



Australian Government

**National Measurement
Institute**



NITP 9

National Instrument Test Procedures for Vehicle Tanks

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NMI V 16

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PREFACE

On 30 June 2010 the uniform test procedures (i.e. relevant NMI V documents) were deemed to be national instrument test procedures (NITPs) for the purposes of section 18GG of the *National Measurement Act 1960* (Cth).

In 2011 the NITPs were renumbered to better align the numbers with the classes of pattern approval and servicing licensee. As a result this document (NMI V 16) became NITP 9.

The only changes that have been made to the latest edition of this document are it has been rebranded, renumbered, renamed and its cross-references have been updated. In all other respects it is identical with NMI V 16.

NMI's Chief Metrologist has determined that NITP 9 contains the test procedures for the verification of vehicle tanks.

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EXPLANATION OF TERMS

For explanations of other terms see *General Information for Test Procedures*.

Adjustment

Alteration of the measurement parameters to bring the instrument within the allowable MPEs for an instrument in use.

Calibration

The set of operations that (under specified conditions) establishes the relationship between the indicated or nominal value of an instrument and the corresponding known value of the measured quantity.

Certification

The examination of an instrument by a **certifier** (the holder, or an employee of the holder, of a servicing licence) in order to mark the instrument indicating that it conforms with the relevant test procedures.

- **Initial certification** is the certification of a new instrument by a certifier, which does not bear a verification or certification mark and has never been verified or certified before.
- **Subsequent certification** is any certification of an instrument by a certifier because the mark is no longer valid due to such reasons as:
 - repairs or adjustments have been made that affect metrological performance; or
 - the mark has been defaced or removed.

In-service Inspection

The examination of an instrument by an **inspector or certifier** to check that:

- the verification or certification mark is valid; and
- the errors do not exceed the MPEs permitted for in-service inspection.

In-service inspection does not permit the instrument to be marked with a verification or certification mark.

Verification

The examination of an instrument by an **inspector** in order to mark the instrument indicating that it conforms with the relevant test procedures.

- **Initial verification** is the verification of a new instrument by an inspector which does not bear a verification or certification mark and has never been verified or certified before.
- **Subsequent verification** is any verification of an instrument by an inspector because the mark is no longer valid due to such reasons as:
 - repairs or adjustments have been made that affect metrological performance; or
 - the mark has been defaced or removed.
- **Re-verification** is the examination of an instrument by an inspector to check that:
 - the verification or certification mark is valid; and
 - the instrument has not been modified in any way since verification or certification;in order to mark the instrument indicating that it conforms with the relevant test procedures.

1. SCOPE

NITP 9 describes the test procedures for the verification, certification and in-service inspection of vehicle tanks to ensure that they measure to within the maximum permissible errors specified in the National Measurement Regulations and that they comply with the certificate of approval.

Refer to general certificate of approval 9/0/B for all the metrological and technical requirements for vehicle tanks. All vehicle tanks must comply with the relevant Trade Measurement Act and Regulations.

The test procedures apply to all:

- vehicle tanks other than those used for the collection of sillage; and
- vehicle tanks used for the collection of sillage.

These test procedures supersede *Test Procedure No 18. Vehicle Tanks*, first edition, May 1990, found in Inspectors Handbook No 5.

2. EQUIPMENT

1. Certificate of approval.
2. An appropriate reference standard of measurement, e.g. a master meter calibrated for water or petroleum liquid.
3. A supply of liquid for testing; appropriate hoses and connections.
4. Current Regulation 13 or Regulation 80 certificates for all reference standards of measurement. Uncertainties must be in accordance with the National Measurement Regulations and not greater than one-third of the maximum permissible error of the tank being tested. Consult the licensing authority for more information.
5. Test report (see Appendix A).

3. VISUAL INSPECTION

Visually inspect the vehicle tank and record details of the required data and characteristics of the tank on the test report.

3.1 Required Data

1. Test report reference number.
2. Date of test.
3. Type of test: verification, certification or in-service inspection (for in-service inspection ensure that the verification/certification mark is in place).
4. Name of owner/user.
5. Address of owner/user.
6. Contact name of the person responsible for the vehicle tank under test.
7. Address where the vehicle tank is located.
8. Description of vehicle tank.
9. Type of tank.
10. Purpose for vehicle tank and nature of goods carried.
11. Number of compartments.
12. Manufacturer.
13. Model.
14. Vehicle tank serial number.
15. Certificate of approval number.
16. For each compartment of the vehicle tank:
 - the minimum graduation value;
 - scale interval; and
 - capacity.
17. The verification or certification mark (only required for re-verification and in-service inspection).

3.2 Characteristics of the Vehicle Tank

3.2.1 General Characteristics

1. Are all mandatory markings and notices fixed on the vehicle tank in the prescribed manner and location?
2. Are all mandatory notices permanently fixed on the vehicle tank?
3. Is the vehicle tank empty, complete, and in an operational condition?

4. Ensure that the sump does not project above the bottom of the tank.

Exception: A retaining well is permitted for tanks intended only for aviation fuel.

3.2.2 Characteristics of Vehicle Tanks other than those used for the Collection of Sullage

1. Where the cover of the inspection opening is fitted with a dip tube or dipstick guide that is not centrally located in the cover: Is it only possible to fit the cover in the opening in one position?
2. Where a tank is constructed to discharge through a manifold common to two or more compartments (except where the tank used for the delivery of black oil):
 - Is liquid only able flow through the outlet pipe from only one compartment at a time?
 - Is the flow of liquid from one compartment to another automatically prevented?
 - Do all compartments connected to a common manifold discharge simultaneously?
3. Is the gradient of the outlet pipe to a discharge valve away from the valve?
4. Unless otherwise specified, where a vehicle tank is not provided with a dipstick(s), is the capacity of each compartment determined by a capacity mark:
 - Located inside the neck of each inspection opening?
 - Indicated by means of a clearly visible line not less than 100 mm in length?
 - Clearly designated with the capacity of the compartment, adjacent to the capacity mark, in letters not less than 10 mm high?
5. Where a dipstick is provided and where possible, inspect for a dip plate.

- Does the dip plate cover the projected area of the dip tube?
- Is the dip plate about 90° to the axis of the dip tube?

3.2.3 Characteristics of Dipsticks

1. Have there been any unauthorised repairs or alterations to the dipstick(s)?
2. Is there any damage to the dipstick(s)?
3. Is each dipstick marked with the tank serial number and the related compartment number?
4. Is the dipstick(s) of rigid metal construction and of solid, hollow or T shaped cross section?
5. Is the bottom of a hollow dipstick fitted with a drilled hole or similar to prevent capture of product in the dipstick?
6. Is the base of the **bottom datum dipstick** fitted with a foot with a bearing area being not less than the area bounded by straight lines joining the extremities of the dipstick cross section? Or, is the **top datum dipstick** rigidly fitted with a crosspiece, which has a bottom surface at right angles to the dipstick?
7. Is the dipstick only graduated for use with one compartment where applicable?
8. Are all markings, numbering and scale intervals in accordance with those shown in Appendix B?
9. With the exception of tanks designed to carry bituminous liquids is the dipstick for compartments with a capacity greater than 12 kL void of graduations between 10% and 75% of capacity?
10. Is the dipstick surface treated to assist in reading the liquid level?
11. Does the manufacturer's name and serial number marked on the dipstick agree with those shown on the data plate?

12. Is the datum mark, when required, clearly and correctly shown on the dipstick?
13. Is the dipstick stamped with an inspector's mark or licensee's mark?

3.2.4 Characteristics of the Dip Tube or Guide

1. Have there been any unauthorised repairs or alterations to the dip tubes?
2. Is there any damage to the dip tubes?
3. Is the dip tube clear of likely obstructions to the dipstick?
4. Does the dip tube measure no less than 50 mm and no more than 75 mm internal diameter for a bottom datum dipstick?
5. Is the dip tube opening marked 'ID' or 'DIP' in letters not less than 10 mm high and raised at least 1 mm above the surface where required?
6. Is the guide horizontal where a top datum dipstick rests?
7. Is the guide able to prevent the dipstick from deviating more than 1 in 20 from the vertical when the dipstick is in the measuring position?
8. Is the axis of the dip tube or guide within 25 mm of the point determined from Appendix C and is it perpendicular to the longitudinal axis of the tank?

3.2.5 Characteristics of Vehicle Tanks used for the Collection of Sullage

1. Does the vehicle tank have the characteristics described at clause 3.2.1?
2. Is there only one discharge valve?
3. Is there is a sight tube mounted at each end of the tank?
4. Are the site tubes rigid and made from clear plastic material with an internal diameter of not less than 15 mm nor greater than 20 mm?

5. Can the site tubes be removed for cleaning?
6. Are the site tubes mounted vertically on the centre line of the tank from the bottom to the top of the tank?
7. Do the site tubes show the liquid level over the whole vertical axis of the tank?
8. Is there a graduated scale permanently fixed and sealed to the tank behind the sight tubes?
9. Is the graduated scale:
 - Calibrated from zero to full capacity of the tank?
 - Not less than 75 mm wide and at least 3 mm thick?
 - Graduated in accordance with Appendix D?
10. Is the scale spacing of the graduated scale not less than 5 mm?
11. Are the scale marks extended so as to be visible on both sides of the sight tube?
12. Is the serial number of the vehicle tank marked on each of the graduated scales?

4. TEST PROCEDURES

The following series of test procedures determine if the accuracy of a vehicle tank meets requirements and whether the instrument requires adjustment/service.

Each test procedure is explained as a discrete test. However tests can be combined to expedite the testing procedure. A suggested sequence for testing is shown in clause 5.

4.1 Accuracy

The method of verifying the accuracy of a vehicle tank consists of delivering measured quantities of liquid into the tank to correspond with selected scale marks on the linear measuring device or graduated scale and reading the indicated result in the prescribed manner.

4.1.1 Tanks with Dipstick(s) or Graduated Scales

The maximum permissible error applicable to tanks provided with a dipstick is ± 0.5 scale interval for each scale mark on the dipstick or graduated scale.

4.1.2 Tanks with a Capacity Mark

The maximum permissible error applicable to tanks provided with a capacity mark is $\pm 0.2\%$ of the indicated volume.

4.2 Vehicle Tanks other than those used for the Collection of Sullage

Effect of an Internal Valve

Where a vehicle tank, other than a rail tank, is fitted with an internal and external valve, test the compartment with the internal valve open.

Tanks used for the Delivery of Aviation Fuel Only

Exclude the quantity liquid retained by a weir after a complete delivery from measurement during the testing of the tank.

1. Check that the vehicle tank is on a level surface.
2. Close the external valve. For rail tanks ensure internal valve is closed.
3. Deliver a quantity of liquid into the tank or tank compartment.
4. Check for leaks either externally or internally between compartments.
5. Drain the tank with the outlet valve open for one minute after the continuous flow of water has ceased.
6. Repeat step 2 and deliver a measured quantity of liquid into the tank compartment corresponding the lowest scale mark on the linear measuring device.
7. Read the dipstick in the manner described in Appendix E.
8. Record the reading.
9. Deliver further quantities of liquid into the tank or tank compartment and repeat steps 7 and 8 for:

- not less than two scale marks relating to the first **15%** of the capacity of the tank/compartment;
- one scale mark every 1 000 L between **15%** and **75%** of the capacity of the tank/compartment (if the dipstick is marked in that area);
- not less than three scale marks between **75%** and **100%** of the capacity of the tank/compartment;
- the capacity of the tank or compartment.

4.3 Vehicle Tanks used for the Collection of Sullage

The volume of sullage contained within the vehicle at any time is the mean of the readings on the graduated scale at each end of the vehicle tank.

The two readings shall not differ by more than the absolute value of the maximum permissible error.

The maximum permissible error shall be in accordance with clause 4.1 or as specified in the certificate of approval.

1. Check that the vehicle tank is on a level surface.
2. Close the external valve.
3. Deliver a quantity of liquid into the tank.
4. Check for leaks.
5. Empty the tank and ensure it drains completely.
6. Repeat step 2 and deliver a measured quantity of liquid into the tank corresponding to not less than two scale marks relating to the first **15%** of the capacity of the tank.
7. Check the level of liquid in the sight tubes at each end of the tank by observing the bottom of the meniscus and reading the associated value on the graduated scales.
8. Record each reading in turn.
9. Determine the mean of the readings on the graduated scales.
10. Record the mean volume.

11. Deliver further quantities of liquid into the tank and repeat steps 7 to 10 for:
 - one scale mark every 1 000 L between **15%** and **75%** of the capacity of the compartment (if the dipstick is marked in that area);
 - not less than three scale marks between **75%** and **100%** of the capacity of the tank; and
 - the capacity of the tank.

4.4 Additional Tests

Apply any additional tests required by the certificate of approval.

4.5 Stamping and Sealing

If the instrument is correct, stamp the vehicle tank with the inspector's mark and the date mark, and in the case of a vehicle tank used:

- other than for sullage, stamp the dipstick(s), or
- for sullage, seal the graduated scale.

If the instrument is not correct, issue a rejection notice and obliterate any inspector's or licensee's mark that the vehicle tank bears.

5. SUGGESTED SEQUENCE FOR TESTING

1. Check the certificate of approval for any additional tests required. Make provision for including these tests in the testing sequence.
2. Visually inspect the vehicle tank and ensure all required markings and notices are fixed in the prescribed manner and locations.
3. Visually inspect the vehicle tank to ensure that it's suitably presented for testing.
4. Visually inspect the tank as appropriate and make a note of the instrument's metrological characteristics:
 - vehicle tank and compartments;
 - opening and sump;

- internal venting;
- covers;
- manifold, outlets and valves;
- capacity mark;
- dipsticks and dip plates and dip guides;
- sight tubes and graduated scales; and
- any other characteristics as necessary.

5. Conduct the volume test for the prescribed volumes (clause 4.2 or clause 4.3 as appropriate).
6. Conduct any additional tests that are required to complete the testing including if necessary any additional testing required by the certificate/s of approval.
7. Determine whether the tank has passed or failed.
8. Complete the test report.
9. Carry out anything else you need to do to complete the procedure. This may include:
 - obliterating verification, certification and control marks from the tank; and
 - stamping the tank (for more information on stamping see *General Information for Test Procedures*).

APPENDIX A. TEST REPORTS

Appendix A contains a test report on which to record the results.

Although the format of the test report may vary according to the individual needs and requirements of trade measurement authorities and licensees, the following test report contains the minimum amount of information that must be recorded.

If the certificate of approval requires additional tests, attach pages that record the results of these tests.

Number each page of the test report in the style shown at the top of each page.

Test Report for Vehicle Tanks

Test report reference number Date of test

Type of test (tick one) Verification Certification In-service inspection

For in-service inspection record the verification/certification mark.....

Name of owner/user

Address of owner/user

Name of contact on premises

Address where the instrument is located.....

Description of vehicle tank

Tick whichever box is applicable:

 Road tank Rail tank

Non-sullage tank

 Petroleum Black Oil Aviation Fuel Bitumen Wine Other Sullage tank

Manufacturer	
Model	
Serial number	
Certificate of approval number	
Maximum capacity	
Number of compartments	
Scale mark value (L)	

General Characteristics (clause 3.2.1)

Are all mandatory markings permanently fixed on the vehicle tank and any removable fittings in the prescribed location (s)?	yes/no
Are all mandatory notices are permanently fixed on the vehicle tank, i.e. <ul style="list-style-type: none"> • Warning: re repairs and alterations? • Notice: re tank without manifold? 	yes/no yes/no/ na
Is the vehicle tank empty, complete, not damaged and in a clean and operational condition? (Note: Inspectors are not permitted to enter vehicle tanks under any circumstances)	yes/no
Does the sump project above the bottom of the tank?	yes/no/na

Characteristics of Vehicle Tanks Other than those used for the Collection of Sullage (clause 3.2.2)

Where the cover of the inspection opening is fitted with a dip tube or dipstick guide that is not centrally located in the cover: Is it only possible to fit the cover in the opening in one position?	yes/no/na
Where a tank is constructed to discharge through a manifold common to two or more compartments (except where the tank used for the delivery of black oil): <ul style="list-style-type: none"> • Is liquid only able flow through the outlet pipe from only one compartment at a time? • Is the flow of liquid from one compartment to another automatically prevented? • Do all compartments connected to a common manifold discharge simultaneously? 	yes/no/na yes/no/na yes/no/na
Is the gradient of the outlet pipe to a discharge valve away from the valve?	yes/no
Where no dipstick is provided, is the capacity of each compartment determined by a capacity mark: <ul style="list-style-type: none"> • Located inside the neck of each inspection opening? • Indicated by means of a clearly visible line not less than 100 mm in length? • Clearly designated with the capacity of the compartment, adjacent to the capacity mark, in letters not less than 10 mm high? 	yes/no/na yes/no/na yes/no/na
Where no dipstick is provided: <ul style="list-style-type: none"> • Does the dip plate cover the projected area of the dip tube? • Is the dip plate about 90° to the axis of the dip tube? 	yes/no/na yes/no/na

Characteristics of Dipsticks (clause 3.2.3)

Have there been any unauthorised repairs or alterations to the dipstick?	yes/no
Is the dipstick damaged?	yes/no
Is the dipstick marked with the tank serial number and related compartment number?	yes/no
Is the dipstick is of rigid metal construction and is of solid, hollow or T shaped cross-section?	yes/no
Is product prevented from being held in a hollow dipstick?	yes/no
Is the base of a bottom datum dipstick is fitted correctly with a foot?	yes/no/na
Is a top datum dipstick rigidly fitted with a crosspiece with its bottom surface at right angles to the dipstick?	yes/no/na
Is the dipstick surface treated?	yes/no
Is the dipstick only graduated for use with one compartment?	yes/no/na
Are all markings, numbering and scale intervals in accordance with those shown in Appendix B?	yes/no
With the exception of tanks designed to carry bituminous liquids, is the dipstick for compartments with a capacity greater than 12 kL void of graduations between 10% and 75% of capacity?	yes/no/na
Does the manufacturer's name and serial number marked on the dipstick agree with those shown on the data plate?	yes/no
Is the datum mark marked correctly on the dipstick?	yes/no/na
Is the dipstick stamped with the inspector's mark or the licensee's mark?	yes/no

Characteristics of the Dip Tube(s) or Guides (clause 3.2.4)

Have there been any unauthorised repairs or alterations to the dip tubes?	yes/no
Is there any damage to the dip tubes?	yes/no
Are there any obstructions to the dipstick?	yes/no
Is the internal diameter between 50 mm and 75 mm for bottom datum dipstick?	yes/no/na
Is the dip tube positioned correctly and are the dimensions correct?	yes/no
Is the dip tube opening identified 'ID' or 'DIP' as appropriate? • Lettering \geq 10 mm? • Raised lettering?	yes/no yes/no yes/no/na
Is the guide horizontal where a top datum dipstick rests?	yes/no/na
Does the guide maintain the dipstick vertically (no more than 1 in 20)?	yes/no
Is the axis of the dip tube or guide within 25 mm of the point determined from Appendix C? • Is it perpendicular to the longitudinal axis of the tank?	yes/no yes/no

Characteristics of Vehicle Tanks used for the Collection of Sullage (clause 3.2.5)

Are all mandatory notices permanently fixed on the vehicle tank, i.e. • Notice re sight tube readings? • Notice re internal valve?	yes/no yes/no/na
Is there only one discharge valve?	yes/no
Are sight tubes mounted at each end of the vehicle tank?	yes/no
Are sight tubes: • Rigid of clear plastic? • Internal diameter between 15 mm and 20 mm? • Removable for cleaning?	yes/no yes/no yes/no
Are the site tubes mounted vertically on the centre line of the tank from the bottom to the top of the tank?	yes/no
Do the site tubes show the liquid level over the whole vertical axis of the tank?	yes/no
Is there a graduated scale permanently fixed and sealed to the tank behind the sight tubes?	yes/no
Is the graduated scale: • Calibrated from zero to full capacity of the tank? • Not less than 75 mm wide and at least 3 mm thick?	yes/no yes/no
Are the graduated scales marked correctly and graduated in accordance with Appendix D?	yes/no
Are the scale marks visible from both sides of the sight tube?	yes/no
Is the scale spacing \geq 5 mm?	yes/no
Is each graduated scale marked with the vehicle tank serial number?	yes/no

Vehicle Tanks Other than those used for the Collection of Sullage (clause 4.2)

Check for leaks		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Check for full drainage		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Volume check (clause 4.2.3)			
Minimum scale mark		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
First 15% of capacity (at least two marks)	First mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	Second mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Between 15% and 75% of capacity (every 1 000 L if applicable)		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Between 75% and 100% of capacity (at least 3 marks)	First mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	Second mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	Third mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Highest mark (max capacity)		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail

Vehicle Tanks used for the Collection of Sullage (clause 4.3)

Check for leaks		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Check for full drainage		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Volume check (clause 4.3.2) readings to be taken at both sight tubes and averaged			
First 15% of capacity (at least two marks)	First mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	Second mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Between 15% and 75% of capacity (every 1 000 L if applicable)		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Between 75% and 100% of capacity (at least 3 marks)	First mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	Second mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	Third mark	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
Highest mark (max capacity)		<input type="checkbox"/> Pass	<input type="checkbox"/> Fail

Additional Tests (clause 4.4)

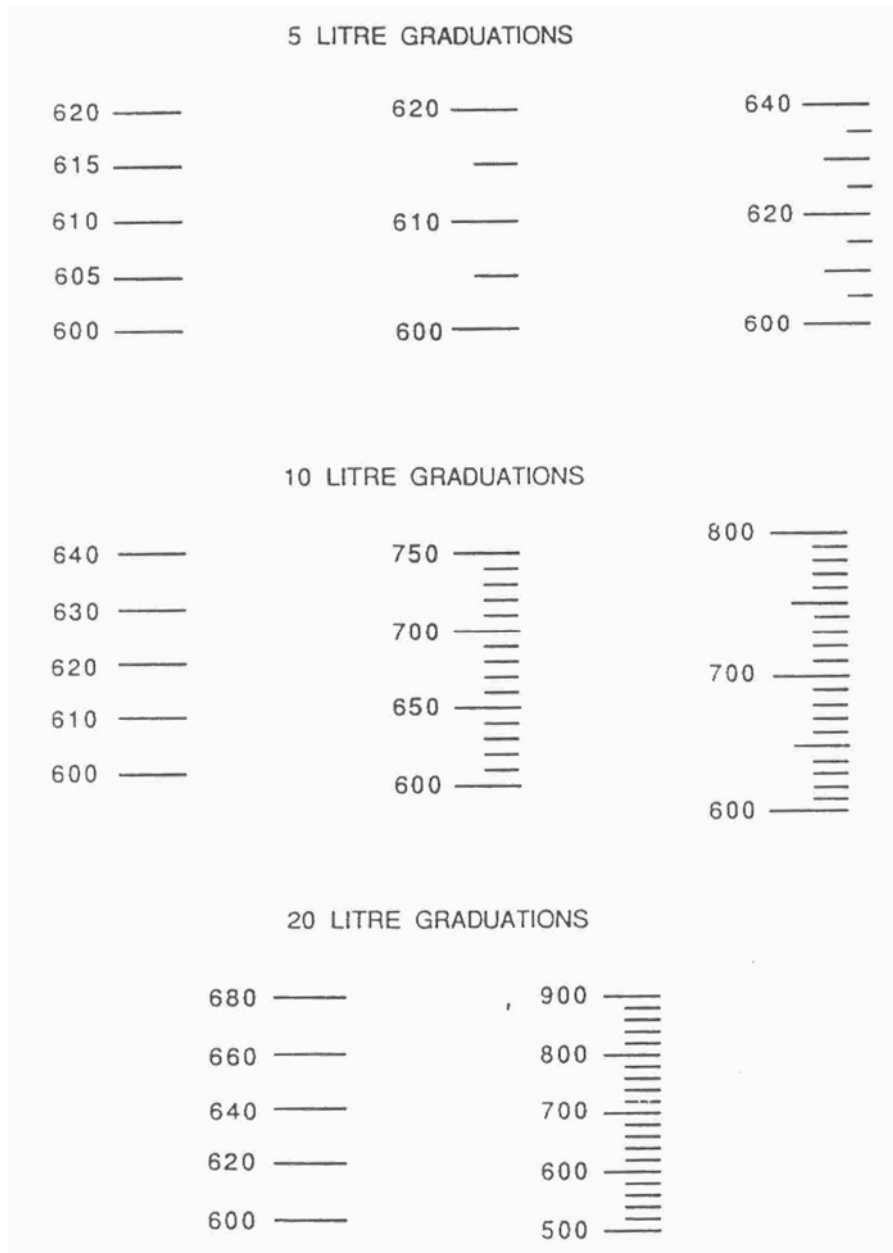
	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail
	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail

Signed Print name

Comments

.....

APPENDIX B. EXAMPLES OF RECOMMENDED SCALE MARKS



APPENDIX C. LOCATION OF DIPTUBE (OR CAPACITY MARK) IN VEHICLE TANKS

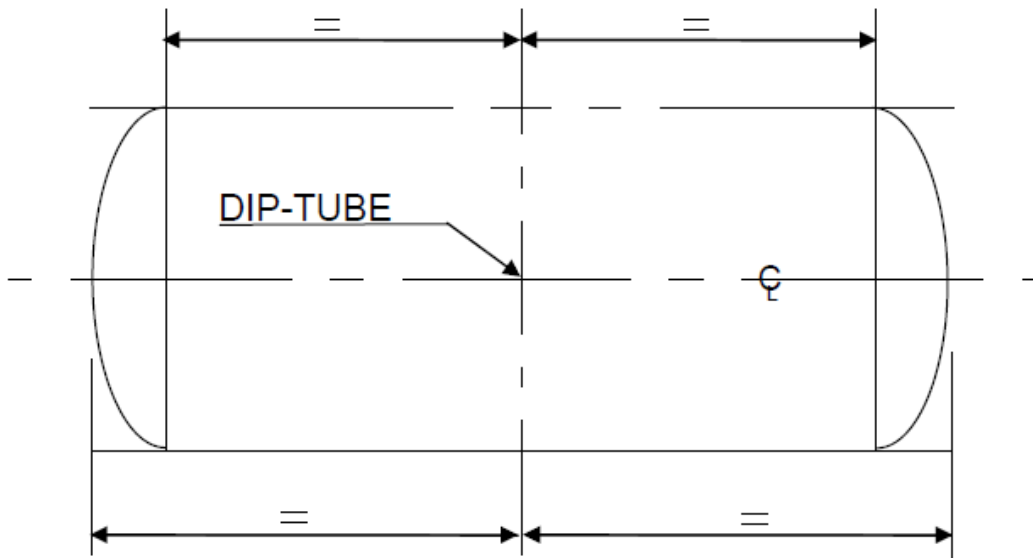


Figure 1. Symmetrical (horizontal cross-section through mid-height)

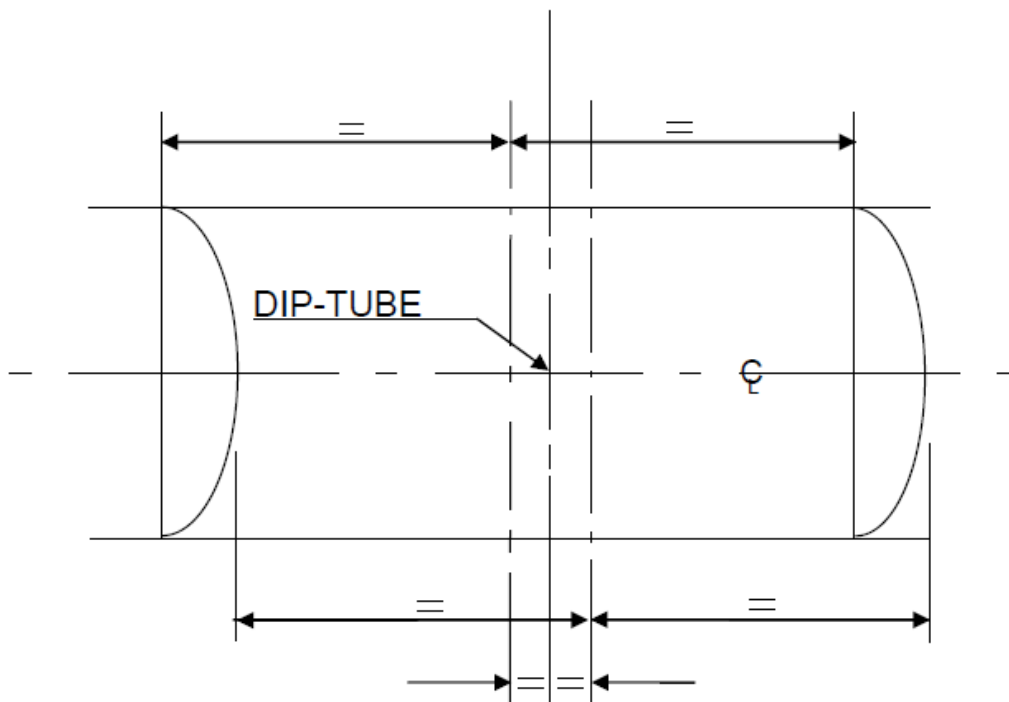


Figure 2. Non-symmetrical (horizontal cross-section through mid-height)

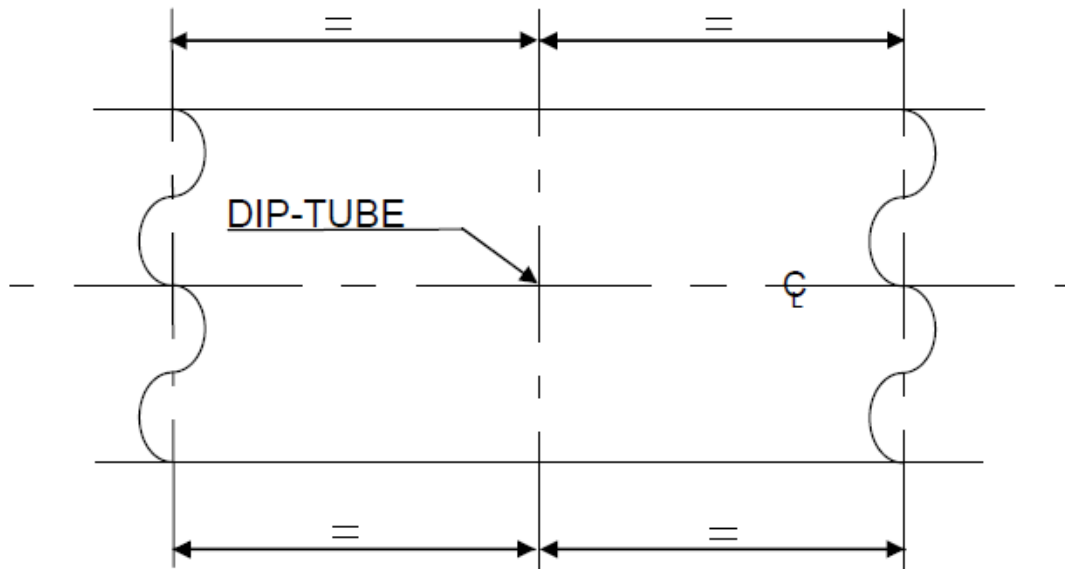


Figure 3. Corrugated (horizontal cross-section through mid-height)

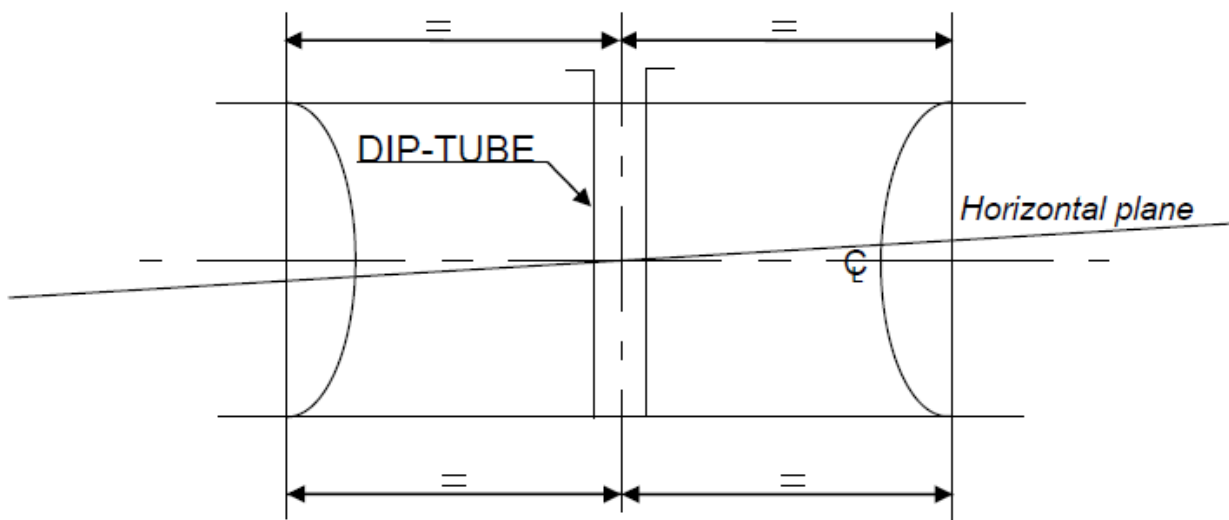
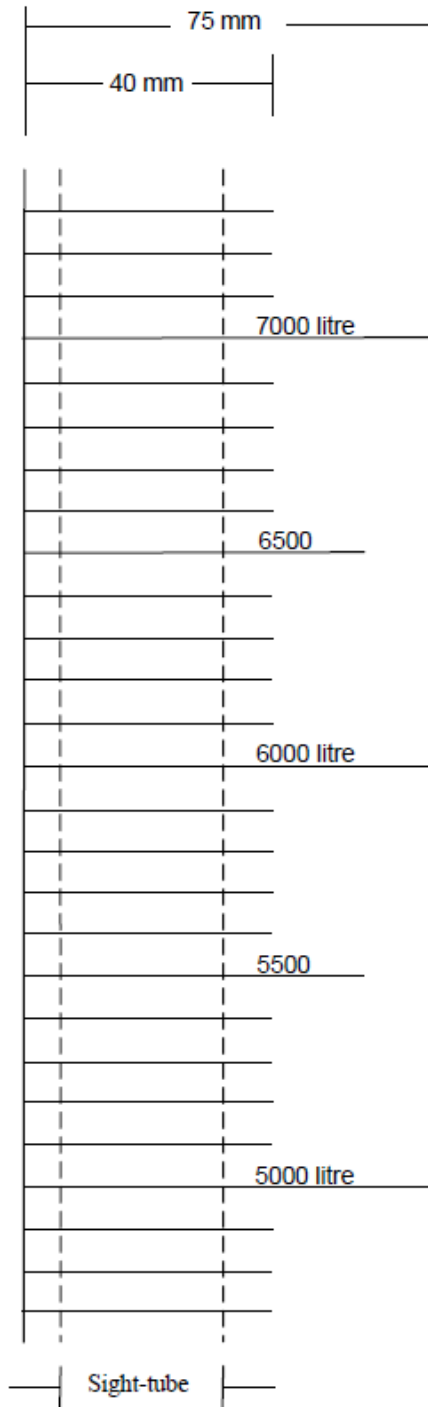


Figure 4. Symmetrical (tilted) (horizontal cross-section through mid-height)

APPENDIX D. ARRANGEMENT OF SCALE MARKS FOR SULLAGE TANKS



Graduated scale behind the sight tubes of a vehicle tank for the collection of sullage

APPENDIX E. METHOD OF READING THE DIPSTICK

To ensure that correct and reproducible readings are obtained when using a vehicle tank dipstick (that shall be surface treated), the following procedure is recommended.

1. Ensure that the dipstick is initially clean and dry.
2. Gently insert the dipstick vertically in the prescribed position.
Note: Take special care during the last 50 mm of movement to prevent ripples.
3. After reaching its correct prescribed position, and while still vertical, gently but promptly remove the dipstick from the liquid and keep in the vertical position.
4. Read the indication at the line of demarcation between the wet and dry parts of the dipstick as quickly as possible due to evaporation of product.
5. At least at one measurement take several dip readings to ensure the dipstick produces the same reading in whatever position it is placed in the socket(s).

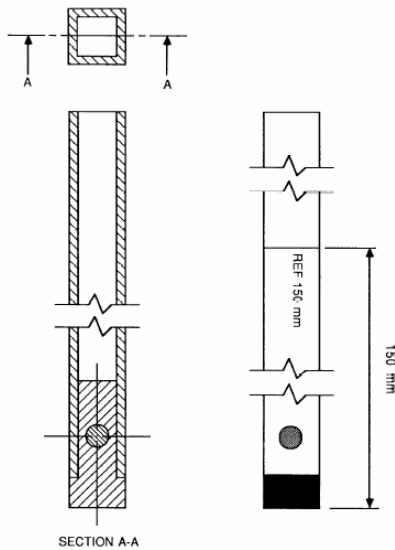


Figure 1. Typical bottom datum dipstick vehicle

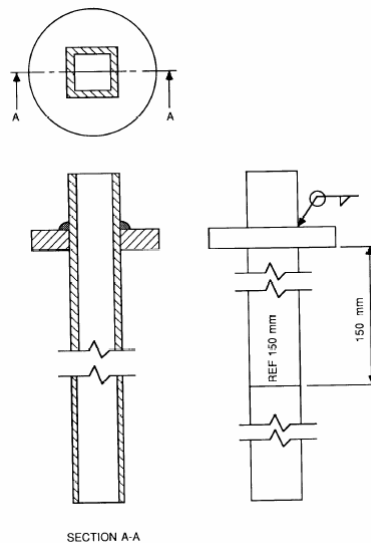


Figure 2. Typical top datum dipstick vehicle