

Performing Inventory Control For Storage Tanks



Presented by



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Why You Should Read This Booklet If You Use Inventory Control

Federal and state laws require underground storage tanks (USTs) to have leak detection.

All Aboveground Storage Tanks (ASTs) that are regulated by the Wyoming DEQ Storage Tank Program (STP) are required to perform inventory control.

If automatic tank gauging is used on your USTs you may also be required to perform inventory control.

The International Fire Code, which the State of Wyoming Fire Marshal has adopted, requires that daily inventory control be conducted at all facilities that dispense motor fuel (IFC 2206.2.1.1)

If you have two consecutive months of failing inventory control records, whether they be overages or shortages you are required to report a suspected release to the department within 24 hours and investigate a suspected release within 7 days.

If you have a low throughput UST (15,000 gallons or less per month) and are using the low throughput exemption, shortages or overages exceeding 150 gallons are considered failures. If you fail for two consecutive months you are required to report and investigate a suspected release.

If your tanks do not have leak detection, you can be cited for violations and fined. 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. With the price of fuel steadily increasing, it is good business practice to perform inventory control.

If you need further information about tanks please contact the Wyoming DEQ STP at (307)777-7095 or (307)777-7097. Or you can visit the STP website at <http://deq.state.wy.us/shwd/stp/>



How Does Inventory Control Work?



This booklet helps you use inventory control 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. To do inventory control right, you have to spend time to make sure that you consistently measure the tank's contents correctly, that you don't let math errors creep into your daily and monthly calculations, and that you keep complete, easy-to-read records on file for at least a year.

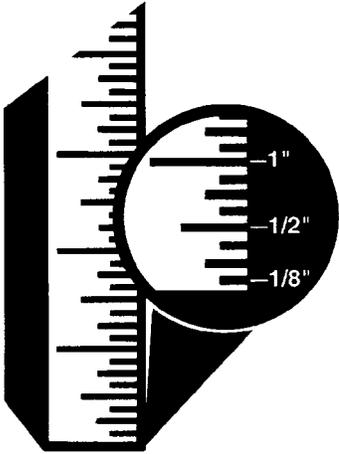


Basically, inventory control requires daily measurements of tank contents and math calculations that let you compare your "**stick**" inventory (what you've measured) to your "**book**" inventory (what your recordkeeping indicates you should have). Some people call this process "inventory reconciliation." If the difference between your "**stick**" and "**book**" inventory is too large, your tank may be leaking.



***To use INVENTORY CONTROL correctly,
follow Steps 1—5.***

Do You Have The Right Equipment?



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 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 1/8 inch.



Pastes For Finding Water Or Fuel

You must check for water in the bottom of the tank at least once each month by smearing a water-finding paste along the bottom of the gauge stick. The paste changes color when it comes in contact with water. Many operators improve their stick readings by smearing a fuel-finding paste on about 6 inches of the stick where they expect the fuel level to be. Fuel-finding paste changes color when it comes in contact with fuel.

Forms

The instructions in this booklet are keyed to two forms: the "DAILY INVENTORY WORKSHEET" and the "MONTHLY INVENTORY RECORD." You will find filled-in sample copies of these forms on the last two pages of this booklet. These samples are on perforated pages, so tear them out and refer to them while you read through the directions that are keyed alphabetically to the sample forms. Also, **near the back of the booklet, you will find "masters" you can copy repeatedly to provide forms for use in your recordkeeping. The requirements for inventory control can be found in Wyoming Water Quality Rules and Regulations, Chapter 17, Section 16. These rules can be found online at:**

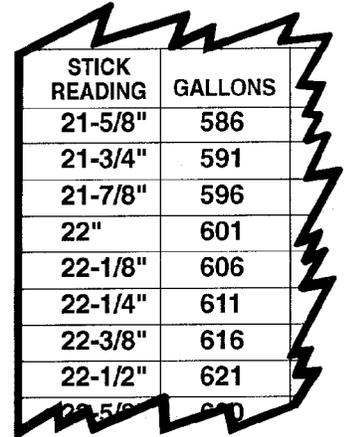
http://deq.state.wy.us/wqd/WQDrules/Chapter_17.pdf



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 1/8 inch stick reading. If your tank chart does not convert each 1/8 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.

You always need to convert inches into gallons in order to fill out the forms correctly and to do the necessary math. To convert inches into gallons, find your stick's reading to the nearest 1/8 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 1/8 inch reading, you must do the additional math explained on page 9.



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

Drop Tube

The fill pipe through which the fuel is delivered into the tank must have a drop tube extending to within 6 inches of the bottom of the tank. Stick measurements should be made through a drop tube in the fill pipe or gauging port. If your fill pipe does not have a drop tube, call your petroleum equipment supplier to have one installed.

Calibrated Dispensing Meters

Meters must be calibrated according to local standards.

Manifolded Tanks

If you have manifolded tanks or dispensers that blend fuel, consider these tanks as one tank system if they share a common inventory of stored fuel. As you follow the directions on the following pages, you will need to combine your measurements and calculations for all the tanks manifolded into one system.

Step 1—Measure The Tank's Contents

You must measure the tank every day that fuel is added or removed. You may take measurements using a gauge stick or a mechanical or electronic tank level monitor.

No fuel can be added or removed from the tank while you are performing Step 1 or Step 2.

Every day you measure the tank, you should fill out a "DAILY INVENTORY WORKSHEET." As you go through the following directions, refer to the sample DAILY INVENTORY WORKSHEET you will find on the last pages of this booklet.

Use the sample "DAILY INVENTORY WORKSHEET" from the last two pages of the booklet to see where you put the information from letters "A" through "M" in the following directions.

- A** Fill in the identifying information at the top of the worksheet.
- B** Next to the "TANK IDENTIFICATION" box are empty vertical columns. Each column represents one tank—consistently enter all information on that one tank in the same vertical column. **NOTE:** Once you have filled in the tank identification boxes, make copies of the worksheet so you won't have to repeatedly enter the same information.

USE GOOD STICKING PRACTICES: **Slowly** lower the gauge stick to the tank's bottom. Let the stick gently touch the bottom, then quickly bring it back up. Read the depth of fuel indicated by the wet mark to the closest 1/8 inch division on the stick. Use of fuel-finding paste will make your stick readings more accurate.



- C** Write your measurement in the box labeled "END STICK INCHES" for the tank you measured.

NOTE: If your tank is equipped with an automatic tank gauge (ATG), you may record the inches of product and gallons of product directly from the ATG's printed tape or simply staple the tape with this information to the worksheet.

Step 2—Record The Amount Pumped

At the same time you measure the tank contents (Step 1), you must record on the DAILY INVENTORY WORKSHEET the amount of fuel pumped. **No fuel can be added or removed from the tank while you are sticking the tank and recording the amount pumped.**



- D** Locate the box labeled "AMOUNT PUMPED" on the left side of the worksheet. Copy the numbers from each dispenser's totalizer onto the worksheet. **Be very careful that you write all the meter readings for a tank in the same column.** You may have several dispensers and totalizers for one tank, so the worksheet provides boxes in which you can enter several readings in any order.
- E** Add up the totalizer meter readings in each column and write the result in the box labeled "TODAY'S SUM OF TOTALIZERS."
- F** Find the last DAILY INVENTORY WORKSHEET you completed. Copy "TODAY'S SUM OF TOTALIZERS" from that worksheet into the "Previous Day's Sum of Totalizers" box of the worksheet you are working on today.
- G** On today's worksheet, subtract "Previous Day's Sum of Totalizers" from "TODAY'S SUM OF TOTALIZERS" and write the result in the box labeled "AMOUNT PUMPED TODAY."

You may have an alternative to reading totalizers. If you have a self-service fueling operation where the cashier can authorize fuel sales from inside the facility, you can probably print out a daily report that gives you the total sales for each type of fuel. **NOTE: You can use the sales volumes from this report instead of reading your totalizer meters only if no fuel sales are made between the time you print the report from the cash register and the time you measure your tanks (Step 1).**

If you pumped fuel through a dispenser and back into a tank, for example during a test, subtract the number of gallons you pumped from "AMOUNT PUMPED TODAY."

- H** If you are using cash register reports to record the amount pumped, enter the amount of each type of fuel pumped in the box labeled "AMOUNT PUMPED TODAY" or staple the printout to the worksheet.

Step 3—Record Fuel Deliveries



You must check how much fuel has been delivered every time any amount of fuel is delivered to your tank. **NOTE: You should not pump any fuel during the time it takes to do items "I" and "J" below.**

Before the delivery begins, the liquid level in the tank must be measured. Always use good sticking practices: slowly lower the gauge stick, gently touch the stick to the bottom of the tank, then quickly bring the stick back up. Read the depth of fuel indicated by the wet mark to the nearest 1/8 inch on the stick.

- I Write your measurement in the box labeled "Inches of Fuel Before Delivery" for each tank you measured.

The delivery person can now deliver fuel into the tank. After the delivery, wait at least 5 minutes for the fuel level in the tank to stabilize, and then measure again as described above.

- J Record fuel level in the box labeled "Inches of Fuel After Delivery."
- K Using your tank chart with 1/8 inch readings, convert both delivery readings to the correct number of gallons. Record these numbers in the boxes labeled "Gallons of Fuel Before Delivery" and "Gallons of Fuel After Delivery." (If necessary, see page 9 on converting inches into gallons.)
- L Subtract "Gallons of Fuel Before Delivery" from "Gallons of Fuel After Delivery." Record the result in the box labeled "GALLONS DELIVERED (STICK)."

Now look at the delivery receipt and find the volume of each type of product that was delivered. If two volumes are given, one labeled "net" and the other "gross," use the gross gallons as the volume of product delivered.

- M For each type of fuel delivered, copy the gross gallons delivered from the delivery receipt onto the worksheet in the box labeled "GROSS GALLONS DELIVERED (RECEIPT)." The gallons in items "L" and "M" should roughly match. If they don't, contact your supplier.

NOTE: When deliveries are made, sales need to be documented and added to the amount delivered. Failure to do so could result in failing results at the end of the month.

An automatic tank gauge (ATG) can usually print a delivery report. If your tank has an ATG that prints such a report, you may simply staple the ATG's delivery report to the DAILY INVENTORY WORKSHEET.

Step 4—Calculate Daily Changes In Inventory

In this step, you will copy information from the DAILY INVENTORY WORKSHEET onto the MONTHLY INVENTORY RECORD. You will then do some math to determine your daily inventory. You need one MONTHLY INVENTORY RECORD for each tank that you have.

As you go through the following directions, refer to the sample MONTHLY INVENTORY RECORD you will find on the reverse side of the DAILY INVENTORY WORKSHEET sample you have already been using. For easy reference, the sample is on a perforated page so you can tear it out and keep it handy as you read through the directions. Also, near the back of the booklet is a "master copy" on a perforated page you can tear out to make copies of the MONTHLY INVENTORY RECORD for your recordkeeping.

Use the sample "MONTHLY INVENTORY RECORD" from the last two pages of the booklet to see where you put the information from letters "N" through "Z" in the following directions.

- N** Fill in the identifying information at the top of the MONTHLY INVENTORY RECORD.

If this is the very first day of your inventory recordkeeping, convert the "END STICK INCHES" from the DAILY WORKSHEET into gallons and enter on the MONTHLY RECORD under "END STICK INVENTORY (GALLONS)" for that starting date. (If necessary, see page 9 on converting inches into gallons.) This is all you can do today. Starting tomorrow, follow all of the instructions listed below.

- O** Find the line in the left column on the MONTHLY RECORD with today's date listed. Copy the previous day's "END STICK INVENTORY (GALLONS)" number into the box for today's "START STICK INVENTORY (GALLONS)."
- P** Enter the amount of fuel delivered from the DAILY INVENTORY WORKSHEET. If you were ~~NOT~~ pumping fuel during the time when the delivery was taking place, then use the "GALLONS DELIVERED (STICK)" number. However, if you had to pump fuel while the delivery was taking place, then use the "GROSS GALLONS DELIVERED (RECEIPT)" number as your delivery amount.
- Q** Copy the "AMOUNT PUMPED TODAY" number from the DAILY INVENTORY WORKSHEET into the "GALLONS PUMPED" column of the MONTHLY INVENTORY RECORD.

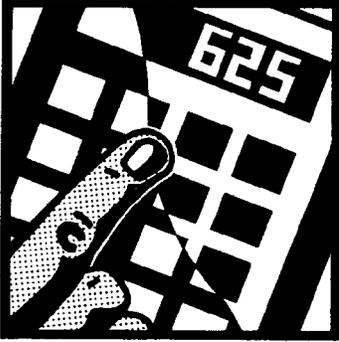
- R** Add the "START STICK INVENTORY (GALLONS)" and the "GALLONS DELIVERED" columns; then subtract the "GALLONS PUMPED" column. Enter the result in the column labeled "BOOK INVENTORY (GALLONS)."
- S** Copy the "END STICK INCHES" number from the DAILY WORKSHEET into the column labeled "END STICK INVENTORY (INCHES)" on the MONTHLY RECORD. Convert inches into gallons and enter the result in the column on the MONTHLY RECORD labeled "END STICK INVENTORY (GALLONS)." (If necessary, see page 9 on converting inches into gallons.)
- T** Subtract the "BOOK INVENTORY (GALLONS)" from the "END STICK INVENTORY (GALLONS)." Enter the difference into today's "DAILY OVER OR SHORT" box. This number will usually be a positive or negative number (only rarely will it be zero).
- U** Enter your initials to show who entered today's information.

GOOD ADVICE: *If you are "over" for 5 days in a row (or "under" for 5 days in a row), you should check for problems with your math and your UST.*

At least once each month, you must also measure for water in the tank. Smear water-finding paste on the bottom few inches of the gauge stick. Open the fill pipe and **slowly** lower the stick to the tank's bottom. Hold the stick on the bottom for 10 seconds for gasoline (30 seconds for diesel). Then remove the stick. If there is water in the bottom of the tank, the water-finding paste will change color. Read the depth of water indicated by the line where the water-finding paste has changed color to the closest 1/8 inch division on the stick. **Do not use this stick reading to measure the amount of fuel in the tank,** because the fuel will creep up the stick and will give you an inaccurate reading.

- V** If you checked the tank for water today, enter the number of inches of water in the tank on the line under "Facility Name" at the top of the monthly record. If there is no water present, enter a zero to indicate that you in fact checked for water but found none. If you find more than 1 inch of water, you should arrange for its immediate removal, notify the product supplier, and conduct further tests to ensure that the tank is not leaking.





Step 5—Calculate Monthly Changes In Inventory

At the end of each month, follow the directions below to see if the difference between "stick" and "book" inventory indicates a possible leak.

- W Add all of the month's "GALLONS PUMPED" numbers and write this total at the bottom of the column in the box labeled "TOTAL GALLONS PUMPED."
- X Add all the month's "DAILY OVER OR SHORT" numbers: pay careful attention to positive and negative numbers to get an accurate total. For example, adding +4 and +3 and -2 should equal +5. Enter the total at the bottom of the column in the box labeled "TOTAL GALLONS OVER OR SHORT."
- Y Fill out the "LEAK CHECK" line at the bottom of the MONTHLY INVENTORY RECORD as follows:
 1. Take the "TOTAL GALLONS PUMPED" number and drop the last two digits to get 1% (for example: 6594 becomes 65).
 2. Add 130 (for example: $65 + 130 = 195$).

Enter the result of this calculation at the end of the "LEAK CHECK" line. This number is the **maximum change in inventory allowed** by state regulations (1% of throughput plus 130 gallons).

- Z At the bottom of the MONTHLY INVENTORY RECORD, circle "YES" or "NO" to show whether your "TOTAL GALLONS OVER OR SHORT" number is **LARGER** than the "LEAK CHECK" number you identified in the previous item. Even if your "TOTAL GALLONS OVER OR SHORT" is a negative number, treat it as a positive number for the purpose of this comparison. For example, -74 would become +74.

If you circle "YES" for 2 months in a row, you must notify your regulatory agency as soon as possible (usually within 24 hours) that your tank may be leaking.

NOTE: Keep your inventory control records on file for at least 1 year. Your state, however, may have different rules about when you have to report a leak or how long you must keep the inventory records. Be sure you know the rules that apply to you.

DAILY INVENTORY WORKSHEET

FACILITY NAME: _____

YOUR NAME: _____

DATE: _____

TANK IDENTIFICATION					
Type of Fuel					
Tank Size in Gallons					
END STICK INCHES					
AMOUNT PUMPED	↓	↓	↓	↓	↓
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
Totalizer Reading					
TODAY'S SUM OF TOTALIZERS					
Previous Day's Sum of Totalizers					
AMOUNT PUMPED TODAY					
DELIVERY RECORD	↓	↓	↓	↓	↓
Inches of Fuel Before Delivery					
Gallons of Fuel Before Delivery <small>(from tank chart)</small>					
Inches of Fuel After Delivery					
Gallons of Fuel After Delivery <small>(from tank chart)</small>					
GALLONS DELIVERED (STICK) <small>[Gallons "After" - Gallons "Before"]</small>					
GROSS GALLONS DELIVERED (RECEIPT)					

SAMPLE

DAILY INVENTORY WORKSHEET

A FACILITY NAME: LAST CHANCE #2
 YOUR NAME: JUAN DOE
 DATE: 9/22/93

B	TANK IDENTIFICATION	1	2	3	4	
	Type of Fuel	REG UNL	PREM UNL	DIESEL	MID UNL	
	Tank Size in Gallons	6000	6000	6000	10,000	
C	END STICK INCHES	41 $\frac{1}{4}$	58 $\frac{7}{8}$	69	86 $\frac{1}{2}$	
D	AMOUNT PUMPED	↓	↓	↓	↓	↓
	Totalizer Reading	24383	30798	92485	44013	
	Totalizer Reading	55138	11017	70178	38974	
	Totalizer Reading					
	Totalizer Reading					
	Totalizer Reading					
	Totalizer Reading					
	Totalizer Reading					
E	TODAY'S SUM OF TOTALIZERS	79521	41815	162663	82987	
F	Previous Day's Sum of Totalizers	78271	40260	161663	82584	
G H	AMOUNT PUMPED TODAY	1250	1555	1000	403	
	DELIVERY RECORD	↓	↓	↓	↓	↓
I	Inches of Fuel Before Delivery	13 $\frac{3}{8}$			49 $\frac{7}{8}$	
K	Gallons of Fuel Before Delivery (from tank chart)	537			5246	
J	Inches of Fuel After Delivery	41 $\frac{1}{4}$			86 $\frac{1}{2}$	
K	Gallons of Fuel After Delivery (from tank chart)	2672			9423	
L	GALLONS DELIVERED (STICK) (Gallons "After" - Gallons "Before")	2135			4177	
M	GROSS GALLONS DELIVERED (RECEIPT)	2100			4200	

SAMPLE

MONTHLY INVENTORY RECORD

N TANK IDENTIFICATION & TYPE OF FUEL: 4 MIDGRADE UNL

MONTH/YEAR: 9, 93

FACILITY NAME: LAST CHANCE #2

DATE OF WATER CHECK: 9/1 LEVEL OF WATER (INCHES): 0 **V**

DATE	O	P	Q	R	S		T	U
	START STICK INVENTORY (GALLONS)	GALLONS DELIVERED	GALLONS PUMPED	BOOK INVENTORY (GALLONS)	END STICK INVENTORY (INCHES)	(GALLONS)	DAILY OVER (+) OR SHORT (-) ["End" - "Book"]	INITIALS
1	4047 (+)	—	(-) 333 (=)	3714	38 1/4	3690	-24	JD
2	3690 (+)	—	(-) 44 (=)	3646	38	3658	+12	JD
3	3658 (+)	—	(-) 329 (=)	3329	35 3/8	3323	-6	JD
4	3323 (+)	—	(-) 60 (=)	3263	35	3275	+12	JD
5	3275 (+)	—	(-) 145 (=)	3130	33 3/4	3117	-13	JD
6	3117 (+)	—	(-) 238 (=)	2879	31 1/8	2790	-89	JD
7	2790 (+)	6134	(-) 117 (=)	8807	80	8844	+37	JD
8	8844 (+)	—	(-) 127 (=)	8717	78 7/8	8732	+15	JD
9	8732 (+)	—	(-) 182 (=)	8550	77 1/2	8591	+41	JD
10	8591 (+)	—	(-) 205 (=)	8386	75 1/2	8379	-7	JD
11	8379 (+)	—	(-) 204 (=)	8175	73 5/8	8173	-2	JD
12	8173 (+)	—	(-) 166 (=)	8007	72	7991	-16	JD
13	7991 (+)	—	(-) 320 (=)	7671	69 3/4	7730	+59	JD
14	7730 (+)	—	(-) 307 (=)	7423	67	7402	-21	JD
15	7402 (+)	—	(-) 76 (=)	7326	66 1/2	7342	+16	JD
16	7342 (+)	—	(-) 224 (=)	7118	64 1/8	7050	-68	JD
17	7050 (+)	—	(-) 390 (=)	6660	61	6657	-3	JD
18	6657 (+)	—	(-) 296 (=)	6361	58 5/8	6354	-7	JD
19	6354 (+)	—	(-) 78 (=)	6276	58 1/8	6290	+14	JD
20	6290 (+)	—	(-) 424 (=)	5866	54 5/8	5869	+3	JD
21	5869 (+)	—	(-) 205 (=)	5664	53 1/8	5639	-25	JD
22	5639 (+)	4177	(-) 403 (=)	9413	86 1/2	9423	+10	JD
23	9423 (+)	—	(-) 87 (=)	9336	85 1/2	9343	+7	JD
24	9343 (+)	—	(-) 311 (=)	9032	82	9036	+4	JD
25	9036 (+)	—	(-) 239 (=)	8797	79 1/8	8757	-40	JD
26	8757 (+)	—	(-) 256 (=)	8501	76 7/8	8526	+25	JD
27	8526 (+)	—	(-) 264 (=)	8262	74 1/2	8270	+8	JD
28	8270 (+)	—	(-) 263 (=)	8007	72	7991	-16	JD
29	7991 (+)	—	(-) 185 (=)	7806	69	7811	+5	JD
30	7811 (+)	—	(-) 116 (=)	7695	68	7690	-5	JD
31	(+)	(-)	(=)					

W TOTAL GALLONS PUMPED > 6594 TOTAL GALLONS OVER OR SHORT > -74 **X**

DROP THE LAST 2 DIGITS from the PUMPED number and enter on the line below

Y LEAK CHECK: 65 + 130 = 195 gallons

Is "TOTAL GALLONS OVER OR SHORT" LARGER than "LEAK CHECK" result? YES NO (circle one) **Z**

If answer is "YES" for 2 MONTHS IN A ROW, notify regulatory agency as soon as possible.

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

**>>> Copy and post this reminder where employees
who measure tanks can see it! <<<**

GET GOOD INVENTORY CONTROL MEASUREMENTS!

Measure each tank every operating day

Use gauge sticks that are

- ✓ marked to the 1/8 inch**
- ✓ not cut off or worn off at the "0" end**
- ✓ varnished and not warped**

**Measure through the same drop tube each
time**

Use good sticking practices

- ✓ SLOWLY lower stick**
- ✓ GENTLY touch stick on tank bottom**
- ✓ QUICKLY pull stick out**

Measure just before each delivery

**Wait at least 5 minutes after delivery,
then measure again**

Read and record totalizer meters carefully

**Check for water at least once a month
using water-finding paste**