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Environmental Protection
Agency

Solid Waste And
Emergency Response
5403W

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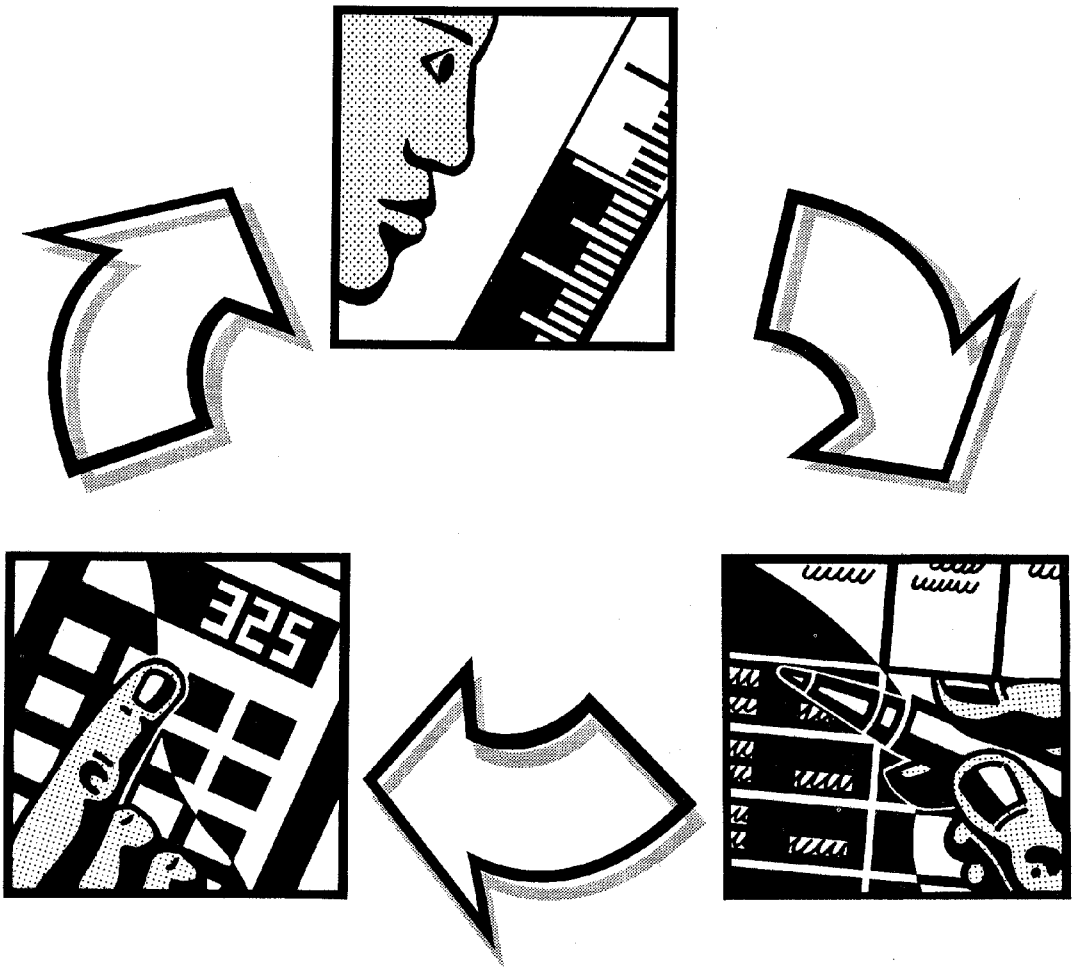
EPA

Manual Tank Gauging

For Small Underground Storage Tanks



CONTENTS

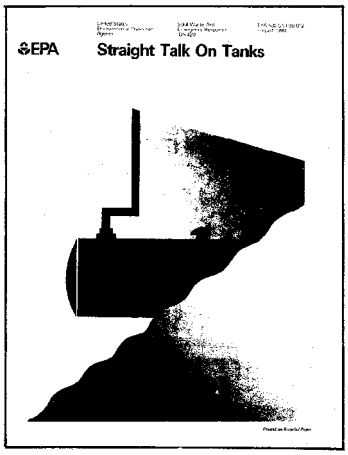
Why You Should Read This Booklet

Federal and state laws require underground storage tanks (USTs) to have leak detection. A lot of attention has been focused on large gasoline tanks, but it is also important to detect leaks from tanks 2,000 gallons or smaller, which often contain used oil.

If your USTs do not have leak detection, you can be cited for violations and fined. Leak detection violations can also keep you from getting legally required insurance coverage and reimbursement for cleanup costs. Without leak detection, you constantly risk discovering a leak only after it becomes a major financial burden for yourself and an environmental problem for everyone.

Manual tank gauging is a unique leak detection method that can be used only on tanks 2,000 gallons or smaller. If this method is appropriate for any of your USTs, this booklet can help you make sure you do **manual tank gauging** correctly.

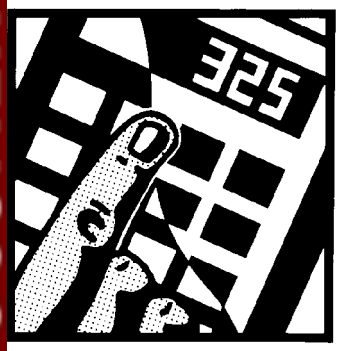
If you need information on federal leak detection requirements and the various methods of leak detection available to you, see "Straight Talk On Tanks." Call EPA's toll-free Hotline at 800 424-9346 and order this free publication by number: EPA 530/UST-90/012.



How Does Manual Tank Gauging Work?

This booklet helps you use manual tank gauging to meet federal regulatory leak detection requirements by showing you how to do three important tasks:

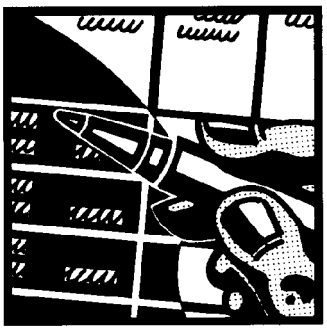
- **!** Good sticking
- **!** Good math
- **!** Good recordkeeping



Without these three, you may fail to meet the leak detection requirements. Steps 1 through 5 on the following pages show you how to perform manual tank gauging correctly.

Basically, manual tank gauging involves **taking the tank out of service every week for 36 hours or more** while you measure the tank's contents to see if changes in the tank's volume indicate a possible leak.

Manual tank gauging can be used only on tanks 2,000 gallons or smaller. Be sure you read about several important restrictions on the use of manual tank gauging that are described on the next page.



To use MANUAL TANK GAUGING correctly,

follow Steps 1—5 starting on page 5.

Please note these important restrictions on the use of manual tank gauging:

- **Manual tank gauging can be used only on tanks 2,000 gallons or smaller.**

- **Tanks 1,000 gallons or smaller can use this method alone**.

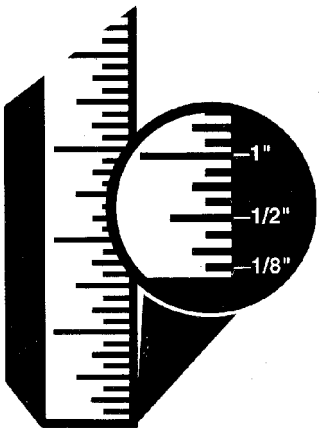
- **Tanks from 1,001 to 2,000 gallons can use manual tank gauging only when it is combined with periodic tank tightness testing. The combined method of manual tank gauging and tank tightness testing is a TEMPORARY leak detection method.** You can use the combined method only for 10 years after installing a new tank that has corrosion protection and spill/overfill devices or for 10 years after upgrading an old tank with corrosion protection and spill/overfill devices. (However, tanks that are filled by transfers of no more than 25 gallons at one time are not required to have spill/overfill devices.) During this 10-year period, tanks need tightness testing every 5 years. After the 10-year period, you must use a monthly monitoring method, such as groundwater monitoring or interstitial monitoring.

  Tanks without corrosion protection and spill/overfill devices cannot use this combined method after December 1998, when these tanks must be upgraded or closed. Before December 1998, these tanks need tightness testing **every year**. (See "Straight Talk On Tanks.")

- **The use of manual tank gauging does not meet your tank system's leak detection requirements for piping.** Pressurized and some suction piping must use other methods of leak detection, such as interstitial monitoring. (See "Straight Talk On Tanks.")

If you don't pay careful attention to these restrictions, you will fail to meet the leak detection requirements.

Do You Have The Right Equipment?



Find out if state or local requirements have limitations on the use of manual tank gauging or have requirements different than those presented here. You can also use other standard forms, if they show the information that state and federal regulations require.

Gauge Stick Or Other Gauges

The gauge stick used to measure the depth of liquid in an underground tank must be marked or notched to the **c** inch, starting with zero at the bottom end. Check your stick to be sure the end has not been worn or cut off and that the stick is not warped. The stick should be made of non-sparking material, such as wood, and varnished to minimize the creeping of fuel above the actual fuel level in the tank. Instead of using a gauge stick, you may use a mechanical or electronic tank level monitor. Whatever measuring device you use must be capable of measuring the level of product over the full range of the tank's height to the nearest **c** inch.

Forms

The instructions in this booklet are keyed to the "MANUAL TANK GAUGING RECORD" form. You will find a filled-in sample of this form on the last page of this booklet. This sample is on a perforated page, so tear it out and refer to it while you read through the directions that are keyed alphabetically to it. Also, **near the back of the booklet, you will find blank "masters" you can copy repeatedly to provide forms for use in your recordkeeping**. If the "MANUAL TANK GAUGING RECORD" is filled out according to the instructions in this booklet, you will be in compliance with federal regulations for manual tank gauging.

Tank Chart

A tank chart is a table that converts the number of inches of liquid in the tank into the number of gallons. You need a tank chart that exactly matches your storage tank (tank manufacturers usually provide charts for their tanks). If you have more than one tank, you will need a chart for each tank unless the tanks are identical. The tank chart must show conversion to gallons for each **c** inch stick reading. If your tank chart does not convert each **c** inch reading into gallons, contact the tank manufacturer, or, if you have a steel tank, the Steel Tank Association (708 438-8265) to get an appropriate chart.

STICK READING	GALLONS
21-5/8"	586
21-3/4"	591
21-7/8"	596
22"	601
22-1/8"	606
22-1/4"	611
22-3/8"	616
22-1/2"	621
22-5/8"	626

You always need to convert inches into gallons in order to fill out the form correctly and to do the necessary math. To convert inches into gallons, find your stick's reading to the nearest **c** inch on the tank chart, then simply read across to the gallons column to find the number of gallons. If you cannot get a tank chart showing conversion to gallons for each **c** inch reading, you must do the additional math explained on page 8.

Step 1—Find The Right Testing Period

Once each week you must take your tank out of service for a testing period. The length of the testing period depends on the size of your tank and whether you are using manual tank gauging alone or in combination with tank tightness testing.

Use the sample "MANUAL TANK GAUGING RECORD" on the last page of the booklet to see where you put the information from letters "A" through "M" in the following directions.

A **Circle your tank size and test duration in the table so you will know which you are using.** To identify the appropriate testing period, use the sample form found on the last page of this booklet and locate your tank on the table in the upper left corner of the sample form (see the section labeled "A"). You know which testing period you need to use **every week** by looking at the number in the "Minimum Duration Of Test" column next to the box that matches a description of your tank. With tanks of 551 to 1,000 gallons, you can choose a shorter test time (36 hours) ***with tightness testing*** or a longer test time (44 or 58 hours, depending on tank diameter) ***without tightness testing***.

During the test period the tank must remain out of service so that nothing is put into the tank and nothing is taken out of it.

Step 2—Measure The Tank's Contents

Every week, you must take liquid level measurements twice before and twice after each out-of-service testing period.

USE GOOD STICKING PRACTICES: Slowly lower the gauge stick, let the stick gently touch bottom, and quickly bring it back up. Read the depth of the fuel indicated by the wet mark on the stick to the nearest 1/8 inch.

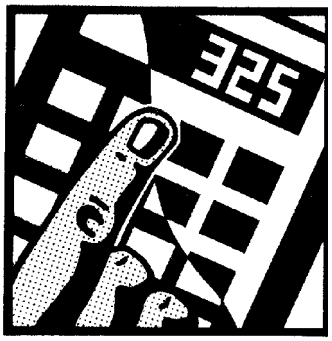
B Fill in the identifying information at the top of the "MANUAL TANK GAUGING RECORD" form. You need a separate form for each tank using manual tank gauging.

C Take your first stick reading using "good sticking practices" noted in the box on the right. **Enter your reading in the column labeled "First Initial Stick Reading."**

D Wipe the stick dry with a rag and take a second stick reading as you did before. **Enter the second reading in the column labeled "Second Initial Stick Reading."**

After the readings are taken, the tank opening should be closed so that no liquid can be added or removed from the tank.

E When the out-of-service testing period is over, take two more stick readings in the same way you took the first two readings. **Enter the ending readings in the columns labeled "First and Second End Stick Reading."**



Step 3—Do Some Math

Every week at the end of the test period, you must record some math calculations.

F Average the two initial stick readings to the nearest **c** inch. **Enter the result in the "Average Initial Reading" column.**

G The average stick reading of the tank's contents will be in **inches**. You always need to convert **inches** into **gallons** in order to fill out the form completely and to calculate the change in the tank volume. Find your stick's reading on the tank chart to the nearest **c** inch, then read across to the gallons column to find the number of gallons. **Enter the result in the "Initial Gallons" column.**

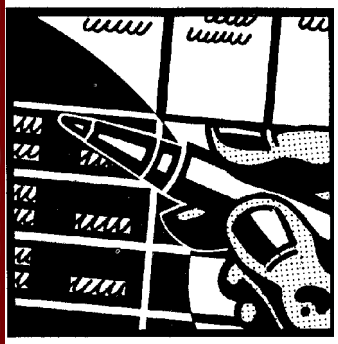
Your tank chart should have direct conversions from **c** inch stick readings to gallons. If you cannot get a tank chart with **c** inch conversions, do the additional math explained on page 8.

H Average the two end stick readings to the nearest **c** inch. **Enter the result in the "Average End Reading" column**.

I Convert the average stick reading from inches into gallons (as you did in item "G" above) and **enter the result in the "End Gallons" column.**

J Subtract the "End Gallons" column from the "Initial Gallons" column. **Enter the result in the column labeled "Change In Tank Volume."**

Step 4—Find The Right Test Standards



K The **weekly** and **monthly** test standards depend on tank size and whether you are using manual tank gauging alone or in combination with tank tightness testing. To find your tank's weekly and monthly test standards, locate your tank on the table in the upper left corner of the sample MANUAL TANK GAUGING RECORD (see the section labeled "K"). You know which test standards apply to your tank by looking at the gallon numbers in the "Weekly Standard" and "Monthly Standard" columns next to your tank.

Circle the weekly and monthly test standards in the table that apply to your tank so you will know which standards your tank must meet.

Step 5—Compare Your Measurements With Test Standards

You must compare your calculation of "Change In Tank Volume" to the weekly and monthly test standards for your tank.

Ⓛ **Every week**, compare your "Change In Tank Volume" number to the weekly test standard. For the purpose of this comparison, consider all numbers to be positive (for example, a -16 would become a +16). If your "Change In Tank Volume" number is not larger than the weekly test standard, circle YES in the "Tank Passes Test" column. If your "Change In Tank Volume" number is larger than the weekly test standard, circle NO. **If you circle NO, you must also call your regulatory agency to report a suspected leak as soon as possible.**

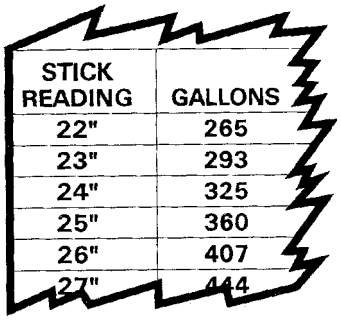
Ⓜ **Once a month**, add up the 4 weekly "Change In Tank Volume" numbers: this time pay careful attention to positive and negative numbers to get an accurate total. For example, adding +4 and +3 and -2 and -1 should equal +4. After you have the sum of the 4 weekly tests, divide by 4 to get the monthly test average. **Enter the result at the bottom of the "Change In Tank Volume" column.**

Compare your monthly test average to the monthly test standard for your tank. For the purpose of this comparison, again consider all numbers to be positive (for example, a -16 would become a +16). If your "Change In Tank Volume" number is not larger than the monthly test standard, circle YES in the "Tank Passes Test" column. If your monthly average "Change In Tank Volume" is larger than the monthly test standard, circle NO. **If you circle NO, you must also call your regulatory agency to report a suspected leak as soon as possible.**

Keep your manual tank gauging records on file for at least 1 year. Also, keep a record of the last tank tightness test, if you use the method that combines manual tank gauging with periodic tank tightness testing.

Using Tank Charts Without **c** Inch Conversions

If your tank chart does not list direct conversions from inches to gallons for every **c** inch, then you must **do the additional math described below every time you stick your tank**.



STICK READING	GALLONS
22"	265
23"	293
24"	325
25"	360
26"	407
27"	444

The easiest way to explain this procedure is with an example. Let's say you have a stick reading of 23**d** inches and you need to figure how many gallons are in your tank.

1. Look on your tank chart and find the inch measurements that are just above and below your stick reading and write down the number of gallons for these inch readings. Subtract the gallon readings to find the difference between the two readings:

   Chart reading at 24 inches: 325 gallons
   Chart reading at 23 inches: 293 gallons

   Difference: 32 gallons

2. Dividing 32 by 8 will give you the number of gallons for each **c** inch, which is 4 gallons. (Round off the number to the nearest whole number.) Because your fraction is **d**, multiply 4 gallons by 3, which gives you 12 gallons as the volume represented by **d** inch.

   CAUTION: The gallons represented by each c inch will vary from top to bottom of the tank and must be calculated for each conversion.

3. Take the number of gallons you have just calculated and add it to the inch reading just below your actual stick reading:

   Chart reading at 23 inches: 293 gallons
   Gallons at **d** inch: + 12 gallons

   Sum: 305 gallons

Thus, your stick reading of 23**d** inches converts to 305 gallons.

NOTE: If your tank chart is in half or quarter inches, you must still use this procedure so that your gallon readings are accurate to **c** inch.

After all of this math, you can see why it pays to have the correct tank chart that indicates gallons for each c inch.

MANUAL TANK GAUGING RECORD

Month _____ **Year** _____

Tank Identification _____

Person Completing Form _____

Facility Name_____

Circle your tank size, test duration, and weekly/monthly standards in the table below:

Tank Size	Minimum Duration Of Test	Weekly Standard (1 test)	Monthly Standard (4-test average)
up to 550 gallons	36 hours	10 gallons	5 gallons
551-1,000 gallons (when tank diameter is 64")	44 hours	9 gallons	4 gallons
551-1,000 gallons (when tank diameter is 48")	58 hours	12 gallons	6 gallons
551-1,000 gallons (also requires periodic tank tightness testing)	36 hours	13 gallons	7 gallons
1,001-2,000 gallons (also requires periodic tank tightness testing)	36 hours	26 gallons	13 gallons

Compare your weekly readings and the monthly average of the 4 weekly readings with the standards shown in the table on the left.

If the calculated change exceeds the weekly standard, the UST may be leaking. Also, the monthly average of the 4 weekly test results must be compared to the monthly standard in the same way.

If either the weekly or monthly standards have been exceeded, the UST may be leaking. As soon as possible, call your implementing agency to report the suspected leak and get further instructions.

Start Test (month, day, and time)	First Initial Stick Reading	Second Initial Stick Reading	Average Initial Reading	Initial Gallons (convert inches to gallons) [a]	End Test (month, day, and time)	First End Stick Reading	Second End Stick Reading	Average End Reading	End Gallons (convert inches to gallons) [b]	Change In Tank Volume In Gallons + or (—) [a—b]	Tank Passes Test (circle YES or NO)
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
									To see how close you are to the monthly standard, divide the sum of the 4 weekly readings by 4 and enter result here >		Y N

KEEP THIS PIECE OF PAPER ON FILE FOR AT LEAST 1 YEAR

MANUAL TANK GAUGING RECORD

Month _____ **Year** _____

Tank Identification _____

Person Completing Form _____

Facility Name_____

Circle your tank size, test duration, and weekly/monthly standards in the table below:

Tank Size	Minimum Duration Of Test	Weekly Standard (1 test)	Monthly Standard (4-test average)
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Start Test (month, day, and time)	First Initial Stick Reading	Second Initial Stick Reading	Average Initial Reading	Initial Gallons (convert inches to gallons) [a]	End Test (month, day, and time)	First End Stick Reading	Second End Stick Reading	Average End Reading	End Gallons (convert inches to gallons) [b]	Change In Tank Volume In Gallons + or (—) [a—b]	Tank Passes Test (circle YES or NO)
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
									To see how close you are to the monthly standard, divide the sum of the 4 weekly readings by 4 and enter result here >		Y N

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MANUAL TANK GAUGING RECORD

Month _____ **Year** _____

Tank Identification _____

Person Completing Form _____

Facility Name_____

Circle your tank size, test duration, and weekly/monthly standards in the table below:

Tank Size	Minimum Duration Of Test	Weekly Standard (1 test)	Monthly Standard (4-test average)
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If either the weekly or monthly standards have been exceeded, the UST may be leaking. As soon as possible, call your implementing agency to report the suspected leak and get further instructions.

Start Test (month, day, and time)	First Initial Stick Reading	Second Initial Stick Reading	Average Initial Reading	Initial Gallons (convert inches to gallons) [a]	End Test (month, day, and time)	First End Stick Reading	Second End Stick Reading	Average End Reading	End Gallons (convert inches to gallons) [b]	Change In Tank Volume In Gallons + or (—) [a—b]	Tank Passes Test (circle YES or NO)
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
Date: Time: AM/PM					Date: Time: AM/PM						Y N
									To see how close you are to the monthly standard, divide the sum of the 4 weekly readings by 4 and enter result here >		Y N

KEEP THIS PIECE OF PAPER ON FILE FOR AT LEAST 1 YEAR

MANUAL TANK GAUGING RECORD

(B) Month 9 Year 93

Tank Identification USED OIL

Person Completing Form Juan Doe

Facility Name LAST CHANCE #2

Circle your tank size, test duration, and weekly/monthly standards in the table below:

Tank Size (A)	Minimum Duration Of Test	Weekly Standard (K) (1 test)	Monthly Standard (4-test average)
up to 550 gallons	36 hours	10 gallons	5 gallons
551-1,000 gallons (when tank diameter is 64")	44 hours	9 gallons	4 gallons
551-1,000 gallons (when tank diameter is 48")	58 hours	12 gallons	6 gallons
551-1,000 gallons (also requires ~~periodic tank tightness testing~~)	36 hours	13 gallons	7 gallons
1,001-2,000 gallons (also requires periodic tank tightness testing)	36 hours	26 gallons	13 gallons

Compare your weekly readings and the monthly average of the 4 weekly readings with the standards shown in the table on the left.

If the calculated change exceeds the weekly standard, the UST may be leaking. Also, the monthly average of the 4 weekly test results must be compared to the monthly standard in the same way.

If either the weekly or monthly standards have been exceeded, the UST may be leaking. As soon as possible, call your implementing agency to report the suspected leak and get further instructions.

SAMPLE

Start Test (month, day, and time)	First Initial Stick Reading (C)	Second Initial Stick Reading (D)	Average Initial Reading (F)	Initial Gallons (convert inches to gallons) (G) [a]	End Test (month, day, and time)	First End Stick Reading (E)	Second End Stick Reading	Average End Reading (H)	End Gallons (convert inches to gallons) (I) [b]	Change In Tank Volume In Gallons + or (−) (J) [a−b]	Tank Passes Test (L) (circle YES or NO)
Date: 9/4 Time: 6 AM/PM	44 7/8	45 1/8	45	1101	Date: 9/6 Time: 6 AM/PM	45 3/8	45 1/2	45 1/2	1119	+18	Y N
Date: 9/11 Time: 6 AM/PM	7 1/8	7	7 1/8	89	Date: 9/13 Time: 6 AM/PM	6 1/4	6 1/4	6 1/4	75	−14	Y N
Date: 9/18 Time: 6 AM/PM	10	10	10	150	Date: 9/20 Time: 6 AM/PM	9 3/8	10 1/8	10	150	0	Y N
Date: 9/25 Time: 6 AM/PM	24 3/4	25 1/8	25	906	Date: 9/27 Time: 6 AM/PM	25 1/8	25 1/4	25 1/4	915	+9	Y N
								(M) To see how close you are to the monthly standard, divide the sum of the 4 weekly readings by 4 and enter result here >		13/4 3.25	Y N

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INTERNATIONAL ASSOCIATION OF TANK TESTING PROFESSIONALS

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PMAA
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SSDA
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