# EPO No. 22 Examination Procedure Outline for

# Retail Motor-Fuel Dispensers Blended Product

September 2016

# Objectives

- Upon completion of this presentation you will be able to
  - Understand and describe
    - All components of EPO No. 22, an "Inspection"
      - Safety
      - General
      - Indicating and Recording Elements
      - Marking
      - Measuring Elements
      - Discharge Hose
      - Totalizers
      - Testing
      - Sealing

# Handbook 44

#### Handbook Key

- Any G- prefix
  - General code Applies to all devices in Handbook 44
    - G-A. Application
    - G-S. Specifications
    - G-N. Notes
    - G-T. Tolerances
    - G-UR. User Requirements

# Handbook 44

#### Handbook Key

- Any code with no prefix
  - Applies to only Liquid-Measuring Devices
    - A. Application
    - S. Specifications
    - N. Notes
    - T. Tolerances
    - UR. User Requirements

# Safety

#### Equipment

- Fire Extinguisher
- First Aid Kits
- Safety Cones
- Spill Kits
- Pay attention to traffic
- Know where emergency shutoff is located

# Safety

#### Personal Protective Equipment

- Safety Shoes
- Gloves
- Eye Protection
- Rubber Soled Shoes
- Appropriate Clothing
  - Synthetic Material may be a source of static
  - Will melt to skin

Safety Ensure grounded contact of Nozzle/handle with test measure Funnel/device used to return fuel to tank Test Measure if vehicle mounted DO NOT USE A PLASTIC CONE AS A **FUNNEL** 

- Avoid "Switch Loading" by performing all
  - Diesel Fuel Test First
  - Gasoline Test Last

## Fue in Cabinet DO NOT LEAVE A DISPENSER LIKE THIS – We MUST call the Fire Marshall



Handle is leaking when hose is pressurized **DO NOT LEAVE A DISPENSER** Leaking-We MUST call the **Fire Marshall** 



# General

- Retroactive Requirements (pg 1-3)
  - Enforceable on ALL EQUIPMENT
  - Printed in Upright Roman Type in Handbook 44
  - Handbook 44 page 1-6 G-S.5.2.3
- Nonretroactive Requirements (pg 1-3)

   Enforceable on or after effective date
   Printed in *Italics Type* in Handbook 44
   Handbook 44 page 1-4 G-S.1. (b) (1)

- Must be observed when
  - Purchasing
  - Installing
  - Inspecting
- Selection
- Installation
- Position of Equipment
- Accessibility

**Covered in Handbook 44 Sections** 

- G-UR. (pg 1-10 1-12)
- G-S.2. (pg 1-6)
- G-S.3. (pg 1-6)
- UR.2.1. (pg 3-22)
- UR.2.4. (pg 3-22)

- Assistance G-UR.4.4 (pg 1-12)
- Must be provided by owner or operator
  - Special Equipment
  - Accessories
  - Abnormal Labor

Keys, remotes, keypads, tools to enter cabinets

#### Use and Maintenance

- G-UR.3.1. Method of Operation (pg 1-11)
  - Only be operated in a manner that is obviously indicated by construction or indicated by instructions on the equipment
- UR.3.5. Steps after Dispensing (pg 3-24)
  - Starting lever returned to shutoff position and zero setback interlock engaged
  - Discharge nozzle returned to designed hanging position
    - Unless indicating and recording elements, if equipped and activated to record, have been returned to a definite zero

- Use and Maintenance
  - G-UR.4.2. Abnormal Performance (pg 1-11)
    - Unstable Indications
    - Abnormal Equipment Performance

#### Use and Maintenance

- G-UR.4.1. Maintenance of Equipment (pg 1-11)
  - Equipment in service at a single place of business shall not be considered "maintained in a proper operating condition" if
    - Predominantly, equipment of all types or applications are found to be in error or direction favorable to the device user
    - Predominantly, equipment of the same type or application is found to be in error in a direction favorable to the device user

#### Use and Maintenance

- G-UR.4.1. Maintenance of Equipment (pg 1-11)
  - All equipment in service and all mechanisms and devices attached thereto or used in connection therewith shall be continuously maintained in proper operation condition throughout the period of such service.

#### Leak





Display not functioning

#### Display is broken and not functioning





# Displays not readable

Please prepay for gas

THIS SALE

# Discharge Hose is Split



# Cracked Hose



# Leak

# Union joint filled with fuel



#### Active leak

## Coloration indicative of leak



#### Product identification not present



# Cracked breakaway hose



# Leak above breakaway



#### Purchase \$



#### Gallons



### Price per Gallon \$

## Before you pay, use your Plenti Card.

- 1. Insert Plenti Card or enter phone/loyalty number. Press LOYALTY and select Plenti
  - tor for



display

# Price per gallon :

#### Push To Start

# Display malfunctioning

#### **Octane rating** damaged

ICE PER GA

MINIMUM OCTANE RATING (R+M) / 2 METHOD



SEU

Ðlu

it card

ON \$ **Unit price** unreadable

ARKANSAS BUREAU OF STANDARD 501.570.1159

A Division of

ALL TAXES INCLUDED

Breakaway split and bulging

# Hose damaged







Multiple Annual Inspections

Improperly Displayed Inspection Year


No Filter inside or outside of cabinet –



## Same pump – no filter



## No octane rating indication

# Product is covered



#### Design

- S.1.1. A liquid measuring device (pg 3-5)
  - Shall be equipped with a primary indicating element, and
  - May be equipped with a primary recording element

#### Units

- S.1.2.1. (pg 3-5)
- S.1.2.3. (a) (pg 3-6)
- S.1.2.3. (c) (pg 3-6)

#### Readability

- G-S.5. All subsections (pg 3-5 3-6)
  - G-S.5.1. General
    - All weighing and measuring devices shall be provided with indicating or recording elements appropriate in design and adequate in amount.
    - Primary indication and recorded representations shall be clear, definite, accurate, and easily read under any conditions of normal operation of the device.



Price per gallon. All taxes included

#### REGULAR



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UNLEADED PLUS

> MINIMUM OCTANE RATING (R + M) / 2 METHOD





#### Readability

- G-S.6. Marking Operational Controls, Indications, and Features (pg 1-8)
  - All operational controls, indications, and features, including switches, lights, displays, push buttons, and other means, shall be clearly and definitely identified.
  - Use of approved pictograms or symbols shall be acceptable
  - (Nonretroactive as of January 1, 1977)

#### Insert Card or See Attendant to Prepa

Esp Eng

Rollback Code

TxtPay

#### Readability

- G-S.7. Lettering (pg 1-8)
  - All required markings and instructions shall be distinct and easily readable and shall be of such character that they will not tend to become obliterated or illegible.



## PUS





nt card:

#### Readability

- S.1.4. Graduations (pg 3-6)
  - Length
  - Width
  - Interval
- S.1.5. Indicators (pg 3-6 3-7)
  - Symmetry
  - Length
  - Width
  - Clearance

- Values of Intervals
- All intervals and increments must be uniform throughout
  - Analog
    - Graduated intervals are equal, and
    - Difference between successive value equal
      - ....then, values are uniform
  - Digital
    - Difficult to verify
    - Spot check quantity and price
  - Dual Unit Devices must have identification of unit used

- Indication of delivery
- Device automatically shows initial zero and quantity delivered
- Electronic device manufactured prior to January 1, 2006
  - First .03 L (0.009 gal) need not be indicated
- Electronic device manufactured after January 1, 2006
  - All measurements shall be inhibited until the fueling position reaches a condition necessary to ensure delivery starts at zero

- Money Value Division
  - Analog
    - S.1.6.5.1 (pg 3-9) see table for values
  - Digital
    - S.1.6.5.2 (pg 3-9) must comply with G.S.5.5.
  - Auxiliary
    - If a system is equipped with auxiliary indications, all indicated money value divisions of the auxiliary element shall be identical to those in the primary element

- Unit Price and Product Identity
  - S.1.6.4.2. Product Identity (pg 3-8)
  - U.R.3.2. (pg 3-23)
    - Device shall be able to display on each side product being dispensed
    - Device with multiple grade, brand, blend, or mixture shall be able to display on each side the unique product being dispensed

- Unit Price
- S.1.6.4.1. (a) (pg 3-8)
  - Shall be able to display on each face the unit price at which the device is set to compute or dispense
- S.1.6.4.1. (b) (pg 3-8)
  - Multiple Unit Price
    - All unit prices displayed
    - All unit prices capable of being displayed through user action
    - All unit prices do not have to be displayed simultaneously

#### Unit Price

- S.1.6.4.1. (b) (pg 3-8)
  - Customer Action
    - Controls on device
    - Customer's personal electronic equipment communicating with RMFD
    - Verbal instruction by customer
- Exemptions
  - Fleet or Contract Sales
  - Post Delivery Discounts that meet S.1.6.8

- Quantity and Total Price Display except aviation
  - Total Price and quantity must be displayed on the face of the dispenser for a minimum of fie minutes or until the next transaction is initiated is initiated by the customer

- Quantity and Total Price Display Aviation
  - Quantity shall be displayed throughout the transaction
  - Total price shall also be displayed by
    - Face of dispenser or controller adjacent to the device
    - If designed to continuously compute and display total price then the total price shall be computed and displayed throughout the transaction
  - Total price and quantity shall be displayed for a minimum of five minutes or until the next transaction is initiated by customer action
  - Printed receipt shall be available and at minimum include total price, quantity, and unit price

- Advancement and Return to Zero
  - S.1.3. Advancement of Indicating and Recording Elements (pg 3-6)
    - Shall not be possible to advance indicating and recording elements except by operation of device
      - Once started, cannot be stopped until zero is reached
      - In case of indicating elements only, elements are automatically obscured until the elements reach zero position



- S.1.6.3. (pg 3-7 3-8)
  - Primary indicating and receiving elements shall be readily returnable to a definite zero
  - Shall not be possible to return elements beyond zero
- UR.3.1 (pg 3-23)
  - Any dispenser making retail deliveries shall be returned to zero before each delivery
  - Exception totalizers on key lock operated or other self operated dispensers

## Did not return to ZERO Condition

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n L M

## HASE

ALLONS







Tom

PLY TODAY

88-98 SHELL or



- S.1.6.7 Recorded Representations (Point of Sale) (pg 3-11)
  - Printed receipt providing the following information shall be available through built-in or separate recording element for all transactions
    - Total Volume
    - Unit Price
    - Total Computed Price
    - Product identified by
      - Name
      - Symbol
      - Abbreviation
      - Code Number



- Provision for Sealing
  - G-S.8. (pg 1-8)
    - A device shall be designed with provision for applying a security seal that must be broken before any change can be made
    - NOTE Audit Trail is considered an acceptable form of seal in certain applications
  - G-UR.4.5. Security Seal (pg 1-12)
    - A security seal shall be appropriately affixed to any adjustment mechanism designed to be sealed.

Provisions for Sealing (pg 3-12 – 3-13)

- S.2.2. Adequate provisions shall be made for an approved means of security or physical seal that requires the seal to be broken before adjustment or interchange can be made of
  - Any measuring or indicating element
  - Any adjustable element for controlling delivery rate
  - Any metrological parameter that will affect integrity
- See Table S.2.2. for acceptable sealing methods

## Not Sealed

## Pin can be removed without removing seal

## No Security Seal

E1

6

## Seal twisted not properly sealed


# Audit trail equipped dispenser

SERVITALUKA ROAD SRING LAKE, MI 49456 WINES

# Properly Sealed

61 MB CHILDR

# Properly Sealed



#### Indicating and Recording Elements

- Sealing Multiple measuring elements with a common provision for sealing
  - G-S.8.1. (pg 1-9)
    - Any change to metrological parameter of any element shall by individually identified
    - Audit trail requires specific device code

# Markings

G-S.1. Identification (pg 1-4 – 1-5)

 G-S.1.1.Location of Marking Information for Not Built For Purpose, Software Based Device

• G-S.1.2. Devices and Main Elements Remanufactured as of January 1, 2002







# Markings

#### G-UR.3.4 Responsibility (pg 1-11 – 1-12)

 Devices where employees are not present, must clearly and conspicuously display information detailing method for return of monies paid if product or service is not obtained

#### S.4.4.1. Discharge Rates (pg 3-16)

- devices rated 30 g.p.m. or greater maximum and minimum discharge rate shall be marked in accordance with S.4.4.2.
- Minimum Discharge shall not exceed 20% of marked maximum discharge rate.

# Markings

• S.4.4.2. Location of Marking Information (pg 3-17)

- Within 24 inches to 60 inches from the base of device
- Internally or externally provided permanent and easily read
- On a portion that is not easily removed or interchangeable
- Nonretroactive January 1, 2003

#### **Measuring Elements**

- S.2.1. Vapor Elimination (pg 3-12)
  - Liquid measuring devices shall be equipped with vapor or air eliminator or other automatic means to prevent passage of vapor and air through meter
  - Vent Lines for vapor or air eliminator shall be made of metal tubing or other rigid material

## **Discharge Hose - Retail**

- S.3.1. Diversion of Measured Liquid (pg 3-15)
- S.3.2. Exceptions
  - Diversion of Product not allowed
  - Two or more outlets permitted if
    - Liquid can flow from only one outlet at a time
    - Flow direction clearly indicated
  - Two deliver outlets to (exclusively) fuel trucks if
    - Deterrents provided
      - Physical barriers, valves, light system, signs
    - Simultaneous use does not facilitate fraud

## **Discharge Hose - Retail**

- S.3.3. Pump Discharge Unit (pg 3-15)
  - Pump Discharge Unit with a flexible hose shall be of the wet-hose type
- S.3.5. Discharge Hose, Reinforcement (pg 3-16)
  - Discharge hose shall be reinforced so performance is not affected by expansion or contraction
- S.3.6. Discharge Valve (pg 3-16)
  - Only if hose is wet-type
  - Any other shutoff valve on discharge side of meter shall be automatic or predetermined stop type and only operable by
    - Tool entirely separate form device
    - Mutilation of security seal with which the value is sealed open

# Bulging Hose

Hoses should be firm when squeezed -A hose that deforms when squeezed should be replaced

## Discharge Hose - Retail

#### • UR.1.1. Discharge Hose (pg 3-22)

- Length
  - Measure from housing or outlet of the discharge line to the inlet of the discharge nozzle
  - Measured with the hose fully extended if it is coiled, retained, or connected inside a housing
  - Shall not exceed 18 feet unless demonstrated need

### Discharge Hose – Marinas and Airports

- UR.1.1.2. (pg 3-22)
  - Length
    - Short as practicably possible, shall not exceed 50 feet unless a need is demonstrated
  - Protection
    - Hoses exceeding 26 feet shall be adequately protected from weather and other environmental factors when not in use

#### Totalizers

- S.5. Totalizers for Retail Motor Fuel Dispensers (pg 3-17)
  - Shall be equipped with a non-resettable totalizer for the quantity delivered through the metering device

# Pretest Determinations

#### Test Draft Size

#### Designed Maximum Flow Rate

- Less than or equal to 20 GPM
  - Test Draft of at least 5 gallons
- Greater than or equal to 20 gallons
  - Test Draft equal to or greater than the amount delivered by the device in one minute at maximum flow rate
  - Example listed maximum flow rate 60 GPM, test draft must be at least 60 gallons, preferably larger (100 gallon)

#### **Test Measure or Prover**

#### Reading the Test Standard

- Must be leveled
- Leveled by "plumbing the neck"
- Allow all foam to settle before taking measurement
- Meniscus is at eye level to minimize parallax

#### Parallax

- Parallax Apparent displacement, or apparent difference in height or width, of a graduation or other object with respect to a fixed reference, as viewed from different points.
- Hold arm straight out with thumb pointing up
  - Close left eye and note position
  - Close right eye and note position

# Meniscus The curved surface of a liquid in a tube

Readings are taken at the bottom of the meniscus



#### Meniscus



https://calaski.files.wordpress.com/2015/09/meniscus.jpg

Meniscus What is this measurement?

- 4 c.i. Does not meet acceptance tolerance



IEASURE

LONS

GALI

G-T Tolerances page 1-9

- G-T.1. Acceptance Tolerances apply when
  - Put into commercial use for the first time
  - Been placed into service with the preceding 30 days and is being officially tested for the first time
  - Returned to commercial service following official rejection for failure to conform and is being officially tested for the first time within 30 days after corrective service
  - Being officially tested for the first time within 30 days after major reconditioning or overhaul
  - Undergoing type evaluation

- Basic Tolerance Values
  - G-T.2. Maintenance Tolerances (pg 1-9)
    - Apply to equipment in use, except as provided in G-T.1. Acceptance Tolerances
  - T.2. Tolerance Values (pg 3-20)
    - Maintenance, acceptance, and special test tolerances shall be shown in Table T.2 (pg 3-21) Accuracy and Classes and Tolerances: NIST Handbook 44

- Accuracy Class 0.3, 100 GPM...example
  - Acceptance 0.2%
    - 100 GPM x .002 = .2 gallons
    - .2 gallons x 231 cubic inches per gallon = 46.2 cubic inches
  - Maintenance 0.3%
    - 100 GPM x .003 = .3 gallons
    - .3 gallons x 231 cubic inches per gallon = 69.3 cubic inches
  - Special 0.5%
    - 100 GPM x .005 = .5 gallons
    - .5 gallon x 231 cubic inches per gallon = 115.5 cubic inches

#### • Table T.2. (pg 3-21)

\*For test drafts less than or equal to 10 gallons, the tolerances for CLASS 0.5 do not apply. The following applies for these drafts

Maintenance tolerances on normal and special test shall be 1 cubic inch plus 1 cubic inch per indicated gallon

Acceptance tolerances shall be one half maintenance tolerances

#### • T.3. Repeatability (pg 3-21)

- Multiple drafts accomplished at approximately the same rate and size on the same nozzle
  - Shall not exceed 40% of the absolute value of maintenance tolerance
  - 6 cubic inches x .40 = 2.4 or 2 Cubic Inches
  - 40% = .40
  - Results of each test must be within applicable tolerance

### Repeatability

- Must be Normal Flow Test
- Minimum 3 consecutive test
- Range of the test must not exceed 2 cubic inches
   Fails Repeatability

#### Within Tolerance

-2 cubic inch

+1 +3 Cubic Cubic

5 cubic inch total range

#### **Product Storage Identification**

- UR.2.5. Product Storage Identification (pg 3-25)
  - Fill Connection for ANY petroleum product storage tank or vessel shall be permanently, plainly, and visibly marked as to product contained
  - When the fill connection is marked by means of a color code, the color code key SHALL be conspicuously displayed at the place of business







#### **Test Notes**

- If the test measure is dry add 1 cubic inch to gauge reading to allow for the amount of liquid required to "wet" test measure
- Hand Held Test measures require 30 second (+- 5 s) followed by a 10 s drain, with measure held at a 10-15 degree angle from vertical
  - N.4.4.1 (pg 3-19)
- Bottom Drain provers require a 30 second drain after main flow ceases
  - N.4.4.2 (pg 3-19)

#### **Test Notes**

- Read and record the totalizer indications before and after all test drafts
- After each test draft
  - Print ticket if device is so equipped
  - Check price computations on all indicators
  - Check for agreement between indications
- Verify, after completed deliver, that quantity and total price are displayed for at least 5 minutes or until the next transaction
# Test

#### Under-registration

- Meter indicates less product than delivered
- Buyers favor
- (+) Reading
- Over-registration
  - Meter indicates more product than delivered
  - Sellers Favor
  - (-) Reading

# Test

- Normal Flow Test
  - N.4.1. Normal Test (pg 3-18)
    - Tests at flow rate down to and including one half the sum of the maximum discharge flow rate and rated minimum discharge flow rate are "NORMAL TEST"

# Test

### Special Test

- N.4.2. Special Test (pg 3-18)
  - Any test except as set forth in N.4.1. Normal Test
  - RMFD without a marked minimum flow rate
    - Test conducted at the lesser of
      - 5 gallons per minute
      - Minimum rate when the automatic nozzle is at its lowest setting
  - RMFD with a marked minimum
    - At or near marked minimum
    - Suggested slightly above marked minimum



https://www.youtube.com/watch?v=m9HG\_3SIsEM