dial faces
3.4 Increasing load test to capacity
3.5 Increasing load beyond limit of available standards
  a) substitution (if feasible)
  b) strain load to capacity
3.6 Over capacity indication
3.7 Decreasing load
3.8 Return to zero
3.9 Accessory testing
  -compare readouts to printers
3.10 Electronic (if applicable)
  -automatic zero maintenance
  -motion detection
  -tare
  -keyboard
  -multiple displays, readouts, printers
  -over capacity

I.P.O. #17
STATIC VOLUMETRIC LIQUID MEASURES
OF ALL CAPACITIES

Class Code
60

Definition: Containers used for the measurement of volume of unpackaged liquids.

Equipment: Glass graduate standards and metal cylindrical standards.

1. Visual Examination

1.1 Design, composition and construction
- general provisions.....R66,R67
- smooth surfaces.....R92
- determination of dimensions.....R96
- determination of capacity.....R94,R95
- material specifications.....R97
- delivery capability.....R98

1.2 Marking requirements
- manner of marking.....R18
- information required.....R19
- inspector's obligations.....R36

1.3 Installation and use
- general provisions.....R68
- level.....R104
- care in handling.....R105
- drainage.....R106

2. Pre-Test Determination

2.1 Limits of error (application).....R44,R93,R99, R100

2.2 Limits of error (tests with water).....R101,R102,R103

3. Test

3.1 Testing of a container designed "TO DELIVER"
- deliver the declared quantity of water from the measure being tested into the standard or combination of standards
- compare the declared volume to the delivered volume
- test for sensitivity

3.2 Testing of a container designed "TO CONTAIN"
- deliver the known quantity of water from the standard into the measure being tested
- measure any difference between the declared volume and the known volume
- test for sensitivity

I.P.O. #18 Class Code
GASOLINE/DIESEL FUEL DISPENSER 30

Definition: Devices used to measure gasoline or diesel fuel in retail service.

Equipment: Appropriate volumetric proving standard.

1. **Visual Examination**

1.1 Design, composition and construction
- general provisions.....R66,R67,R233
- means of registration.....R126
- flow rating.....R243
- increments.....R128
- units of registration.....R136,R236
- zero indication.....R130
- zero reset.....R252
- register design.....R253,R259
- indicator & display specifications.....R131,R134,R135
- registration advancement.....R248,R249
- provision for sealing.....R32,R234,R235
- computer design.....R253
- interlock design.....R254
- electrical components.....R124
- sight glass.....R247
- calibrator.....R260

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R125
- inspector's obligations.....R29,R31
- prohibitions/restrictions.....R70

1.3 Installation and use
- general provisions.....R68,R69,R238, R271
- device adjustment.....R148
- flow rates.....R290
- reverse flow.....R281
- anti-drain nozzle.....R286
- air/vapour elimination.....R276
- piping installation.....R240,R282
- product segregation.....R239
- protection from environment.....R142
- visibility to customer.....R143,R144
- key-operated or data processing systems.R292,R293

2. Pre-Test Determination

2.1 Limit of error (application).....R44,R261,R262
2.2 Limit of error (specifications).....R265,R266
2.3 Repeatability.....R138,R263
2.4 Registration agreement.....R139

3. Test - Single Stand Alone Unit

3.1 Interlock verification test
3.2 Check sight glass.
3.3 Check for product leak-back through piping.
3.4 Check register on both sides of device.
3.5 Wet and drain 20 litre standard.
3.6 Conduct at least one slow-flow test delivery.
3.7 Evaluate flow characterisitics such as approximate flow rate.
3.8 Verify accurate price computation.
3.9 Conduct a fast-flow test delivery.
3.10 Do repeatibility test if warranted.
3.11 Check anti-drain valve in nozzle.

4. Variations of Basic Unit

For the following types of dispensers these additional tests should be performed in addition to the normal tests indicated above.

4.1 Truck refueller
- minimum test delivery should equal or exceed a one minute flow at maximum rated capacity

4.2 Dispenser with second outlet on a hose tower
- check solenoid valve interlock

4.3 Twin dispenser with common pump
- check for delivery cross-over

4.4 Blend dispenser
- test extreme ranges of product as well as at least one blend near the middle range

4.5 Electronic register, card control or key operated systems
- check for customer access to totalizers and/or printed receipts

Definition: Meters used to measure liquids, which are installed on vehicles and incorporate pumping equipment.

Equipment: Volumetric proving standard and assorted hoses.

1. Visual Examination

1.1 *Design, composition and construction*
- general provisions.....R66,R67,R233
- means of registration.....R126,R127
- flow rating.....R243
- price computation.....R253
- increments.....R128
- units of registration.....R136,R236
- zero indication.....R130
- zero reset.....R252
- analogue graduation specifications.....R131,R132
- digital graduation specifications.....R134,R135
- protection from environment.....R121,R124
- "means of advancement" capability.....R248,R249
- provision for sealing.....R32,R234,R235
- air/vapour elimination.....R245
- printer information.....R129,R255
- printer interlock.....R256
- filter/strainer.....R244
- calibrator.....R260
- reverse flow.....R250

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R125
- inspector's obligations.....R29,R31
- *prohibitions/restrictions*.....R70

1.3 Installation and use
- general provisions.....R68,R69,R271
- general piping provisions.....R238,R239, R240,R274
- piping outlet specifications.....R282,R283
- pump suction piping.....R273
- line pressure requirements.....R275
- filter/strainer.....R277
- air/vapour eliminator.....R276,R279
- anti-drain valve.....R286
- flow rate.....R280,R290
- *reverse flow*.....R281
- meter printer requirements.....A28,R139,R140, R149,R257,R294 R295
- adjustments specifications.....R148
- electromagnetic shielding.....R142

2. Pre-Test Determination

2.1 Limit of error (application).....R44,R261,R262
2.2 Limit of error (specifications).....R265,R266,R267
2.3 Repeatability.....R138,R263
2.4 Correction factors.....R237

3. Test

3.1 Using a volumetric proving standard
- set vehicle so that prover operator can monitor meter registration
- wet and drain prover
- insert ticket, set register to start indication
- conduct slow-flow delivery test(s)
- make a full-flow delivery, watching for leaks
- evaluate product flow characteristics such as flow rate and line pressure
- when delivery is complete, compare registered amount with quantity delivered to prover
- print ticket and compare amount printed with amount registered
- repeat test as often as necessary for repeatability
- conduct split compartment (out-of-product) test
- check for reverse flow
- repeat all tests for any different product(s) that the meter will be used to measure
- check anti-drain valve

I.P.O. #20 Class Code
PUMP SUPPLIED, RACK MOUNTED METERS 33

Definition: Meters used for the measurement of products which are liquid at ambient temperature and pressure, and which are measured at a loading point.

Equipment: Volumetric proving standards, or positive displacement proving standards, or VT truck, or P.D. meter (compared in relation to a local standard), pump, certified thermometer and assorted hoses.

1. **Visual Examination**

1.1 Design, composition and construction
- general provisions.....R66,R67,R233
- means of registration.....R126
- flow rating.....R243
- increments.....R128
- units of registration.....R136,R236
- zero indication.....R130
- zero reset.....R252
- analogue graduation specifications.....R131
- digital graduation specifications.....R134,R135
- "means of advancement" capability.....R248,R249
- sealing facilities.....R32,R234,R235
- air/vapour elimination.....R245
- printer information.....R129,R255
- printer interlock.....R256
- filter/strainer.....R244
- calibration.....R260
- temperature compensated registers.....R258
- protection from environment.....R124

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R125
- inspector's obligations.....R29,R31
- complex systems.....R22,R70

1.3 Installation and use
- general provisions.....R68,R69,R271
- general piping provisions.....R238,R239,R240
- protection from enviroment.....R142
- visibility to customer.....R143,R144
- facility for testing.....R145,R284
- adjustments specifications.....R147,R148
- meter ticket requirements.....R149,R295
- pump suction piping.....R273
- piping outlet specifications.....R275,R282, R283,R289

1. **Visual (cont'd)**

- anti-drain valve.....R286
- automatic air/vapour control.....R274,R276,R278
- filter/strainer.....R277,R278
- reverse flow.....R281
- flow rate.....R280,R290
- electronic data transmission.....R292

2. **Pre-Test Determination**

2.1 Limits of error (application).....R44,R261,R262
2.2 Limits of error (specifications).....R266,R267,R268
2.3 Repeatability.....R138,R263
2.4 Registration agreement.....R139
2.5 Substitute liquids.....R237

3. **Test**

3.1 Using a volumetric prover, top-loaded
- set prover level and secure under loading spout
- wet prover, look for system leaks
- check shut off valve on delivery spout
- check nozzle anti drain valve if applicable
- drain prover
- insert ticket, re-set register
- make one slow-flow and one fast-flow delivery
- evaluate product flow conditions
- print ticket
- do repeatibility test if warranted

4. **Test Variations - Special Instructions**

Note: Circumstances and equipment may dictate different test procedures. In the following cases the basic procedure should be altered, as indicated.

4.1 Bottom loading meter
- flood and prime prover system
- connect, or disable automatic flow controls
- compare remote or electronic print-out to register

4.2 Using a pipe type prover
- flood system, purge air
- circulate product, stabilize pressure, temperature for proving system
- establish prover/counter factor
- make full-flow and slow-flow delivery tests

1. Visual (cont'd)

- after test run, calculate delivered volume according to pressure and temperature correction tables
- compare registered quantity to net amount delivered after prover and product volume adjustment calculations
- annotate certificate to identify product(s) to be measured by meter

I.P.O. #21 Class Code
GRAVITY SUPPLIED VEHICLE MOUNTED METERS 32

Definition: Meters used for the measurement of liquids, and which are installed without upstream pumping equipment.

Equipment: Volumetric proving standard (Regular or Low-profile), Specialized pumping equipment, P.D. meter (compared in relation to a local standard).

1. Visual Examination

1.1 Design, Composition and Construction
- general provisions.....R66,R67,R233
- means of registration.....R126
- indicator and display specifications.....R131,R132,R134
- increments.....R128
- units of registration.....R136,R236
- zero indication.....R130
- zero reset.....R252
- "means of advancement" capability.....R248,R249
- provision for sealing.....R32,R234,R235
- flow rating.....R243
- air/vapour elimination.....R245
- printer information.....R129,R255
- printer interlock.....R256
- filter/strainer.....R244
- calibrator.....R260

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R125
- inspector's obligations.....R29,R31
- prohibitions/restrictions.....R70

1.3 Installation and use
- general provisions.....R68,R69,R238, R271
- register installation for observing delivery.....R143,R144
- provision for unwitnessed delivery.....R294
- general piping provisions.....R238,R240,R273
- piping outlet inspection.....R282
- dry discharge hose specifications.....R287
- air/vapour elimination.....R276,R279
- provisions for testing.....R283
- ticket information provision.....R149,R295
- vacuum breaker requirement.....R275
- flow rate.....R290
- adjustment specifications.....R147,R148

2. Pre-Test Determination

2.1 Limit of error (application).....R44,R261,R262
2.2 Limit of error (specifications).....R266,R267
2.3 Repeatability.....R138,R263
2.4 Multiple indication agreement.....R139

3. Test - Top-Loading Prover

3.1 Set prover level and stable yet lower than truck meter.
3.2 Reserve one compartment of the truck as an empty tank for split compartment testing.
3.3 Use dry line delivery hose to fill prover. Verify that hose has sight glass.
3.4 Wet down prover, drain and observe recommended drain time.
3.5 Insert ticket.
3.6 Make delivery test at slow-flow. Check for delivery accuracy within limits of error.
3.7 Deliver to prover at full-flow.
3.8 When delivery is complete, compare meter registration to known quantity delivered into prover.
3.9 Print the ticket and compare to registration.
3.10 Drain prover according to drain time in Appendix II.
3.11 Do repeatiblity test if warranted.
3.12 Make split compartment test to ensure air/vapour eliminator is functioning properly.

Note: Circumstances and equipment may dictate different test procedures

4. Variations To Test

4.1 Bottom loaded
- set prover and level
- ensure that compartment contains sufficient product to maintain "head"
- bottom load connection must be short, very stiff, hose
- flood and prime system; drain prover
- insert ticket
- deliver to prover at full flow
- when delivery is complete, shut truck delivery valve and compare meter registration to known quantity delivered into prover
- conduct split compartment test

4. Test (cont'd)

- print ticket and compare to meter registration
- drain prover and repeat test for repeatability
- make at least one slow-flow delivery
- make at least one fast-flow delivery - Check for delivery within limits of error

4.2 Combination pump/gravity meter installation
- Verify that system complies with I.P.O.'s for both pump and gravity meters.
- Treat system as two separate componente and test completely. Confirm that components from one system cannot interfere with the operation of the other system.

I.P.O. #22 Class Code
MILK RECEIVING METERS 36

Definition: Devices used for the measurement and receipt of bulk liquid milk.

Equipment: Sanitary volumetric proving standard (stainless-steel), sanitary pump and hoses.

1. **Visual Examination**

1.1 Design, Composition and Construction
- general provisions.....R66,R67,R233
- means of registration.....R126
- flow rating.....R243
- increments.....R128
- units of registration.....R136,R236
- zero indication.....R130
- register indication specifications.....R131,R134,R135
- "means of advancement" capability.....R248,R249
- provision for sealing.....R32,R235
- air/vapour elminiation.....R245
- printer information.....R129,R255
- filter/strainer.....R244
- calibration.....R260

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R125
- inspector's obligations.....R29,R31

1.3 Installation and use
- general provisions.....R68,R69,R271
- general piping provisions.....R238,R274
- electrical controls.....R141
- visibility to customer.....R143,R144
- meter adjustments.....R147,R148
- meter ticket.....R149
- pump suction line specifications.....R240,R273
- meter outlet line specifications.....R282,R283
- line pressure specifications.....R275
- filter/strainer.....R277
- air/vapour eliminator.....R276,R279
- flow rate.....R280,R290
- flow control.....R285
- reverse flow.....R281

2. Pre-Test Determination

2.1 Limit of error (application).....R44,R261,R262
2.2 Limit of error (specifications).....R266
2.3 Repeatability.....R138,R263
2.4 Multiple registration agreement.....R139

3. Test

3.1 Set prover level and stable.
3.2 Check downstream lines.
3.3 Wet prover, check for leaks, drain.
3.4 Vacuum test, if applicable.
3.5 Insert ticket, set meter to start.
3.6 Make two full-flow delivery tests.
3.7 Evaluate product flow characteristics.
3.8 Compare meter registration to prover.
3.9 Print ticket and compare to register.
3.10 Conduct slow-flow test.
3.11 Conduct "out-of-product" test.
3.12 Make test deliveries under "low pump load" and "high pump load" conditions.

I.P.O. #23 Class Code
FIXED, PORTABLE AND VEHICLE TANKS 40

Definition: Devices used for the delivery of pre-determined volumes of liquid by means of calibrated tanks, at ambient pressure.

Equipment: Volumetric proving standard, narrow-neck metal standard, glass graduate standard, or P.D. meter (compared in relation to a local standard), pump, and assorted hoses.

1. Visual Examination

1.1 Design, composition and construction
- general provisions.....R66,R67,R233, R297,R309,R310 R311
- means of registration.....R126,R127,R236 R304
- indicator specifications.....R13,R301,R313
- indicator location.....R302,R303,R305 R312
- provision for sealing indicator.....R234
- increment specifications.....R236,R314
- air venting.....R299
- materials specifications.....R298
- leakage detection.....R315
- piping specifications.....R300,R316,R317 R318,R319,R320
- discharge hose.....R307,R308

1.2 Marking requirements
- form of markings.....R18
- information required.....R24
- inspector's obligations.....R29,R31
- restrictions/prohibitions.....R70

1.3 Installation and use
- general provisions.....R68,R69
- general piping provisions.....R238,R240
- visibility to customer.....R144
- tank filling specifications.....R329,R334
- tank delivery specifications.....R330

2. Pre-Test Determination

2.1 Limits of error.....R44,R325
2.2 Sensitivity.....R302
2.3 Conditions for testing.....R321,R322
2.4 Minimum tank capacity.....R324
2.5 Air entrapment test.....R326

3. Test - Dry-line Calibrated

3.1 Using a PD Prover (meter)
- Spot the vehicle in a level location.
- Compare testing meter to a relevant local standard.
- Ensure repeatability of meter.
- Open all lines downstream of tank except the emergency valve at the specific tank or compartment being tested.
- Inspect lines, pipes, valves and other tank compartments for compliance with the Regulations.
- Record the location of the capacity indicators in respect to the tank body.
- Fill the tank to its lowest capacity, confirm correct indicator setting.
- Test for sensitivity at the lowest quantity markers in each compartment.
- Multiple capacity tanks require multiple markers. Verify each one sequentially, to full capacity.
- Verify sufficient product expansion space is available above the highest indicator.
- Conduct manifold test; test product delivery through pump-off lines (if the tank is so equipped).
- Set indicators in all other compartments (if applicable) and conduct second manifold test, directed towards the first compartment.

3.2 Using a Volumetric Prover
- Spot prover above tank.
- Repeat sequence in 3.1 by making prover drops. Graduated standards or measures which may be required should be assembled before testing begins.
- Observe drain times (Appendix II).

4. Test - Wet-line Calibrated

4.1 Using a PD Prover (meter)
- Open all lines downstream of tank, except the shut-off valve at the manifold (emergency valves open).
- Conduct test as in 3.1.

4.2 Using a Volumetric Standard (prover)
- Open all lines downstream of tank, except the shut-off valve at the manifold (emergency valves open).

I.P.O. #24 — Class Code Various

MECHANICAL, AUTOMATIC TEMPERATURE COMPENSATING METERS

Definition: Meters used for the measurement of liquids at ambient product temperature, which provide readings adjusted to show the volume which the delivered product would occupy if it were heated or cooled to a standard temperature.

Equipment: Volumetric proving standard, or P.D. meter (compared in relation to a local standard), certified thermometer, temperature-controlled bath, appropriate volume correction tables, and pump and assorted hoses.

1. **Visual Examination**

1.1 Design, comporition and construction
- general provisions.....R66,R67,R233
- means of registration.....R126,R127
- flow rating.....R243
- increments of registration.....R128
- units of registration.....R136,R236
- zero indication.....R130
- zero reset.....R252
- analogue graduation specifications.....R131
- digital graduation specifications.....R134,R135,R136
- protection from environment.....R121,R124
- "means of advancement" capability.....R248,R249
- provision for sealing.....R32,R234,R235
- air/vapour elimination.....R245
- printer information.....R129,R255
- printer interlock.....R256
- filter/strainer.....R244
- reverse flow.....R250
- calibration.....R260
- gross and net registration.....R258

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R125
- inspector's obligations.....R29,R31
- restrictions/prohibitions.....R70

1.3 Installation and use
- general provisions.....R68,R69,R271
- general piping provisions.....R238,R240
- piping outlet specifications.....R282,R283
- pump suction piping.....R273
- line pressure requirements.....R275
- filter/strainer.....R277

1. **Visual (cont'd)**

- air/vapour elimination.....R274,R276,R279
- anti-drain valve.....R286
- flow rate.....R280,R290
- flow controls.....R285,R288
- reverse flow.....R281
- meter ticket requirements.....R149,R294,R295
- visibility to customer.....R143,R144
- electronic data transmission.....R292
- adjustment specifications.....R148
- specialized installations.....R289

2. **Pre-Test Determination**

2.1 Limit of error (application).....R44,R261,R262
2.2 Limit of error (specifications).....R265,R267, R268,R270
2.3 Repeatability.....R138,R263

3. **Test**

3.1 Make initial test deliveries on the basis of the uncompensated reading according to the I.P.O. for the basic style of device.
3.2 Confirm that the gross register is accurate and repeatable.
3.3 Establish correct relative density at 15°C, using the current version of API/ASTM D1250 tables.
3.4 Confirm that these density factors are applicable to the product being measured - laboratory test results may be deemed necessary by the inspector in some cases.
3.5 Verify that the compensator adjustment is set correctly in respect to items (3.3) and (3.4).
Wet and drain prover.
3.6 Make delivery tests in net mode at a selected temperature; maintain stable temperature during delivery.
3.7 Calculate correct net delivery on the basis of gross registration, adjusted by temperature/volume correction factor from the appropriate API/ASTM table.
3.8 Compare calculated net delivery to registered net delivery; refer to Regulation 270 for calculation formula.
3.9 Repeat steps (3.6 to 3.8) to test for repeatability.
3.10 If facilities are available, repeat the delivery tests at two other significantly different temperatures, within the approved range of the device.

I.P.O. #25 **Class Code**
SLOW FLOW METERS FOR DISPENSING AUTOMOTIVE LUBRICANTS **90**

Definition: Devices used for the measurement of bulk automotive lubricants including transmission fluid and radiator anti-freeze which are dispensed directly to the consumer.

Equipment: Standard graduate.

1. Visual Examination

1.1 Design, composition and construction
- general provisions.....R66,R67,R233
- means of registration.....R126
- increments of registration.....R128
- units of registration.....R136,R236
- flow rating.....R243
- zero indication.....R130
- zero reset.....R252
- graduation specifications.....R131,R134
- "means of advancement" capability.....R248,R249
- provision for sealing.....R32,R234,R235
- calibrator.....R260
- reverse flow.....R250

1.2 Marking requirements
- form of markings.....R18
- information required.....R21
- inspector's obligations.....R29,R31
- prohibitions/restrictions.....R70

1.3 Installation and use
- general provisions.....R68,R69,R271
- general piping provisions.....R238,R240
- meter outlet specifications.....R282
- meter intake piping.....R273
- anti-drain valve.....R286
- flow rate.....R280,R290
- reverse flow.....R281
- adjustment specifications.....R148

2. Pre-Test Determination

2.1 Limit of error (application).....R44,R261,R262
2.2 Limit of error (specifications).....R265
2.3 Repeatability.....R138,R263

3. **Test**

3.1 Wet and drain standard graduate.
3.2 Set standard on stable, level surface.
3.3 Set meter to zero.
3.4 Deliver at full-flow to the nominal capacity of the standard.
3.5 Compare meter indication to amount delivered.
3.6 Repeat tests for repeatability.
3.7 Conduct delivery test(s) at slow-flow. Compare meter indication to amount delivered.

I.P.O. #26 Class Code
SLOW FLOW METERS FOR HOME HEATING OIL 90

Definition: Devices used for the measurement of home heating oil at the point of consumption.

Equipment: Standard graduate.

1. **Visual Examination**

1.1 Design, composition and construction
- general provisions.....R66,R67,R233
- means of registration.....R126
- units of registration.....R136,R236
- increments of registration.....R128
- flow rating.....R243
- graduation specifications.....R131,R134
- "means of advancement" capability.....R248,R249
- provision for sealing.....R32,R234, R235
- calibration.....R260

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R70
- inspector's obligations.....R29,R31

1.3 Installation and use
- general provisions.....R68,R69,R271
- general piping provisions.....R238,R240
- piping outlet specifications.....R282
- flow rate.....R290
- reverse flow.....R281
- adjustment specifications.....R148

2. **Pre-Test Determination**

2.1 Limit of error (application).....R44,R261,R262
2.2 Limit of error (specifications).....R269
2.3 Repeatability.....R138,R263

3. **Test**

3.1 Set meter on test rack. Circulate and prime system.
3.2 Wet and drain graduate standard.
3.3 Set standard on stable, level surface.
3.4 Establish start point. Record totalizer indicator reading.

3. Test (Cont'd.)

3.5 Deliver to the nominal capacity of the standard.
3.6 Compare amount registered to amount delivered.
3.7 Repeat tests for repeatability.
3.8 Compare totals registered to cumulative amount registered throughout tests.

I.P.O. #27 Class Code
LIQUIFIED GAS METERS 37

Definition: The measurement of pressurized liquids which are gases at ambient pressure and temperature, and which are not being retailed as motor vehicle fuel.

Equipment: Vapour displacement standard prover, or positive displacement standard, (either master-meter type or pipe type or combination thereof), thermometer (calibrated and certified), "Pressure-Temperature Volume Correction Tables", pump, and assorted hoses.

1. **Visual Examination**

1.1 Design, composition and construction
- general provisions.....R66,R67,R233
- means of registration.....R126
- flow rating.....R243
- registration increments.....R128
- units of registration.....R136,R236
- zero indication.....R130
- zero reset.....R252
- analogue graduation specifications.....R131,R132
- digital graduation specifications.....R134,R135
- protection from environment.....R121,R124
- "means of advancement" capability.....R248,R249
- provision for sealing.....R32,R234, R235
- air/vapour elimination.....R245
- printer information.....R129,R255
- printer interlock.....R256
- filter/strainer.....R244
- reverse flow.....R250
- calibration.....R260
- A.T.C.....R258

1.2 Marking requirements
- form of markings.....R18
- information required.....R21,R125
- inspector's obligations.....R29,R31
- complex installations.....R22,R70

1.3 Installation and use
- general provisions.....R68,R69,R271
- general piping provisions.....R238,R240
- piping inlet specifications.....R282,R283, R285
- pump suction piping.....R273
- line pressure requirements.....R275
- filter/strainer.....R277
- air/vapour eliminator.....R274,R276, R279

1. **Visual (cont'd)**

- flow rate.....R280,R290
- reverse flow.....R281
- meter ticket requirements.....R149,R294, R295
- electronic data transmission.....R292
- adjustment specifications.....R147,R148
- customer visibility.....R143,R144
- flow control.....R280,R285

2. **Pre-test Determination**

2.1 Limit of error (application).....R44,R261, R262
2.2 Limit of error (specifications).....R268
2.3 Repeatability.....R138,R263

3. **Test - Liquified Gas Meters**

3.1 General test outline
- Check location and suitability of 115 volt outlet.
- Set prover stable and level.
- Attach grounding lines to all equipment.
- Place safety equipment at convenient, accessible spot.
- Connect vapour line.
- Connect liquid line.
- Operate valves according to proper sequence.
- Flood, prime and pressure system.
- Check for system leaks or improper connections.
- Ensure that thermometers are properly installed.
- Check that pump operates correctly.

3.2 Using vapour displacement prover
- Fill prover to "start" line at bottom sight gauge.
- Make at least one slow-flow run.
- Make full-flow delivery to nominal volume of prover.
- Record temperatures at meter and prover.
- Take pressure readings at meter and prover.
- Close vapour return line at conclusion of test run.
- Read prover gauge glass to determine amount delivered.
- Apply correction factor, as necessary.
- Compare gauge glass reading to meter registration.
- Repeat full-flow tests for repeatability if warranted.

3. Test (Cont'd).

3.3 Using positive displacement prover
- Fill prover and lines, check for leaks.
- Ensure all air and vapour are purged from system.
- Set prover indicator to "start" position.
- Make at least one slow run.
- Make full-flow delivery.
- Record pressure and temperature readings during delivery. Apply correction factor, as necessary.
- Calculate meter factor, using appropriate tables.
- Repeat full-flow tests if warranted.

I.P.O. #28 Class Code
STATIC LINEAR MEASURES 51

Definition: Rigid measures and tape measures used in trade.

Equipment: Tape measure standard.

1. **Visual Examination**

1.1	Desigh, composition and construction	R108 to R114
1.2	Markings	R19

2. **Pre-Test Determination**

2.1	Check approval and any prior verification	
2.2	Exemptions	A8,A11
2.3	Limits of error	R115,R116,R118, R119
2.4	Tensions (if applicable)	R117

3. **Test**

Rigid Measures

3.1 Position the standard on the trade measure such that the two series of graduations are brought together.
3.2 Shift the position of the standard into precise alignment with the zero of the trade measure.
3.3 Compare the total interval of the measure with its nominal equivalent on the standard.
3.4 Compare at least six intervals, from zero to each of six intermediate graduations

Tape Measures

3.1 Position the standard on the measure so that one series of graduations will partially overlap the other, the tapes being supported on a horizontal flat surface.
3.2 Shift the position of the upper tape, as required to bring the zero graduations of the standard and the measure into precise alignment.

3.3 Apply the prescribed tensions, as accurately as possible to both tapes.

3.4 Compare the total interval of the measure with its nominal equivalent on the standard.

3.5 Compare at least six intervals, from zero to each of the six intermediate graduations.

NOTE: If the static measure under inspection is rejected, the approval number and the words "Legal for Trade" shall be defaced.

Definition: Fabric measuring devices and wire/cordage measuring devices used in trade.

Equipment: Fabric tape measure standard, and materials representative of those measured on the machine.

1. Visual Examination

1.1 Design, composition and construction.....R211,R212,R213

2. Pre-Test Determination

2.1 Limits of error.....R214 to R219

3. Test

Fabric Measuring Devices

3.1 Insert the testing tape between the rollers and advance tape zero to the etop. (This is the point of which all readings will be made carefully.)

NOTE: Care should be taken to avoid notching the tape standard.

3.2 Set all dial indicators to zero and close rollers on tape.

3.3 Advance tape slowly, pulling with one hand and guiding with the other.

3.4 Check the tape at each 1/8 yard (or each decimetre) up to the first yard (metre) and then at each yard (metre), for the whole length of the tape, and note any errors.

3.5 Check the backlash by stopping the tape at a selected graduation. Now advance the tape several inches (centimetres) and then return it to the selected graduation. Any variance is the backlash error.

3.6 Repeat procedure to determine the repeatability of the device.

Wire/Cordage Measuring Device

3.1 Check to ensure that the machine is actually used for measuring (not simply dispensing).
3.2 Open the rollers and place the wire or cord between them.
3.3 Set all dials at zero and pull a length of cord through the machine, lay it on a straight flat surface and check the length with a 50 foot (20 metre) tape standard. Use various diameters of cord.
3.4 Pull the wire or cord through the machine at various speeds to check for error due to slippage.
3.5 Check the backlash by "stopping" the cord at a marked point and note the indication. Now advance the cord several inches (or centimetres) in one direction and then return it to the starting position. Any variance is the backlash error.
3.6 Repeat procedure to determine the repeatability of the device.

APPENDIX I

LOAD DISCRIMINATION (L.D.)

Reg. 194 & 195	Beam - Weight = ½ in-service LOE or 2 min. graduations (whichever is less)
Reg. 196	Dial - 1.4 x min. graduation
Reg. 196	Digital - 1.4 x min. graduation

MINIMUM LIMIT OF ERROR (M.L.O.E.)

Reg. 182(1)	Beam, Dial, Digital	.05% of capacity of scale, or 1 min. graduation, whichever is the lesser
Reg. 182(2)	Railway Track Scale:	30 lb.
Reg. 192	Crane Scale:	.125% of capacity
Reg. 188	Hopper Scale & Tank Scale (described in 172(2)):	
(a)		.015% of capacity for acceptance LOE
(b)		.025% of capacity for in-service LOE

WEIGHT TEST

ADDING WEIGHTS	REMOVING WEIGHTS
Beam - MLOE ⟶ LOE	Beam - MLOE ⟵ LOE
Dial - MLOE ⟶ LOE	Dial - MLOE ⟶ LOE x 1.5
Digital - MLOE ⟶ LOE + ½ grad.	Digital - MLOE ⟶ (LOE + ½ grad.) x 1.5

STRAIN TEST

ADDING WEIGHTS	REMOVING WEIGHTS
Beam - LOE	Beam - LOE
Dial - LOE	Dial - LOE x 1.5
Digital - LOE	Digital - LOE x 1.5

INCREMENTAL BUILD-UP

Beam - MLOE ⟶ LOE (Test Weights & known test load)
Dial - MLOE ⟶ LOE (Test Weights & known test load)
Digital - MLOE ⟶ LOE (Test Weights & known test load + ½ grad.)

APPENDIX II

DRAIN TIMES FOR OPEN VOLUMETRIC PROVERS AND MEASURES

Local volumetric standards are the property of the Department, and are certified by the Legal Metrology Branch (OTTAWA). Each standard is issued a calibration certificate, which provides directions for draining and the appropriate drain time that should be used for that particular standard.

Volumetric standards belonging to the private sector must be certified by an inspector of Weights and Measures as having been compared in relation to a local standard.

NOMINAL VOLUME	DRAIN TIME
5 litres or less (1 gallon)	10 seconds
Over 5 litres, up to and including 20 litres (5 gallons)	20 seconds
Over 20 litres, up to and including 500 litres (110 gallons)	1 minute
Over 500 litres, up to and including 5000 litres (1100 gallons)	2 minutes
Over 5000 litres, up to and including 15000 litres (3300 gallons)	3 minutes
Over 15000 litres, up to and including 30000 litres (6600 gallons)	4 minutes
Over 30000 litres, up to maximum regulated	5 minutes

APPENDIX III

CONVERSION TABLES *

METRIC EQUIVALENTS - AVOIRDUPOIS

OUNCES	POUNDS	GRAMS	OUNCES	POUNDS	GRAMS	OUNCES	POUNDS	KILOGRAMS
1 oz		28 g	19 oz		539 g	36 oz		1.02 kg
2 oz		57 g	20 oz		567 g	37 oz		1.05 kg
3 oz		85 g	21 oz		595 g	38 oz		1.08 kg
4 oz		113 g	22 oz		624 g	39 oz		1.11 kg
5 oz		142 g	23 oz		652 g	40 oz		1.13 kg
6 oz		170 g	24 oz		680 g	41 oz		1.16 kg
7 oz		198 g	25 oz		709 g	42 oz		1.19 kg
8 oz		227 g	26 oz		737 g	43 oz		1.22 kg
9 oz		255 g	27 oz		765 g	44 oz		1.25 kg
10 oz		283 g	28 oz		794 g	45 oz		1.28 kg
11 oz		312 g	29 oz		822 g	46 oz		1.30 kg
12 oz		340 g	30 oz		850 g	47 oz		1.33 kg
13 oz		369 g	31 oz		879 g	48 oz	3 lb	1.36 kg
14 oz		397 g	32 oz	2 lb	907 g		4 lb	1.81 kg
15 oz		425 g	33 oz		936 g		5 lb	2.27 kg
16 oz	1 lb	454 g	34 oz		964 g			
17 oz		482 g	35 oz		992 g			
18 oz		510 g						

(*NOTE: Most numbers have been rounded off)

APPROXIMATE METRIC EQUIVALENTS - FLUID

FLUID OZ.	MILLILITRES
1 fl oz	28 ml
2 fl oz	57 ml
3 fl oz	85 ml
4 fl oz	114 ml
5 fl oz	142 ml
6 fl oz	170 ml
7 fl oz	199 ml
8 fl oz	227 ml
9 fl oz	256 ml
10 fl oz	284 ml
11 fl oz	313 ml
12 fl oz	341 ml
13 fl oz	369 ml
14 fl oz	398 ml
15 fl oz	426 ml
16 fl oz	455 ml
17 fl oz	483 ml
18 fl oz	511 ml
19 fl oz	540 ml
20 fl oz	568 ml
21 fl oz	597 ml
22 fl oz	625 ml
23 fl oz	654 ml
24 fl oz	682 ml
25 fl oz	710 ml
26 fl oz	739 ml
27 fl oz	767 ml
28 fl oz	796 ml
29 fl oz	824 ml
30 fl oz	852 ml
31 fl oz	881 ml
32 fl oz	909 ml
33 fl oz	938 ml
34 fl oz	966 ml
35 fl oz	994 ml

FLUID OZ.	LITRES
36 fl oz	1.02 l
37 fl oz	1.05 l
38 fl oz	1.08 l
39 fl oz	1.11 l
40 fl oz	1.14 l
41 fl oz	1.16 l
42 fl oz	1.19 l
43 fl oz	1.22 l
44 fl oz	1.25 l
45 fl oz	1.28 l
46 fl oz	1.31 l
47 fl oz	1.34 l
48 fl oz	1.36 l
49 fl oz	1.39 l
50 fl oz	1.42 l
51 fl oz	1.45 l

FLUID OZ.	LITRES
52 fl oz	1.48 l
53 fl oz	1.51 l
54 fl oz	1.53 l
55 fl oz	1.56 l
56 fl oz	1.59 l
57 fl oz	1.62 l
58 fl oz	1.65 l
59 fl oz	1.68 l
60 fl oz	1.70 l
61 fl oz	1.73 l
62 fl oz	1.76 l
63 fl oz	1.79 l
64 fl oz	1.82 l
65 fl oz	1.85 l
66 fl oz	1.88 l
67 fl oz	1.90 l
68 fl oz	1.93 l
69 fl oz	1.96 l
70 fl oz	1.99 l
71 fl oz	2.02 l
72 fl oz	2.05 l
73 fl oz	2.07 l
74 fl oz	2.10 l
75 fl oz	2.13 l
76 fl oz	2.16 l
77 fl oz	2.19 l
78 fl oz	2.22 l
79 fl oz	2.24 l
80 fl oz	2.27 l
81 fl oz	2.30 l
82 fl oz	2.33 l
83 fl oz	2.36 l
84 fl oz	2.39 l
85 fl oz	2.42 l
86 fl oz	2.44 l
87 fl oz	2.47 l
88 fl oz	2.50 l
89 fl oz	2.53 l
90 fl oz	2.56 l
91 fl oz	2.59 l
92 fl oz	2.61 l
93 fl oz	2.64 l
94 fl oz	2.67 l
95 fl oz	2.70 l
96 fl oz	2.73 l
97 fl oz	2.76 l
98 fl oz	2.78 l
99 fl oz	2.81 l
100 fl oz	2.84 l
101 fl oz	2.87 l
102 fl oz	2.90 l
103 fl oz	2.93 l
104 fl oz	2.95 l
105 fl oz	2.98 l

FLUID OZ.	LITRES
106 fl oz	3.01 l
107 fl oz	3.04 l
108 fl oz	3.07 l
109 fl oz	3.10 l
110 fl oz	3.13 l
111 fl oz	3.15 l
112 fl oz	3.18 l
113 fl oz	3.21 l
114 fl oz	3.24 l
115 fl oz	3.27 l
116 fl oz	3.30 l
117 fl oz	3.32 l
118 fl oz	3.35 l
119 fl oz	3.38 l
120 fl oz	3.41 l
121 fl oz	3.44 l
122 fl oz	3.47 l
123 fl oz	3.49 l
124 fl oz	3.52 l
125 fl oz	3.55 l
126 fl oz	3.58 l
127 fl oz	3.61 l
128 fl oz	3.64 l
129 fl oz	3.67 l
130 fl oz	3.69 l
131 fl oz	3.72 l
132 fl oz	3.75 l
133 fl oz	3.78 l
134 fl oz	3.81 l
135 fl oz	3.84 l
136 fl oz	3.86 l
137 fl oz	3.89 l
138 fl oz	3.92 l
139 fl oz	3.95 l
140 fl oz	3.98 l
141 fl oz	4.01 l
142 fl oz	4.03 l
143 fl oz	4.06 l
144 fl oz	4.09 l
145 fl oz	4.12 l
146 fl oz	4.15 l
147 fl oz	4.18 l
148 fl oz	4.21 l
149 fl oz	4.23 l
150 fl oz	4.26 l
151 fl oz	4.29 l
152 fl oz	4.32 l
153 fl oz	4.35 l
154 fl oz	4.38 l
155 fl oz	4.40 l
156 fl oz	4.43 l
157 fl oz	4.46 l
158 fl oz	4.49 l
159 fl oz	4.52 l
160 fl oz	4.55 l

CONVERSION FACTORS (Canadian to Metric) *

To convert from	to	multiply by
Yards	metres (m)	0.914 4
Gallons	cubic metres (cu m) (m^3)	0.004 546 09
Pounds	kilograms (kg)	0.453 592 37
Feet	metres (m)	0.304 8
Feet	millimetres (mm)	304.8
Inches	millimeters (mm)	25.40
Square yards	square metres (sq m) (m^2)	0.836 127 36
Square feet	square meters (sq m) (m^2)	0.092 903 04
Square inches	square centimetres (sq cm) (cm^2)	6.451 6
Square inches	square millimetres (sq mm) (mm^2)	645.16
Cubic yards	cubic metres (cu m) (m^3)	0.764 554 8
Cubic feet	cubic metres (cu m) (m^3)	0.028 316 8
Cubic inches	cubic centimetres (cc) (c^3)	16.387 064
Gallons	litres (l)	4.546 09
Quarts (¼ gallons)	litres (l)	1.136 52
Pints	litres (l)	0.568 26
Pints	millilitres or cubic centimetres (ml) (cc) (cm^3)	568.261 2
¼ pints	litres (l)	0.284 130 6
¼ pints	millilitres or cubic centimetres (ml) (cc) (cm^3)	284.130 6
Fluid ounces	millilitres or cubic centimetres (ml) (cc) (cm^3)	28.413
Ounces (Avoirdupois)	grams (g)	28.349 5
Tons (short)	Kilograms (kg)	907.184 74
Tons (short)	metric tonnes (t)	0.907 184 74

(*NOTE: Some factors may have been rounded off)

CONVERSION FACTORS (Metric to Canadian) *

To convert from	to	multiply by
Metres	Yard	1.093 6
Cubic metres	gallons	219.969
Kilograms	pounds	2.204 6
Metres	feet	3.280 8
Millimetres	feet	0.003 281
Millimeters	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	1.308
Cubic metres	cubic feet	35.315
Cubic centimetres	cubic inches	0.061 02
Litres	gallons	0.219 97
Litres	quarts	0.879 88
Litres	pints	1.759 8
Millilitres or cubic centimetres	pints	0.001 76
Litres	¼ pints	3.52
Millilitres or cubic centimetres	½ pints	0.003 52
Millilitres or cubic centimetres	fluid ounces	0.035 20
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)