This presentation premiered at WaterSmart Innovations

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INNOVATIONS

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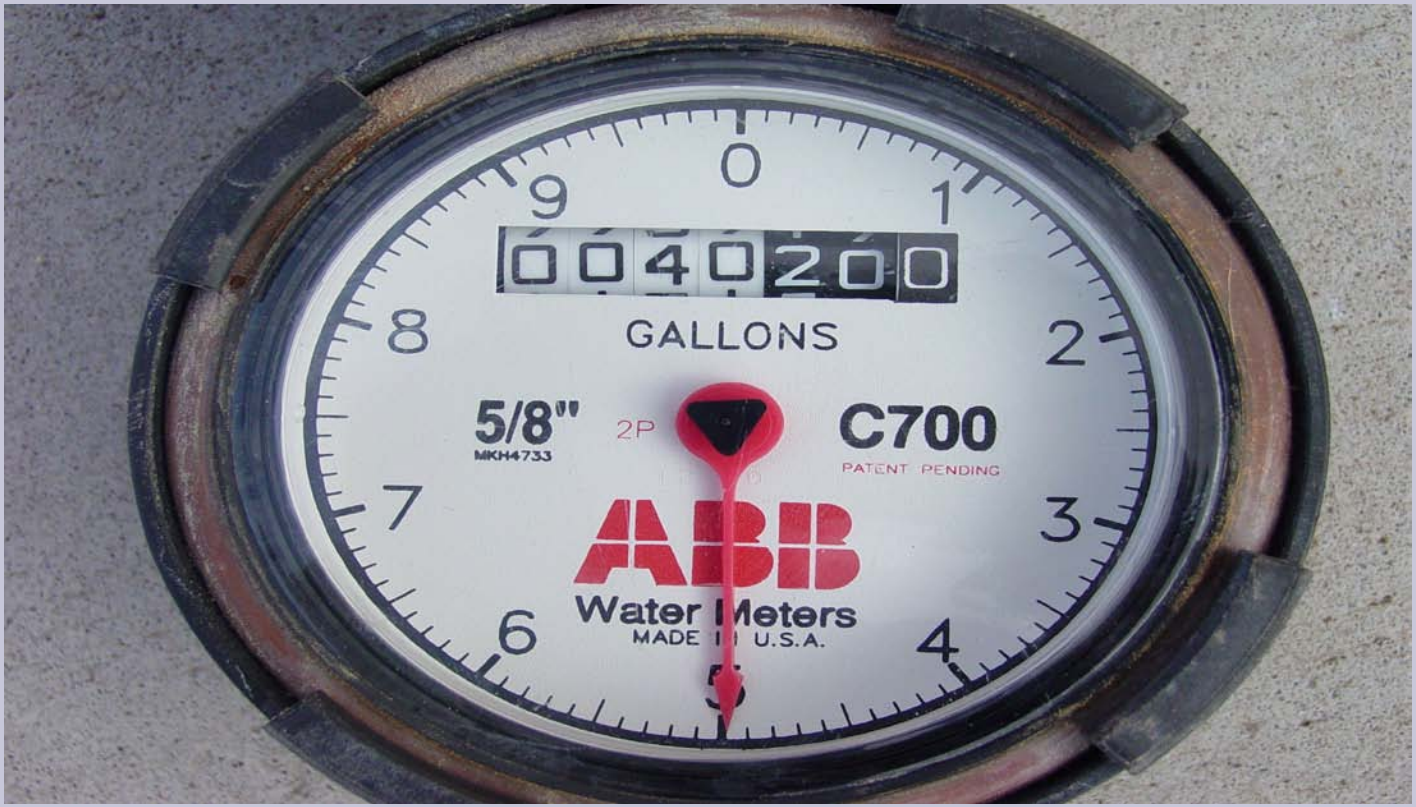
Water Meters:
The Good, The Bad,
And The Reality

What Is A Meter?

Water Meters

The Cash Register of The Water Purveyor



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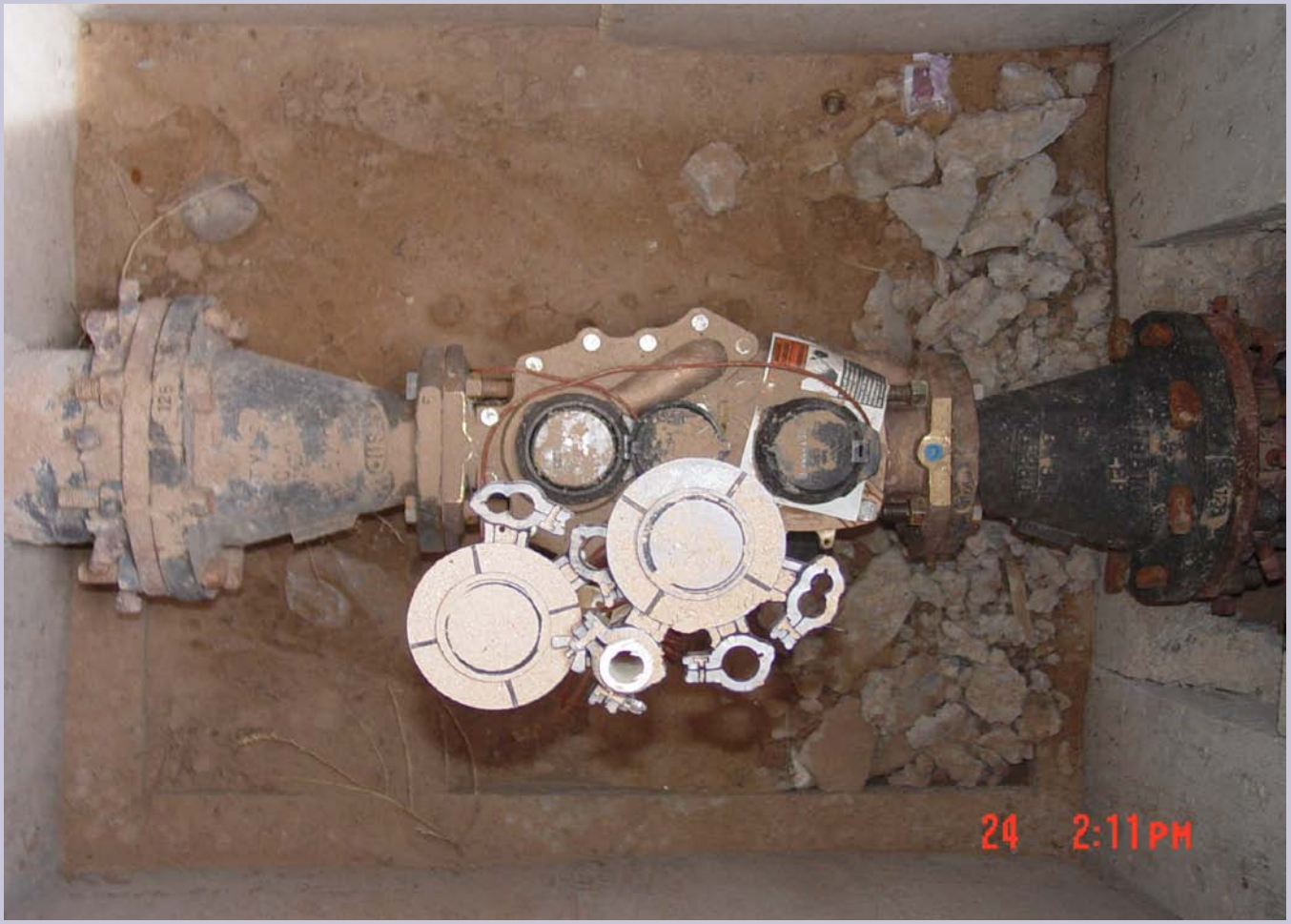
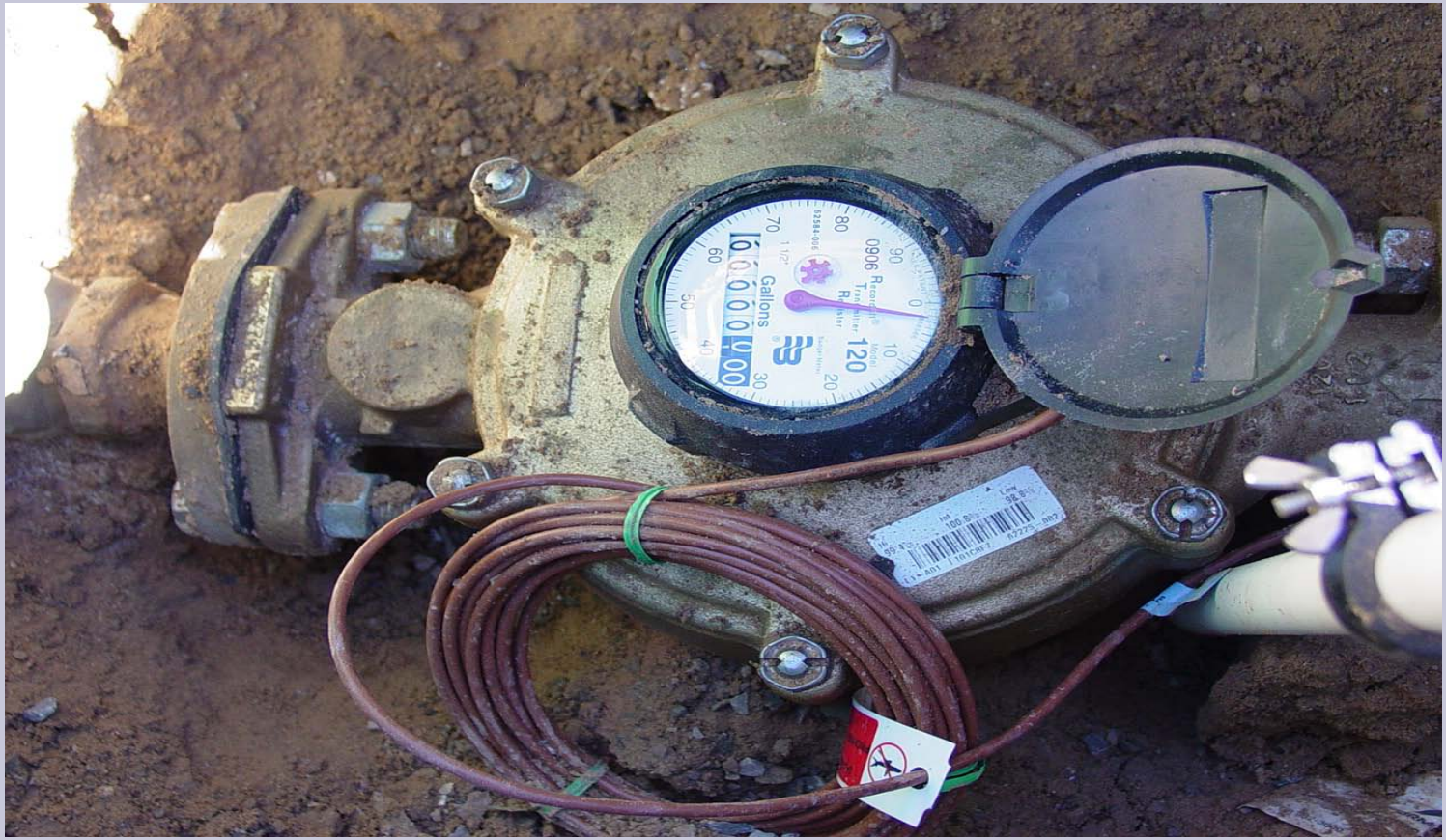
A Good Metering Program Is Necessary for Water Conservation

- You Can Not Manage What You Can Not Track

Meter Size?



Types of Meters



Water Meters, By Zane Satterfield. And Vipin Bhardwaj, engineering scientists

RESOURCE WISE

Positive Displacement Meters

This type of meter works by measuring and registering the number of times the meter chamber, whose volume is known, is filled and emptied.

ADVANTAGES:

- Measures wide variations of flow
- Needs no straight pipe upstream or downstream

DISADVANTAGES:

- Low flow rates are not detected on meters over (2) two inches in size
- High head loss at high flows
- Foreign matter or corrosion will stop or cause loss of accuracy

Types of Displacement Meters

- Nutating disc meters
- Piston meters
- Positive Displacement Meters

Velocity Meters

Operate on the principle that water passing through a known cross-sectional area with a measured velocity can be equated into a volume of flow. Velocity meters are good for high flow applications.

ADVANTAGES:

Used for large flows, low head loss

DISADVANTAGES:

Inaccurate at low flows

Types Of Velocity Meters

- Turbine
- Venture
- Multi-jet
- Propeller
- Magnetic
- Ultrasonic
- Orifice

TURBINE Meters

Have a rotating element that turns with the flow of water. Volume of water is measured by the number of revolutions by the rotor.

Venturi Meters

Have a section that has a smaller diameter than the pipe on the upstream side. Based on a principle of hydraulics, as water flows through the pipe, its velocity is increased as it flows through a reduced cross-section area. Difference in pressure before water enters the smaller diameter section and at the smaller diameter “throat” is measured. The change in pressure is proportional to the square of velocity. Flow rate can be determined by measuring the difference in pressure. Venturi meters are suitable for large pipelines and do not require much maintenance.

Multi-jet Meters

Have tangential openings in a chamber to direct the water flow across a rotor with many vanes. Flow is measured proportional to the speed of the rotor.

Propeller Meters

Have a fan-shaped rotor that spins with the flow of water. A recorder is attached to the rotor to register the readings.

Magnetic Meters

Have an insulated section through which water flows. The flow of water induces an electrical current that is proportional to the velocity and hence the flow rate.

Ultrasonic Meters

Send sound waves diagonally across the flow of water in the pipe. Changes in the velocity of water are converted electronically to change in flow rate.

Orifice Meters

Work on the same principle as venturi meters, except that, instead of the decreasing cross-sectional area, there is a circular disk with a concentric hole. Flow rate is calculated similarly to the venturi meter by measuring the difference in pressure.

Compound Meters

Used where the water demand varies widely

Two meters in one:

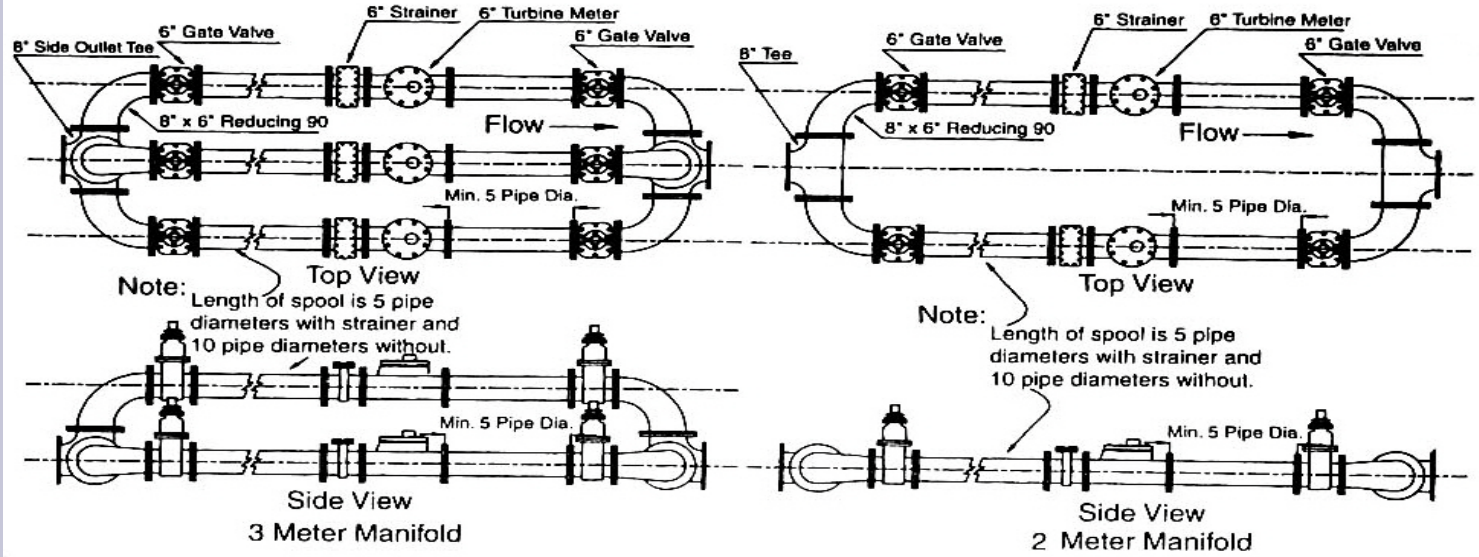
- Has a positive displacement meter for the low flows and a velocity meter for the high flow

Meter Installation

FOLLOW THE MANUFACTURES INSTALLATION REQUIREMENTS!

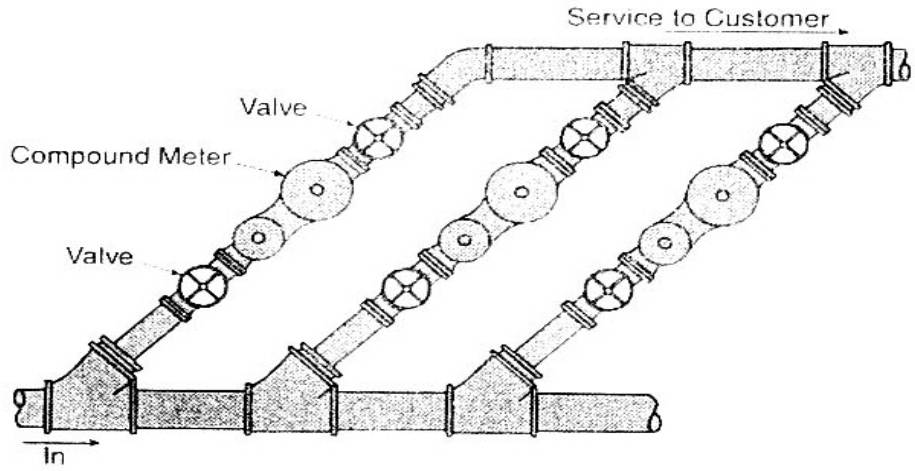
Velocity Meter

1. A minimum of ten pipe diameters of straight pipe, upstream of the meter
2. Five times down stream
3. Do not install elbows, bends, nonconcentric reducers, check valves, back flow preventers and/or pressure reducing devices within 10/5
4. Full open flow components may consist of straight pipe, full open gate valves, bypass tees and concentric reducers (1 nominal reduction only)

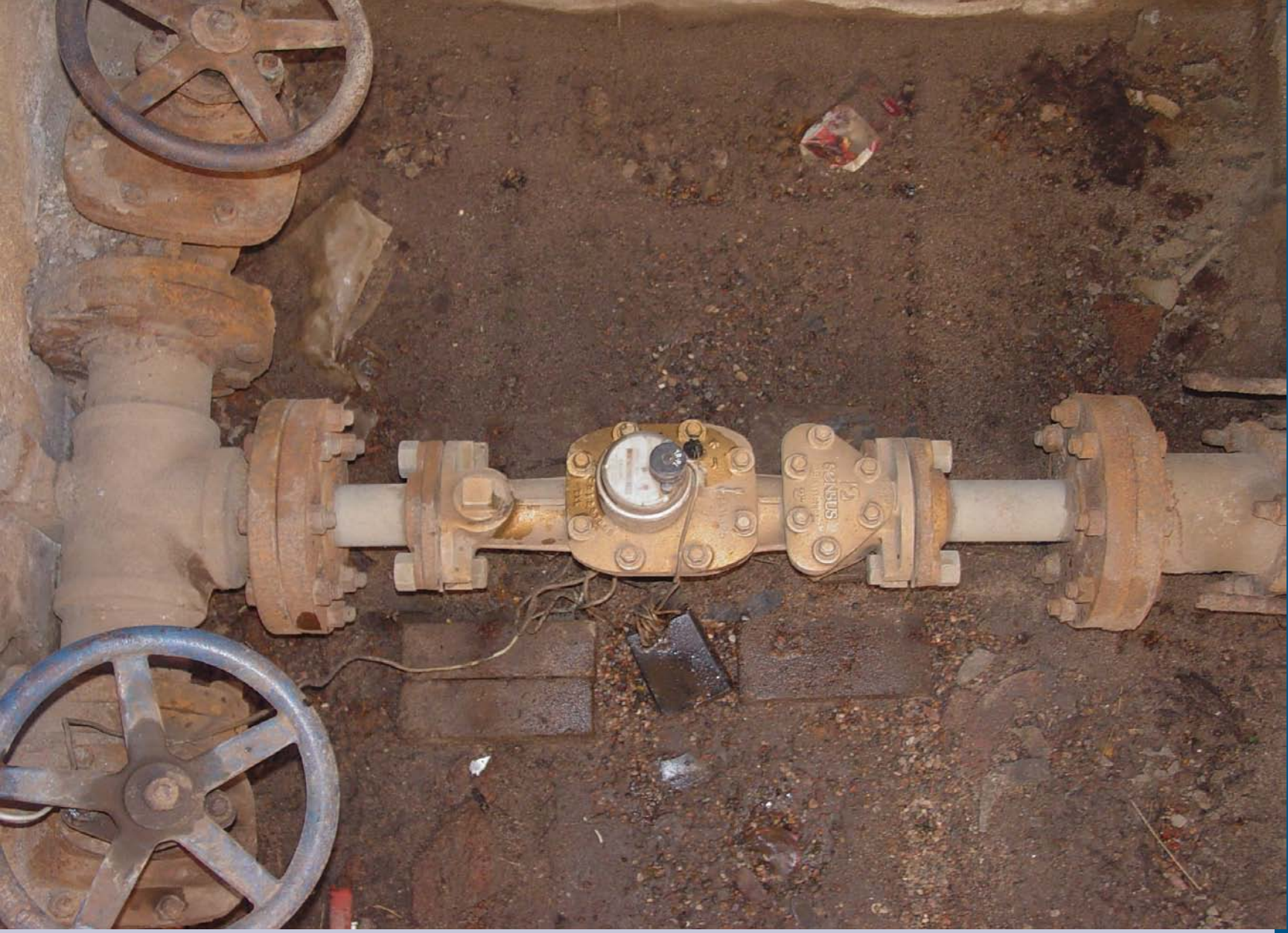


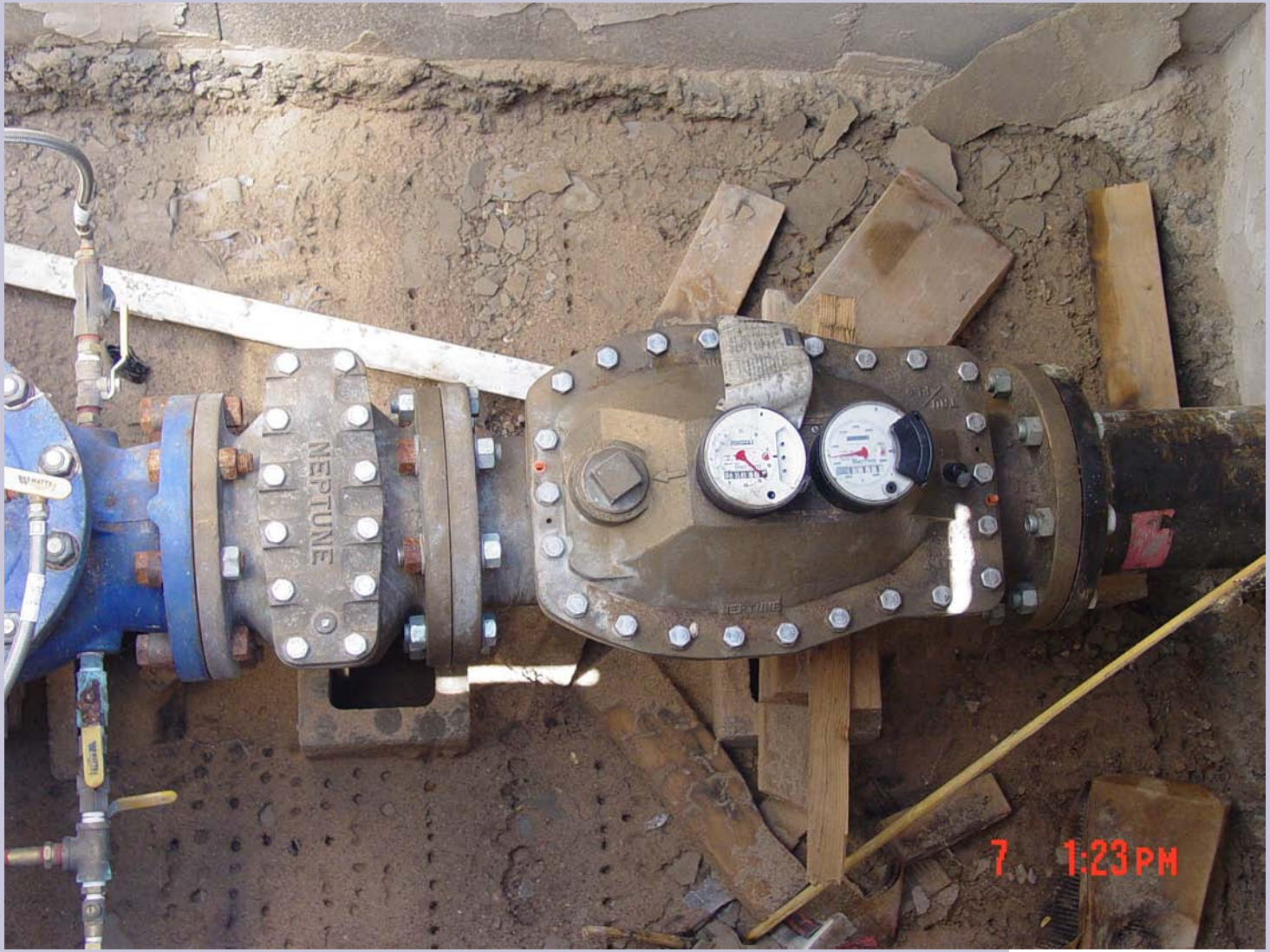
ypical 3 meter and 2 meter hydraulically balanced manifold.

igure 4-3 Manifold of large meters



*AWWA M6 Water Meters

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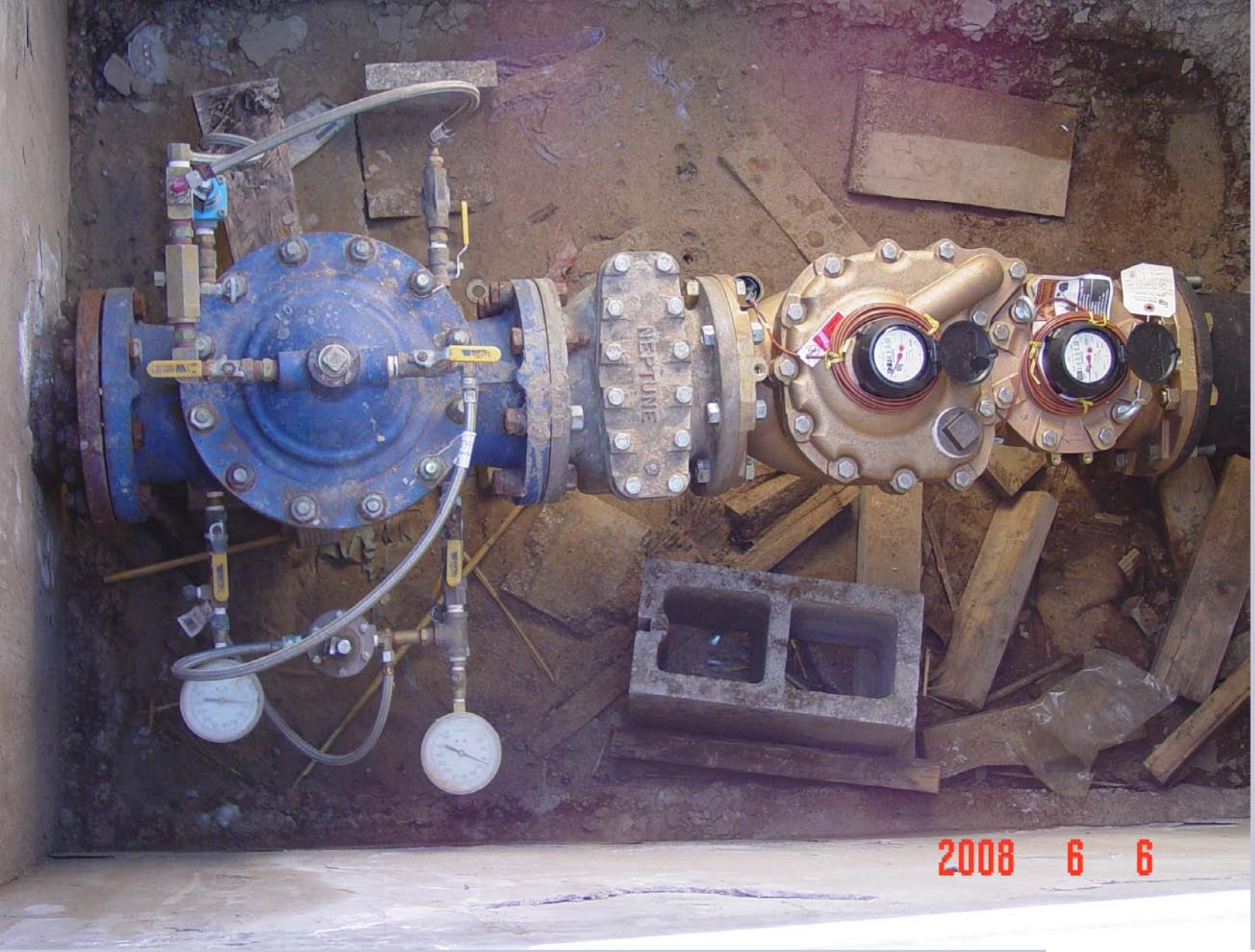

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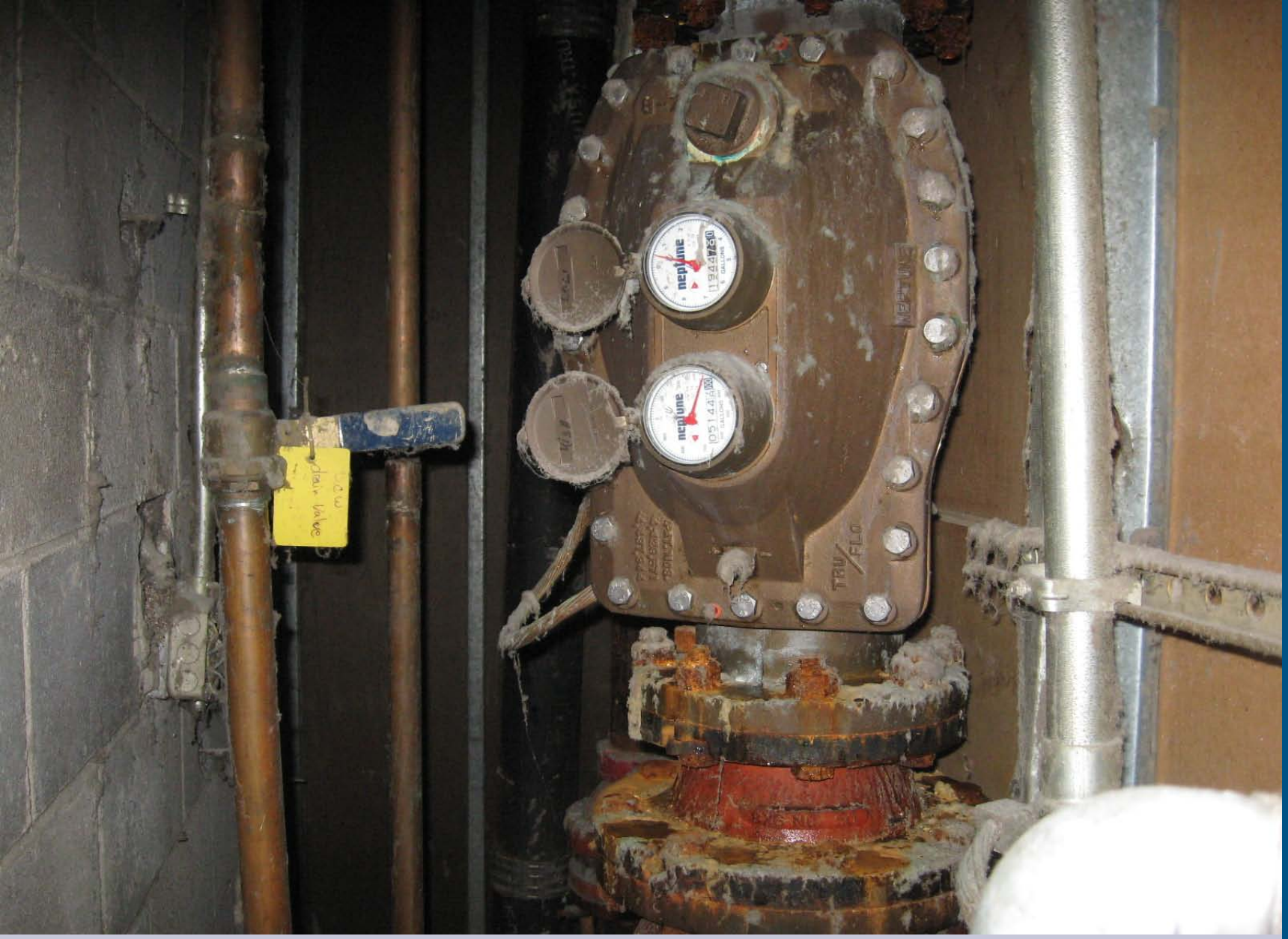

RESOURCE WISE


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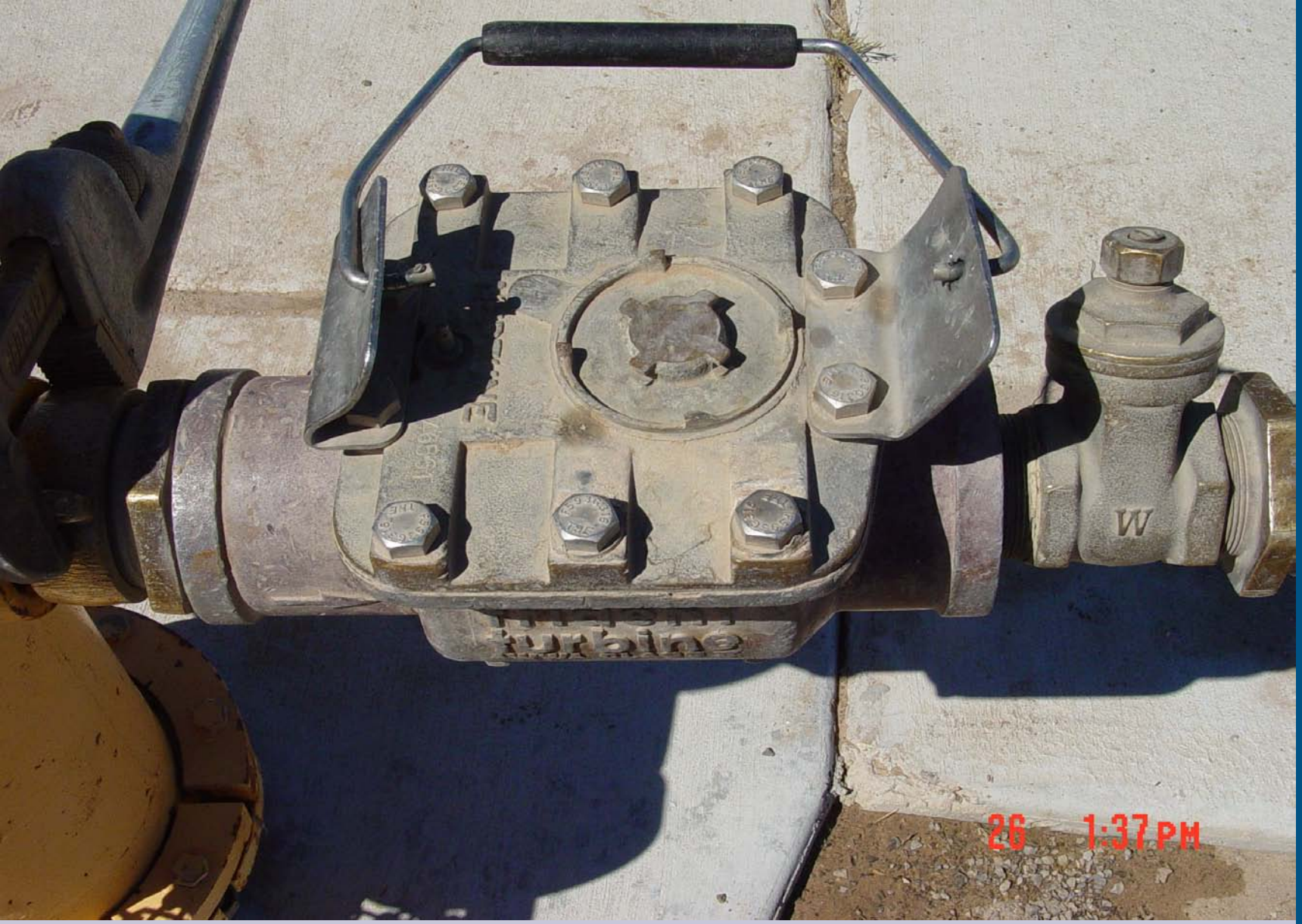
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Meter Selection

Choose the right meter for the job

Know the flow demands: high or low

Displacement meters are not designed for continues high flow.

Velocity meters are not good at recording low flows.

Recordall® Cold Water Top Load Bronze Disc Meter	Size 2" (DN 50mm)	Technical Brief

DESCRIPTION

Badger Meter offers the Recordall Disc meter in Cast Bronze and a Low Lead Alloy. The Low Lead Alloy (Trade Designation: M170 LL) version complies with NSF/ANSI Standard 61 and carries the NSF-61 Mark on the housing. All components of the Low Lead Alloy meter, i.e., disc, chamber, housing, seals, etc., comprise the certified system.

APPLICATIONS: For use in measurement of potable cold water in residential, commercial and industrial services where flow is in one direction only.

OPERATION: Water flows through the meter's strainer and into the measuring chamber where it causes the disc to nutate. The disc, which moves freely, nutates on its own ball, guided by a thrust roller. A drive magnet transmits the motion of the disc to a follower magnet located within the permanently-sealed register. The follower magnet is connected to the register gear train. The gear train reduces the disc nutations into volume totalization units displayed on the register dial face.

OPERATING PERFORMANCE: The Badger Recordall Disc meters meet or exceed registration accuracy for the low flow rates (95%), normal operating flow rates (100 ± 1.5%), and maximum continuous operation flow rates as specifically stated by AWWA Standard C700.

CONSTRUCTION: Badger Recordall Disc meter construction, which complies with ANSI/AWWA standard C700, consists of three basic components: bronze meter housing, measuring chamber, and permanently, sealed register. A corrosion-resistant thermoplastic material is used for the measuring chamber.

To simplify maintenance, the register, measuring chamber, and strainer can be replaced without removing the meter housing from the installation. No change gears are required for accuracy calibration. Interchangeability of parts among like-sized meters also minimizes spare parts inventory investment. The built-in strainer has an effective straining area of twice the inlet size.

MAGNETIC DRIVE: Direct magnetic drive, through the use of high-strength magnets, provides positive, reliable and dependable register coupling for straight-reading, remote or automatic meter reading options.

SEALED REGISTER: The standard register consists of a straight-reading, odometer-type totalization display, 360° test circle with center sweep hand and flow finder to detect leaks. Register gearing consists of self-lubricating thermoplastic gears to minimize friction and provides long life. Permanently sealed; dirt, moisture, tampering and lens fogging problems are eliminated. Multi-position register simplifies meter installation and reading. Generator-type remote reading and automatic meter reading systems are available for all Recordall Disc meters. All reading options are removable from the meter without disrupting water service.

TAMPER-PROOF FEATURES: Customer removal of the register to obtain free water can be prevented when the optional tamper detection seal wire screw/or Torx® tamper seal resistant screw is added to the meter. Both can be installed at the meter site or at the factory.

MAINTENANCE: Badger Recordall Disc meters are designed and manufactured to provide long-term service with minimal maintenance. When maintenance is required, it can be performed easily either at the meter installation or at any other convenient location. As an alternative to repair by the utility, Badger offers various maintenance and meter component exchange programs to fit the needs of the utility.

CONNECTIONS: Tailpieces/Flanges for installations of meters on various pipe types and sizes, including misaligned pipes, are available as an option.

Model 170 shown with optional 1" Test Plug

SPECIFICATIONS

Typical Operating Range (100% ± 1.5%)	2 1/2 - 170 GPM (.57 to 39 m³/hr)
Low Flow (Min. 95%)	1 1/2 GPM (.34 m³/hr)
Maximum Continuous Operation	100 GPM (23 m³/hr)
Pressure Loss at Maximum Continuous Operation	3.3 PSI at 100 GPM (.23 bar at 23 m³/hr)
Maximum Operating Temperature	90°F (26°C)
Maximum Operating Pressure	150 PSI (10 bar)
Measuring Element	Nutating disc, positive displacement
Register Type	Straight reading, permanently sealed magnetic drive standard. Remote reading or Automatic Meter Reading units optional.
Registration	100 Gallons, 10 Cubic Feet, 1 m³
Register Capacity	100,000,000 Gallons, 10,000,000 Cubic Feet, 1,000,000m³. 6 odometer wheels.
Meter Connections	2" AWWA two bolt elliptical flange, drilled, or 2" - 11 1/2 NPT internal pipe threads.
Optional Test Plug	1" NPT test plug (TP) available on elliptical long and short versions.

MATERIALS

Meter Housing	Cast Bronze, Low Lead Alloy
Housing Top Plates	Bronze, Low Lead Alloy
Measuring Chamber	Thermoplastic
Disc	Thermoplastic
Trim	Stainless Steel/Bronze
Strainer	Thermoplastic
Disc Spindle	Stainless Steel
Magnet	Ceramic
Magnet Spindle	Stainless Steel
Register Lid and Box	Thermoplastic or Bronze
Generator Housing	Thermoplastic

METER TESTING

Test all new meters:

Large meters every 2 years

Residential meters every 10 to 15 years.

Well Head Meters Need Testing

Good metering is necessary for tracking non revenue water.

Save the Cost of Testing

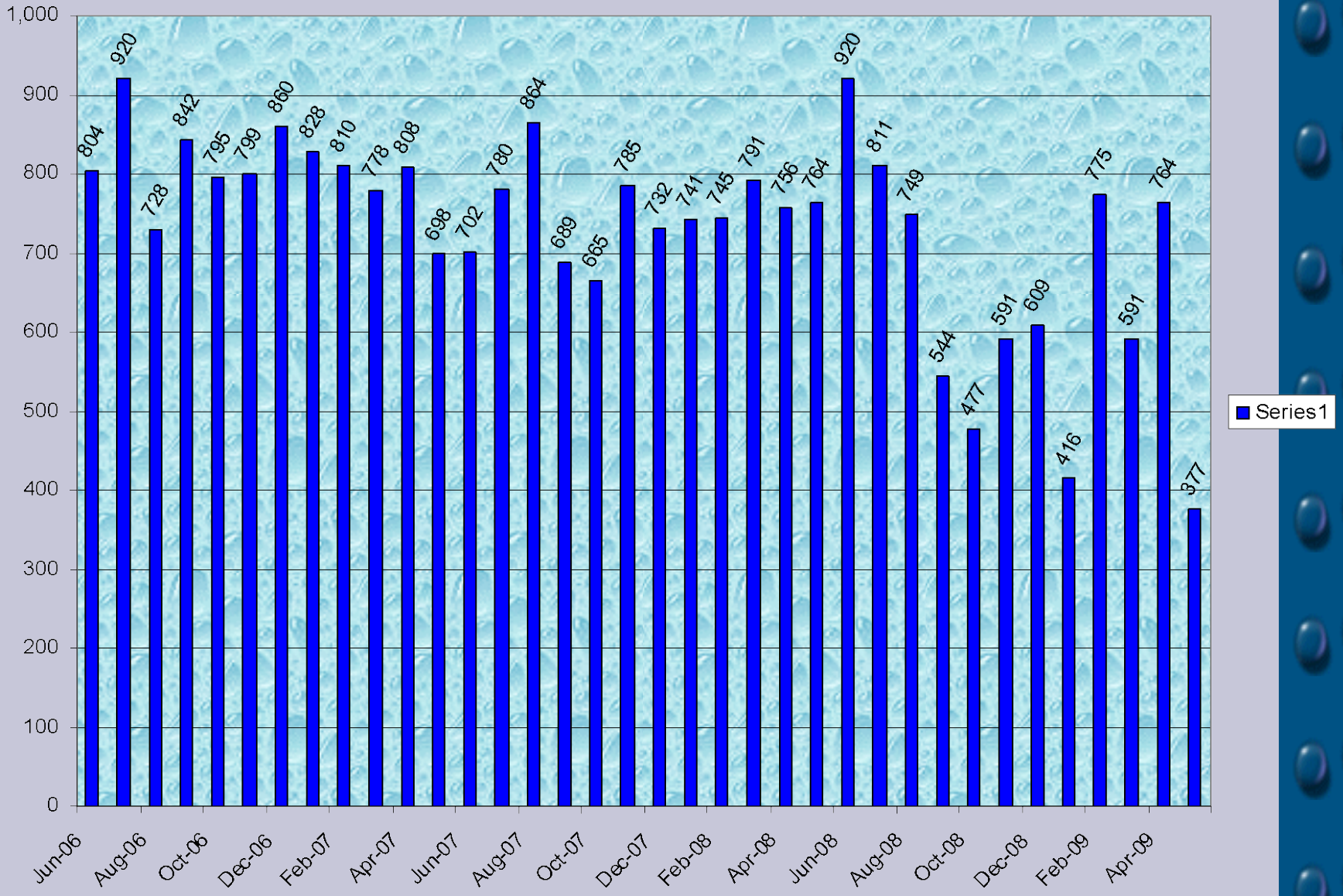
- How can you prove a meter is bad without testing it?

Tracking Usage

History: 3-year minimum

Establish a base line

Look for anomalies in usage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Series1

Winter Average?

- No irrigation
- Water usage at lowest

Analyzing Usage

- Estimate average usage per apartment
- Fixture type, number; occupancy rate

102 Apartments

Phase 1		
	Winter	Total
Year	Average	Units
2003	353	9175
2004	342	8560
2005	287	7284
2006	195	8721
2007	176	6154
2008	94	6229

14 Apartments

Phase 2		
	Winter	Total
Year	Average	Units
2003	41	3662
2004	38	3155
2005	7	2107
2006	1	2790
2007	1	2466
2008	0	2321

52 Apartments

Phase 3		
	Winter	Total
Year	Average	Units
2003	117	4646
2004	105	3920
2005	9	2715
2006	3	2320
2007	11	1840
2008	12	1831

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Analyzing Irrigation Meters

Estimate approximate usage

1) Square footage of landscaping
2) Type of landscaping
3) Water requirements in your region

Conclusion

Meters need to be properly selected, installed, maintained and tested in order to insure that water resources are measured properly.

Thank You

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