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## **Drinking Water Vending Machines Gain Popularity**

By Steve Cook

According to the National Automatic Merchandising Association (NAMA), the mathematician Hero of Alexandria (also known as Heron) described one of the first reports of a water vending machine in 215 BC. That machine was used to dispense holy water used in the temples of Egypt. Today, a drinking water vending machine is a water dispenser that operates by taking water from a standard municipal water supply, passing it through a purification system that may include ultra-violet lights, reverse osmosis filtration and other particulate filters, and dispenses one to five gallons of “pure water” into a customer’s bottle. The U.S. Food and Drug Administration (FDA), Public Health Service further defines a vending machine as “any self-service device which, upon insertion of a coin, paper currency, token, card or key, dispenses unit servings of food [water], either in bulk or in packages, without the necessity of replenishing the device between each vending operation.”

The WMD considers these machines commercial devices for two reasons. The first and most obvious reason is that they dispense an advertised quantity for either a specific amount of money or for a price per unit. The second reason is that the owner of the machine may pay a commission based upon the quantities dispensed by the store or owner of the property where the machine is installed.

Water vending machines are commonly located at supermarkets, but can also be found in other places such as apartment complexes, large hardware stores, and service stations.

There are predominately two different technologies used to measure quantities of drinking water in these machines. Many drinking water vending machines use water meters with an electronic pulse output. The machines are calibrated, similar to electronic gasoline dispensers, by determining the number of pulses that will deliver a gallon of water. Some type of water vending machines use a series of timers that can be adjusted to deliver water over a specific period of time to the desired quantity. Repeatability of the water measurement on timer-based machines is extremely dependent on constant flow rates, pressures, and maintenance of the filtration systems.

Drinking water vending machines are increasing in popularity because of public awareness of health concerns (e.g., contamination of water sources from natural disasters, terrorism, and accidents at municipal water treatment facilities), concerns about the sanitation processes (chlorine and ozone gases) and fluoridation of municipal drinking water, or the fact that many people just do not like the taste of the water provided by the municipal water supplier.

The cost of drinking water is another factor. Drinking water sold through these machines is an economical alternative to “home deliveries” of bottled water, which can cost

approximately \$1.25 per gallon. Off-the-shelf drinking water can cost from \$0.89 to more than \$1.55 per gallon. Drinking water from vending machine costs around \$0.25 to \$0.35 per gallon. According to the International Bottled Water Association Annual Report, drinking water sales amounted 230 million dollars and accounted for 2.4 percent of the total drinking water market in 1999.

You can visit the web site for the National Automatic Merchandising Association ([www.nama.org](http://www.nama.org)) for additional information on drinking water vending machines.

Due to their specific designs, drinking water dispensers do not fall clearly within a specific equipment classification for which a specific NIST Handbook (H) 44 code has been developed.

WMD considers the following procedures appropriate for testing drinking water dispensers whether or not you are following up on a complaint or have an established testing program. After considering the requirements and provisions of HB 44 General Code and those of specific codes and taking into account their design, intended purpose and conditions of use, WMD has developed the following testing and inspection guidelines based upon the procedures developed by the California Division of Measurement Standards.

### **Pre-Test Inspection**

Determine if the water vending machine is a commercial measuring device. Some types of vending operate with timing devices and allow the customer to determine the quantity of the “vend” through a customer-operated nozzle or valve.

*(NIST Handbook 44 paragraph references are included in each step):*

1. H 44 General Code paragraph G-S.1 Identification (1.10)– The water vending machine shall be marked for the purposes of identification with the manufacturer’s or distributor’s name or trademark, model designation, and a non-repetitive serial number.
2. G-UR.2.1 Installation Requirements (1.10) – The water dispenser machine should be installed in a level and plumb condition in accordance with manufacturer’s specifications.
3. S.2.1. Vapor Elimination. (3.36) - The system shall be equipped with an effective means to prevent the passage of air through the measuring operation.
4. S.2.2.2 Directional Flow Valves (3.36) - Measured liquid shall not be diverted from the measuring operation of the discharge line unless liquid can flow from only one outlet at one time and the direction of the flow is definitely and conspicuously indicated.
5. G-S.6. Marking operational Controls, Indications, and Features (1.10) and G.S.7. Lettering (1.10) - Operating controls shall be clearly and definitely identified. Required markings and instructions shall be distinct and easily readable.
6. G-UR.3.1 Method of Operation. (1.10) - Equipment shall be operated only in the obvious manner indicated by its construction or indicating instructions.
7. G-UR.3.4 Responsibility, Money-Operated Devices (1.10) – The name, address and telephone number of the local servicing agency of the device shall be conspicuously

displayed along with adequate information detailing the method for the payment of monies when the device malfunctions. This requirement does not apply to devices at locations where employees are present and responsible for resolving any monetary discrepancies for the customer.

8. G-UR. 4.4. Assistance in Testing Operations (1.10) – Assistance may be required to gain access to the inside of the device to seal adjustable components. Sealing the dispenser cabinet may not be appropriate because many dispensers require internal access for periodic (e.g. weekly) servicing of the filtration and sterilization systems.

### **Pre-Test Determinations**

The prover must be sized to accommodate the output of the device for at least one delivery. If more than one delivery option is available, prover sizes must accommodate the smallest and largest deliveries. If the required prover size will not fit under the delivery spout, another means for accommodating delivery to the prover must be devised.

Table T.1 Tolerances for Water Meters, Normal Tests Table (3.36) - The tolerance applied to the device shall be  $\pm 1.5\%$  of test draft (maintenance and acceptance).

### **Tests**

1. Wet test measure(s) and allow a 10-second drain after main flow stops.
2. N.1.1 Type of Liquid (3.30) - Position the prover or measure, insert coin(s), currency or tokens, and activate the dispenser to deliver type of water selected. Let dispenser vend water, wait until main flow breaks and begins to drip, allow a 10-second drain. Read and record error from the prover; calculate and record the flow rate.
3. N.3 Test Drafts (3.30) - Check each type of dispensed product, largest and smallest deliveries the dispenser vends.
4. G-S.8. Provisions for Sealing Electronic Adjustable Components (1.10), G-UR.4.5 Security Seal – (1.10); S.2.2 Provisions for Sealing (3.30); S.2.4.3 Setting (3.30) - Verify sealing of the metrological parameters (if applicable) for:
  - Meter or pulse output calibration for dispensers that use water meters.
  - Flow rate adjustments if they affect accuracy on time-based measurements.(Some types of drinking water dispensers may not have adjustable components.)
5. Appendix A Fundamental Considerations Associated With the Enforcement of Handbook 44 Codes - Certify, reject, or condemn the device as appropriate for the local weights and measures jurisdiction.