

Water Supply & Sanitary Engineering (DI05006021)

Unit 4: Conveyance of water

Lecture 19: Valves, Meters, Fittings and Fixtures

GTU Diploma Engineering

Sluice Valves (Gate Valves)

- The most common type of valve in a water supply system.
- Function: To completely stop or fully allow the flow of water (Isolating valve).
- Mechanism: A wedge-shaped gate is lowered or raised by a threaded stem.
- Location: Installed at regular intervals (150-300m) and at street intersections to isolate blocks for repairs.

Check Valves (Reflux / Non-Return Valves)

- Function: Allows water to flow in one direction only. Prevents backflow.
- Mechanism: A hinged flap that swings open with forward flow and slams shut if water tries to reverse.
- Location: Placed strictly on the delivery side of pumping sets.
- Purpose: Protects pumps from water hammer and prevents the reservoir from draining backward through the pump when power fails.

Air Relief Valves

- Water contains dissolved air which separates out under varying pressure and accumulates at high points in the pipeline.
- Trapped air reduces the pipe's carrying capacity (air binding) and causes surges.
- Function: Automatically exhausts accumulated air from the pipeline.
- Location: Installed strictly at the summits (highest points) of the pipeline profile.

Working of an Air Valve

- Contains a hollow ball float inside a chamber.
- When air accumulates, it displaces the water, the ball drops, and opens the vent to release air.
- As water rushes back in, it lifts the float, sealing the vent tightly before water escapes.
- Also allows air to enter the pipe when it is being drained, preventing vacuum collapse.

Scour Valves (Blow-off Valves)

- Function: To drain out water and settled sediment/silt from the pipeline during maintenance.
- Location: Installed at the lowest points (valleys/depressions) of the pipeline.
- Discharge is usually directed into nearby natural drains or streams.
- Also used at dead-ends in distribution systems to flush out stagnant water.

Pressure Relief Valves & PRVs

- Pressure Relief Valve: Acts like a safety valve. If pressure exceeds a safe limit (water hammer), it blows open to discharge water and relieve pressure, protecting pipes from bursting.
- Pressure Reducing Valve (PRV): Automatically reduces high upstream pressure to a steady lower downstream pressure.
- Used when a gravity main from a high mountain enters a low valley town, to prevent bursting consumer pipes.

Fire Hydrants

- Specialized outlets provided on the distribution mains to tap water for fire fighting.
- Types: Post Hydrants (stand above ground, common in US) and Flush Hydrants (below ground in chambers, common in India/UK).
- Requirements: Must deliver heavy discharge instantly. Placed 90m - 120m apart in urban areas.

Water Meters

- Function: To measure and record the volume of water consumed by a user.
- Promotes water conservation by charging consumers based on actual usage (volumetric tariff) rather than a flat rate.
- Commonly installed at the boundary of a property on the service pipe.

Types of Water Meters

- Displacement (Volumetric) Meters: Water physically displaces a piston or oscillating disk. Highly accurate for low flows (domestic use).
- Velocity (Inferential) Meters: Water spins a turbine or propeller. The speed of rotation infers flow rate. Used for large mains (bulk meters).
- Electromagnetic/Ultrasonic Meters: No moving parts. Use magnetic fields or sound waves. Very accurate and low maintenance, but expensive.

Pipe Fittings

- Fittings are used to change direction, branch off, or change the diameter of a pipeline.
- Bends/Elbows: Change direction (e.g., 90° , 45° , 22.5°).
- Tees and Crosses: Used to create branches from the main line.
- Reducers: Connect a larger pipe to a smaller one (Eccentric or Concentric).
- Caps and Plugs: Used to close off the dead end of a pipe.

Fixtures (Household Plumbing)

- Fixtures are the terminal points of the water supply where water is drawn for use.
- Taps / Faucets (Bib cocks): Used over sinks and washbasins.
- Stop Cocks: Small valves used to isolate individual sections of household plumbing.
- Mixer taps: Combine hot and cold water streams.
- Flush valves / Cisterns: Used in sanitary appliances (toilets).

Summary of Valves and Fittings

- Sluice valves isolate sections, Check valves prevent backflow, Air valves release trapped air, and Scour valves remove silt.
- Water meters are essential tools for demand management and fair billing.
- Fittings guide the pipeline layout, while fixtures provide the final interface for the consumer.
- This concludes Unit 4 on the Conveyance of Water.