

# 2015 EPO No. 24

## NIST Examination Procedure Outline for

### Vehicle-Tank Meters (VTMs) Gravity-Discharge

It is recommended that this outline be followed as minimum criteria for examining all gravity-discharge vehicle-tank meters – analog or digital. Nonretroactive requirements are followed by the applicable date in parentheses. Do not use this outline for testing vehicle-tank metering systems measuring milk, LPG, cryogenics, or carbon dioxide or for testing power-operated vehicle tank meters. Nonretroactive requirements are followed by the applicable date in parentheses.

#### SAFETY NOTES

*When excerpting this Examination Procedure Outline for duplication, the EPO Safety Annex (Safety Considerations and Glossary of Safety Key Phrases) should be duplicated and included with this outline.*

*Safety policies and regulations vary among jurisdictions. It is essential that inspectors or servicepersons be aware of all safety regulations and policies in place at the inspection site and to practice their employer's safety policies. The safety reminders included in this EPO contain general guidelines useful in alerting inspectors and servicepersons to the importance of taking adequate precautions to avoid personal injury. These guidelines can only be effective in improving safety when coupled with training in hazard recognition and control.*

Prior to beginning any inspection, the inspector should read and be familiar with the EPO Safety Annex - "Safety Considerations and Glossary of Safety Key Phrases." The terms and key phrases in each safety reminder of this outline are found in the glossary of the EPO Safety Annex. The inspector is reminded of the importance of evaluating potential safety hazards prior to an inspection and taking adequate precautions to avoid personal injury or damage to the device. As a minimum, the following safety precautions should be noted and followed during the inspection.

**Clothing**

**Electrical Hazards**

**Emergency Procedures**

**Fire Extinguisher**

**First Aid Kit**

**Grounding**

**Ignition Sources**

**Lifting**

**Location**

**Nature of Product**

**Personal Protection Equipment**

e.g.,

**Safety Shoes, Safety Aprons, Gloves,  
Eye Protection**

**Hard Hat, etc. if deemed necessary**

**Safety Cones/Warning Signs**

**Safety Data Sheets (SDS)**

**Static Discharge**

**Switch Loading**

**Traffic**

**Transportation of Equipment**

also: **Wet/Slick Conditions, Chemicals, Hazardous Materials, Petroleum Products, and Obstructions**

**Inspection:**

<b>SAFETY REMINDER!!!</b>	
<ul style="list-style-type: none"> <li>- Check the inspection site carefully for safety hazards and take appropriate precautions.</li> <li>- Check to be certain that the ground surface of the inspection site is sufficiently strong and rigid to support the prover when it is filled with product - don't forget to chock the wheels of the prover.</li> <li>- Learn the nature of hazardous products used at or near the inspection site – obtain and read copies of MSDS's.</li> <li>- Know emergency procedures and location and operation of fire extinguisher and emergency shut-offs.</li> <li>- Post safety cones/warning signs and be aware of vehicular and pedestrian traffic patterns.</li> <li>- Use caution in moving in wet, slippery areas and climbing on prover, storage tanks, and vehicles.</li> <li>- Use personal protection equipment and clothing appropriate for the inspection site.</li> <li>- If leaks, spills, or exposed wiring cause hazardous testing conditions it is recommended that the testing be discontinued until the unsafe conditions are corrected.</li> <li>- Be sure that a first aid kit is available and that it is appropriate for the type of inspection activity.</li> </ul>	

1. General considerations.

Selection .....	G-S.3., G-UR.1.1., G-UR.1.2., G-UR.1.3. UR.3.3.
Installation .....	G-S.2., G-UR.2.1., G-UR.2.2., UR.1.1.
Position of equipment .....	G-UR.3.3.
Accessibility .....	G-UR.2.3.
Assistance .....	G-UR.4.4., G-UR.4.6.
Use and maintenance .....	G-UR.3.1., G-UR.4.1., G-UR.4.2., UR.2.3., UR.1.4
Use of ATC.....	UR.2.5.1
Invoices based on device readings with Automatic Temperature	
Compensator (ATC) .....	UR.2.5.3.
Period of use (ATC) .....	UR.2.5.2.
Computing-capability .....	UR.3.3.

2. Indicating and recording elements.

Design .....	S.1.1.1.
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**Inspection (cont.):**

Units .....	S.1.1.2.(a) , S.1.1.3.(b) and (c)
Readability .....	G-S.5., G-S.6. (1/1/77), G-S.7., S.1.2., S.1.3.
Values of intervals .....	G-S.5.3.
Recorded representations.	
General .....	G-S.5.6., S.1.4.2.
Required for vehicle-tank metering systems .....	UR.2.2., UR.2.3.
Exceptions for aviation fuel.....	UR.2.2.1.
Computing-type devices.	
Display of unit price .....	S.1.4.1, UR.1.2.
Money-value computations .....	S.1.4.3.
Gross and net indications for devices with ATC.....	S.2.5.3.
Advancement and return to zero.....	S.1.1.4., S.1.1.5., UR.2.1.
Provision for sealing .....	G-S.8. (1/1/90), G-UR.4.5., S.2.2., Table S.2.2.
Provision for sealing ATC Systems .....	S.2.5.4.
3. Marking.	
General.....	G-S.1.
Location, Not-Built-For Purpose, Software-Based Devices .....	G-S.1.1.(1/1/04)
Devices or Main Elements Remanufactured as of January 1, 2002.....	G-S.1.2.
Visibility of required markings after installation .....	G-UR.2.1.1.
Money-Operated Devices, Responsibility.....	G-UR.3.4.
Limitation on Use .....	S.5.1.
Discharge Rates .....	S.5.2.
Temperature Compensation for Refined Petroleum, if equipped with ATC .....	S.5.6.
Meter Size.....	S.5.7.

**Inspection (cont.):**

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|---|-------------------|
| 4. Measuring elements.                                      |                   |
| Vapor elimination .....                                     | S.2.1.            |
| Security seal on adjusting mechanism .....                  | G-UR.4.5., S.2.2. |
| Provisions for thermometer well.....                        | S.2.6. (1/1/12)   |
| 5. Piping.  |                   |
| Directional flow valves and discharge line and valves ..... | S.2.3., S.3.      |
| Leaks.....  | G-UR.4.1.         |
| Facilitation of fraud .....                                 | G-S.2.            |
| 6. Devices Equipped with ATC .....                          | S.2.5., S.2.5.1.  |
| Provisions for deactivating .....                           |                   |
| Gross and net indications.....                              | S.2.5.2.          |
| Provision for sealing ATC.....                              | S.2.5.3.          |
| Temperature determination.....                              | S.2.5.4.          |
|   | S.2.5.5.          |

**Pretest Determinations:**

1. Test Equipment Set-up. Gravity discharge VTMs are designed to make deliveries to underground storage tanks; product is delivered to a tank that is entirely below the level of the truck tank. As such, when product is delivered from these systems the discharge end of the hose is approximately roadway level and the discharge hose is said to have a negative head to allow gravity to push product through the system.

To approximate commercial operating conditions in the testing operations of these devices, the prover height must simulate road level height so that the end of the delivery line from the VTM corresponds to its position when inserted in the fill pipe of an underground storage tank at a filling station.

2. Determine that the test fluid in the tank compartment is similar in character to the fluid to be measured..... N.1.
3. Determine that a compartment or compartments have a sufficient amount of product to conduct “high head” and “low head” tests (also referred to as full compartment and near empty compartments tests since the head pressure acting on the meter decreases as the compartment is drained).
4. Test draft size. Determine if the prover size is adequate ..... N.3.
5. Ensure that the prover inlet is lower than the meter outlet.
6. Tolerances.
 

Applicable requirements .....	G-T., T.1.
Tolerance values .....	T.2., Table 1, Table 2
Repeatability.....	T.3.
Devices equipped with ATC.....	T.2.1. (a), (b)
7. Note totalizer reading.

**SAFETY REMINDER!!!**

- **Wear appropriate personal protection equipment such as petroleum-resistant, nonskid safety shoes (to prevent possible injury from spills or slipping on slick surfaces), protective clothing, eye protection (to prevent injury from splashed product), and a hard hat (to prevent injury from overhangs and projections).**
- **Use proper grounding procedures. Be sure that prover is equipped with an explosion proof motor.**
- **Carefully inspect electrical supply lines to test equipment for wear and damage; correct potentially hazardous conditions before use.**
- **Device operator should be present at all times during test - the operator (not the inspector) should operate the device under test.**
- **Never leave equipment unattended while it is in operation.**

**Test Notes:**

1. Record totalizer (s) indication before and after each draft to determine proper operation.
2. If prover is dry, wet prover. Allow a 30-second drain period each time prover is emptied.
3. Level the test measure or prover. When the test measure or prover is full of liquid, re-check its level to ensure that the weight of the product has not affected the level condition.
4. Evaporation and volume change: exercise care so that the product temperature is the same in the prover as at the meter. .... N.2
5. Temperature corrections are to be made for accuracy tests to account for any difference between the temperature of the liquid passing through the meter and the liquid in the prover. .... N.5.
6. After each test draft:
  - a. Print a ticket (if so equipped). .... G-S.5.2.2., G-S.5.6.
  - b. If computing type, check price computation on indicator and on recorded G-S.5.6., S.1.4.2., representations. .... S.1.4.3., S.1.4.4.
  - c. Check for agreement between indicators..... G-S.5.2.2.
7. Verify that any options for obtaining a recorded representation are appropriate. The customer may be given the option of not receiving the recorded representation. If the system is equipped with the capability, the customer may also be given the option of receiving the recorded representation electronically in lieu of or in addition to a hard copy. .... G-S.5.6.
8. If the result of any test is at or near the tolerance limit, repeat that test. If necessary, conduct a repeatability test as outlined in Step 1 under “Tests: All Meters” below.

**Tests:**

<p><b>SAFETY REMINDER!!!</b></p> <ul style="list-style-type: none"> <li>- <b>If supply or return lines are not coupled at their discharge ends, they must be held in place continuously while product flows through the line.</b></li> <li>- <b>Use proper lifting techniques to lift and move equipment.</b></li> <li>- <b>Be aware of and attempt to eliminate potential ignition sources in or near the inspection site.</b></li> <li>- <b>Be aware of vehicular and pedestrian traffic in the area.</b></li> </ul>
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**Tests: Non-Temperature-Compensated Meters**

1. Normal test - - full flow (high head/full compartment), basic tolerance. .... N.4.1., T.2.
2. Normal test - - full flow (medium head/one-half full compartment), basic tolerance. .. N.4.1., T.2.
3. Normal test - - full flow (low head/one and one-half times prover capacity in the compartment), basic tolerance. .... N.4.1., T.2.
4. Proceed to “Tests – All Meters.”

**Tests: Temperature-Compensated Meters**

1. 1Normal test with temperature compensator activated - full flow, normal tolerance. (Do not deactivate the temperature compensator.) ..... N.4.1., N.4.1.3. T.2.1.
2. Deactivate temperature compensator and repeat normal test. Compare the compensated volume indicated or recorded to the actual delivered volume corrected to 15 °C (60 °F) ..... N.4.1., N.4.1.3. T.2.1.
3. Proceed to “Tests – All Meters.”

**Tests: All Meters**

1. Repeatability Test..... N.4.1.2., T.3.  
If necessary, conduct a repeatability test. Test must include at least three consecutive test drafts. Test drafts must be conducted under approximately the same conditions (e.g., flow rate and temperature) and be of approximately the same draft size.
2. RFI/EMI test (electronic equipment only) ..... G-N.2., G-UR.1.2.,  
This testing is typically done only if a problem is suspected or during the inspection of a new installation. G-UR.3.2., G-UR.4.2.  
Radio Frequency Interference (RFI)  
Electromagnetic Interference (EMI)
3. Check automatic stop mechanism. .... G-UR.4.1.  
The device should stop the flow within one-half the minimum interval indicated.

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### Post Test Tasks:

#### 1. Security Means.

Check for the presence of security seals on the device. Document missing seals on the official report and apply new ones as needed. .... G-UR.4.5.

Adequate provision shall be made for applying a physical security seal or providing for other approved means of security. .... G-S.8, S.2.2., Table S.2.2.(1/1/95)

If system is equipped with an audit trail, note the event counter settings on the report form for future reference. If equipped with an event logger, print a copy of the event log and attach it to the report form for future reference. .... G-S.8., S.2.2., Table S.2.2. (1/1/95)

### **SAFETY REMINDER!!!**

- **Avoid switch loading!**
- **Test devices dispensing low-vapor pressure products (e.g., diesel fuel, kerosene) before testing devices dispensing high-vapor pressure products (e.g., gasoline).**
- **Take precautions to isolate equipment when transporting it to avoid exposure to hazardous fumes!**

2. Record on the official report the number of gallons of product dispensed during test.
3. After all equipment at a location has been tested, review results to determine compliance with equipment maintenance and use of adjustments. .... G-UR.4.1., G-UR.4.3.
4. Record the compliance action and disposition of the device on the report and explain the results to the device owner.