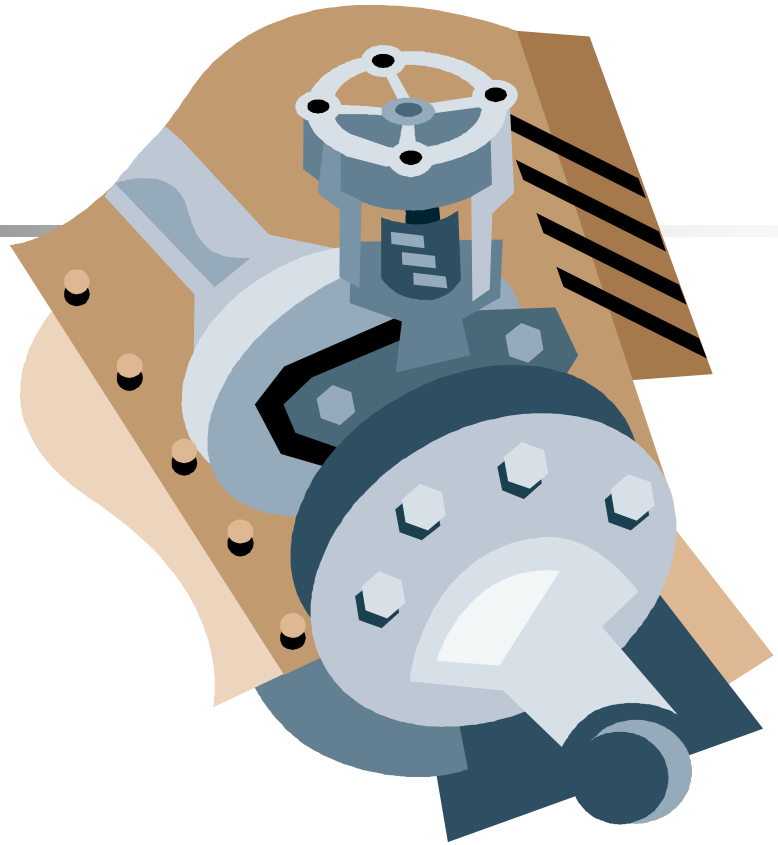
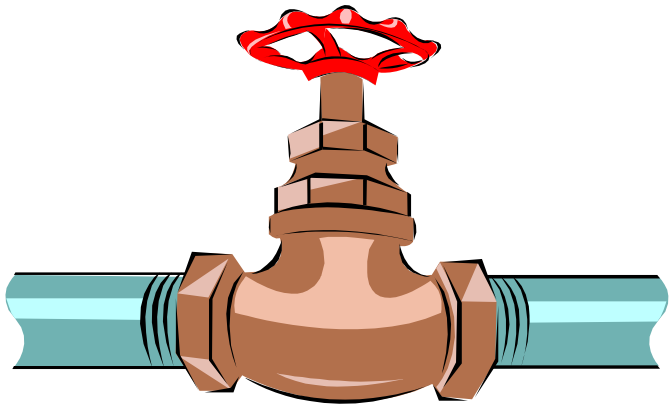
Valves



Topics

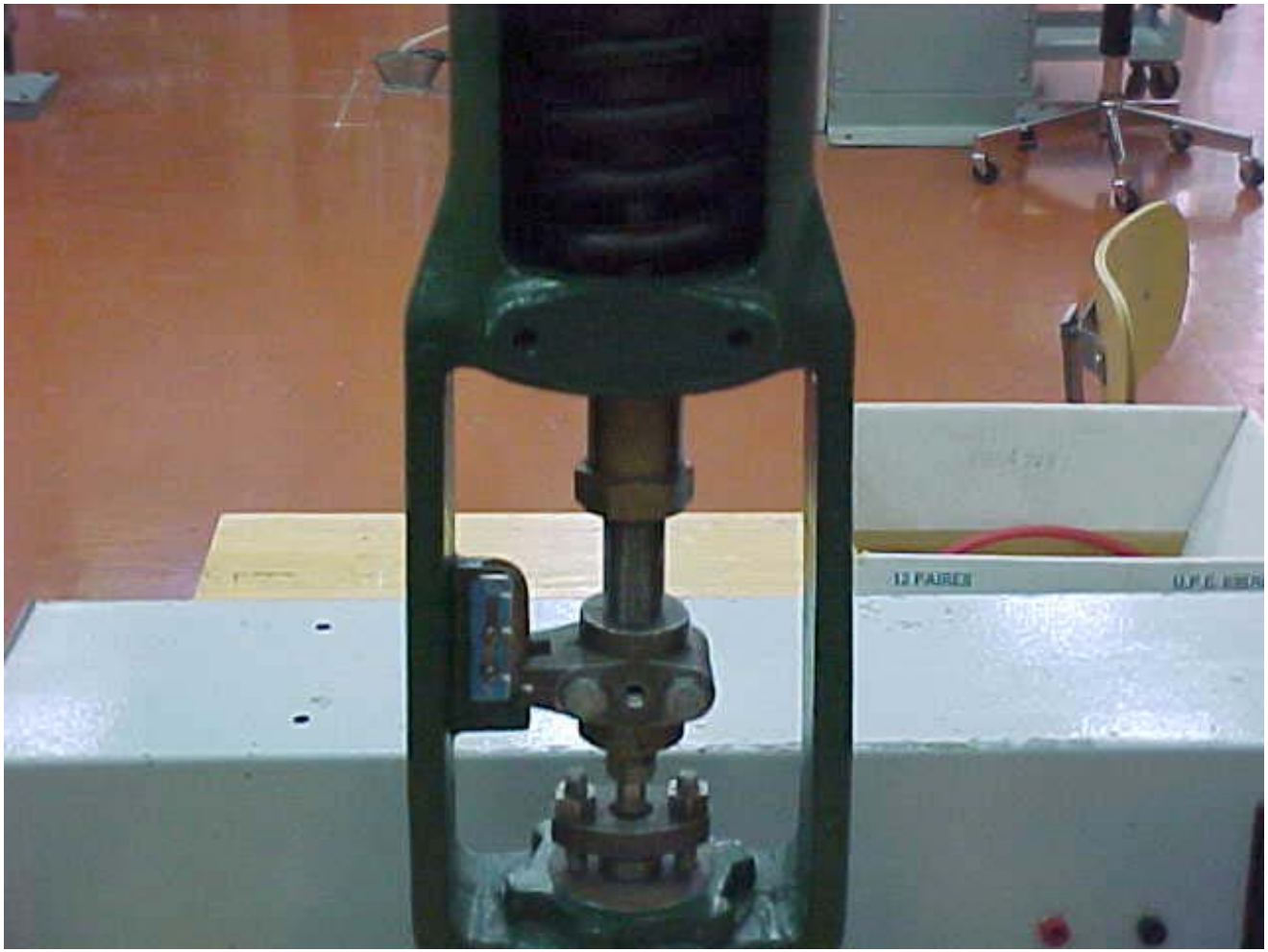
- Regulating
- Isolating
- Back flow prevention
- Pressure Relief



Typical Actuator & Valve

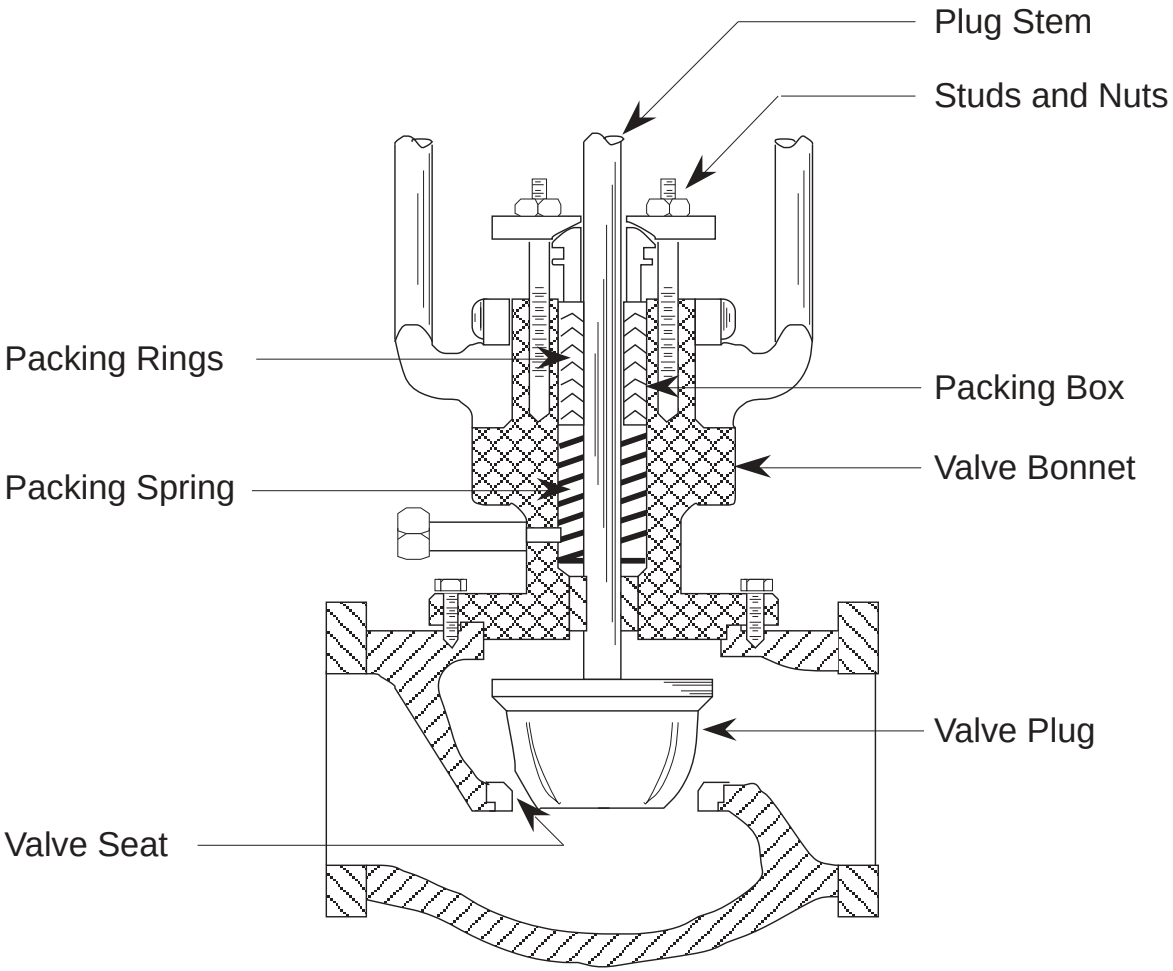
Diaphragm Actuator

Positioner Indicator



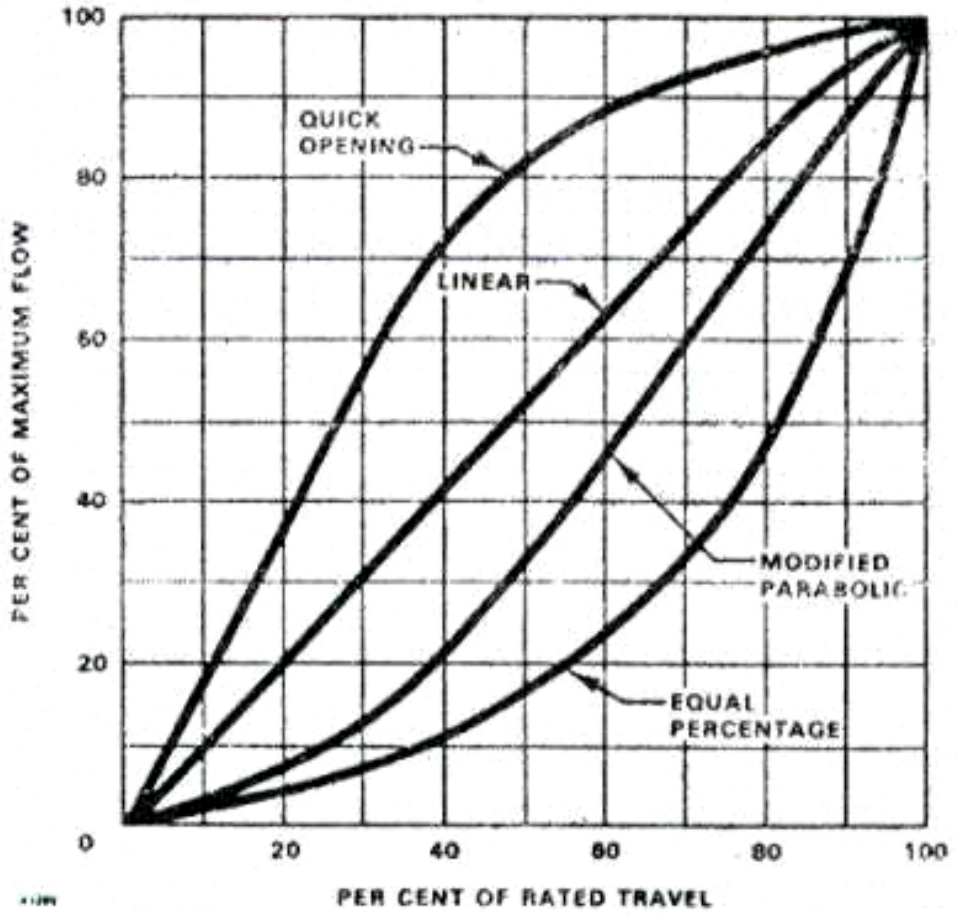
Valve Body

Basic Valve Construction



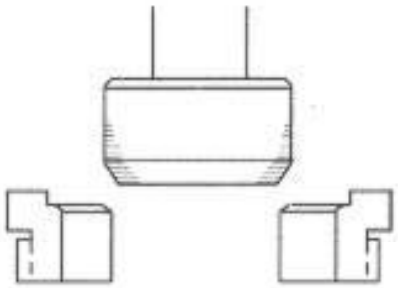
Valve Body

Valve Characteristics

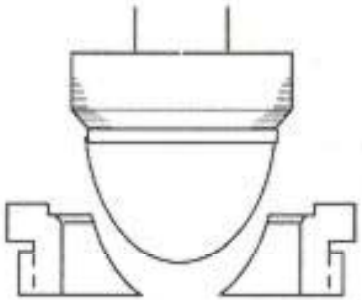


Valve Plugs

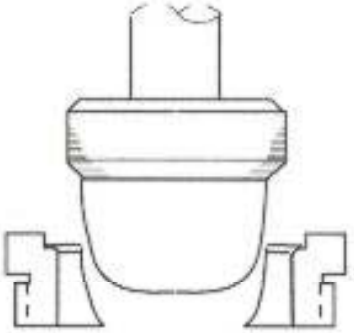
a) Quick Opening



b) Linear

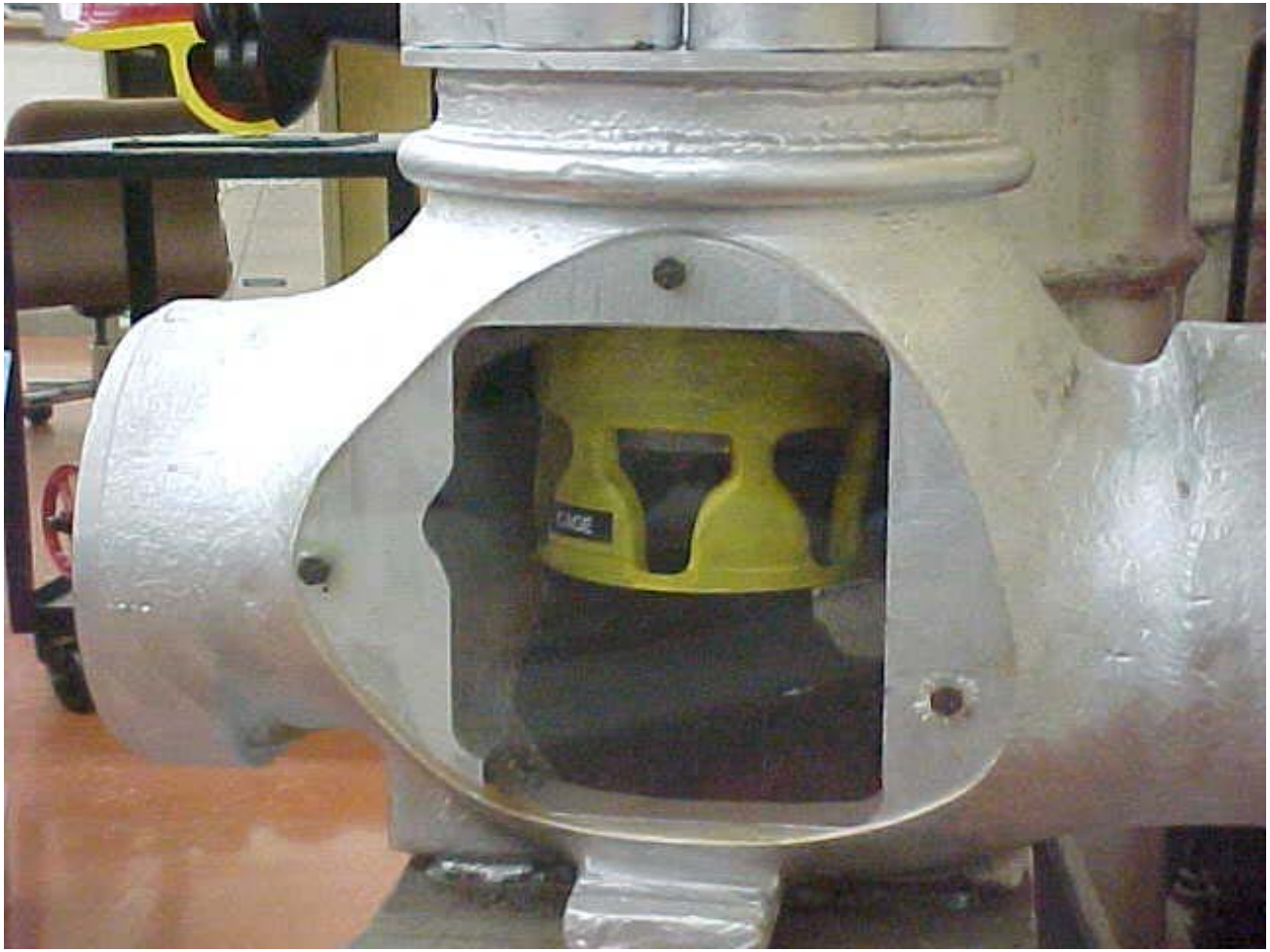


c) Equal Percentage

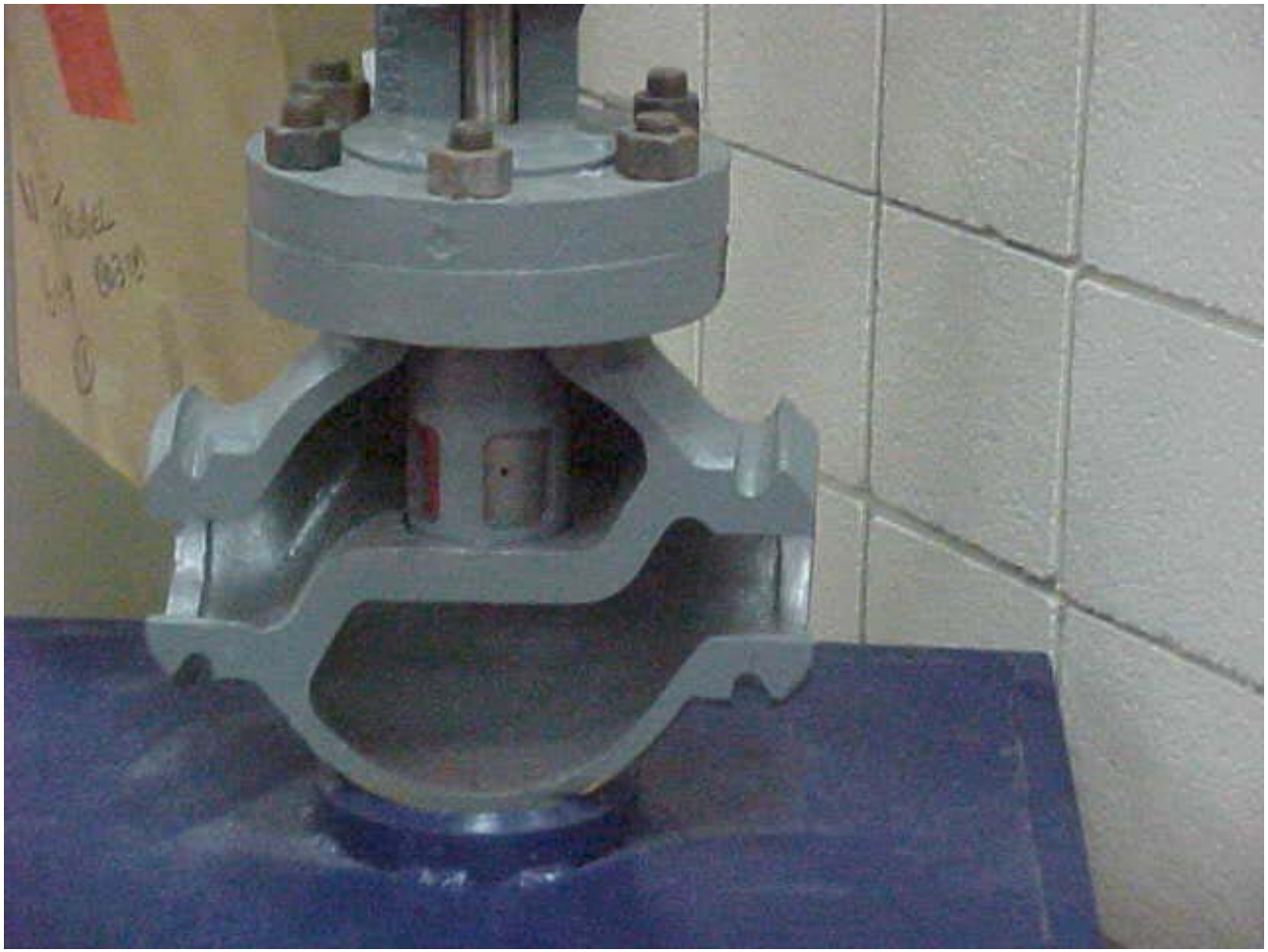


Valve Plugs

Cage

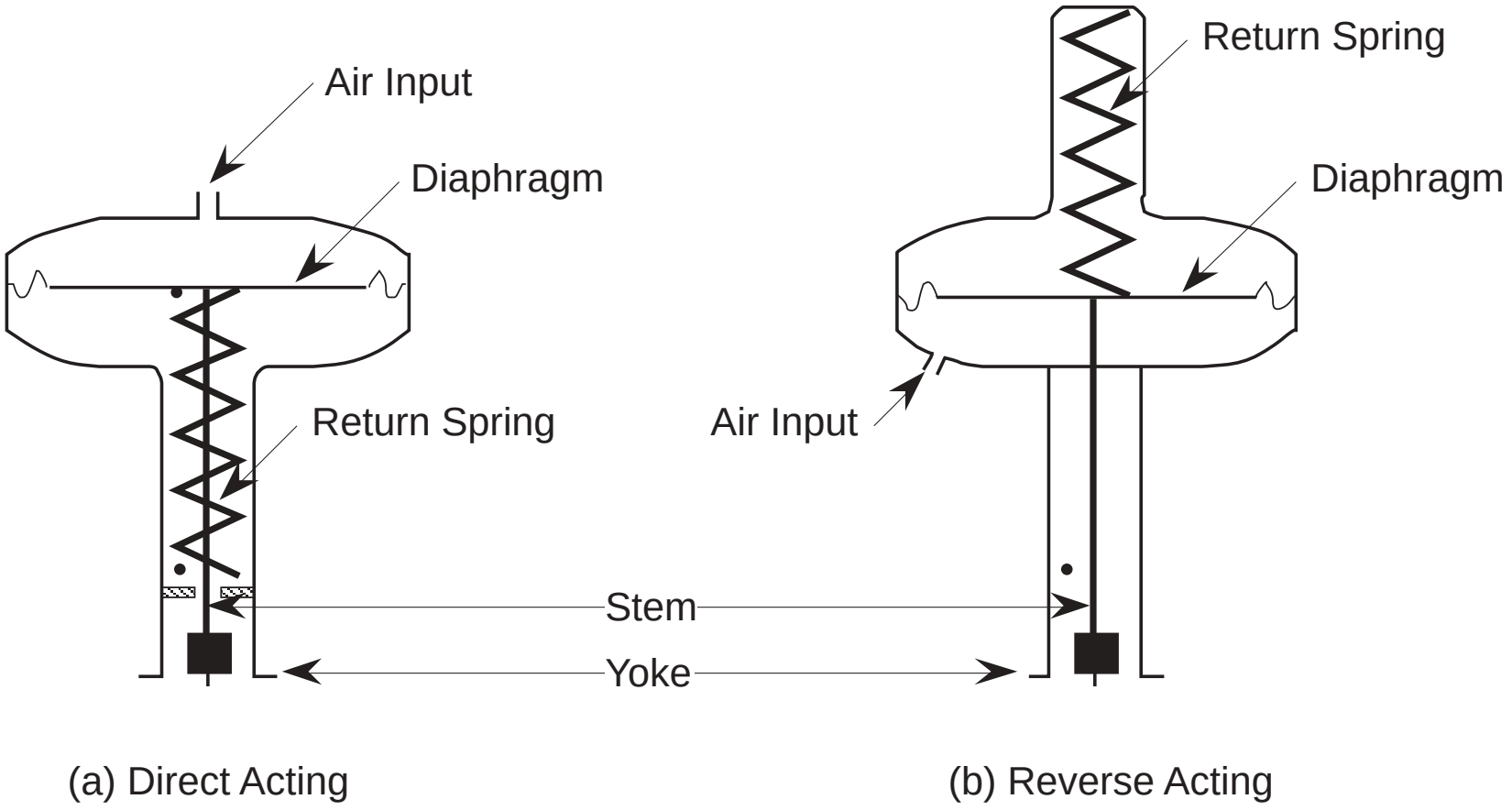


Cage too



Removed Cage

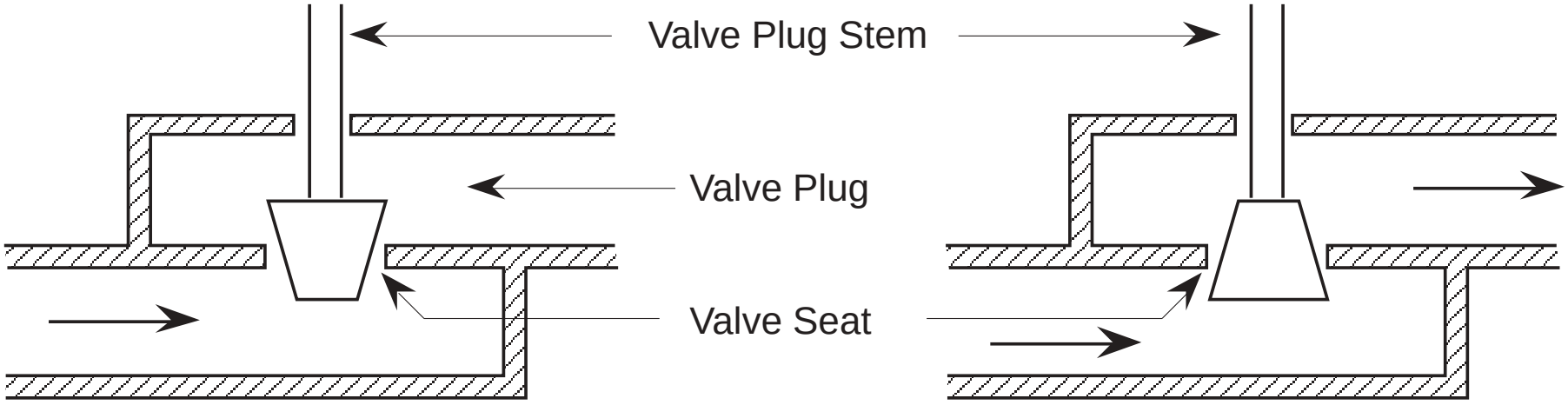
Reverse & Direct Actuators



(a) Direct Acting

(b) Reverse Acting

Reverse & Direct Valves



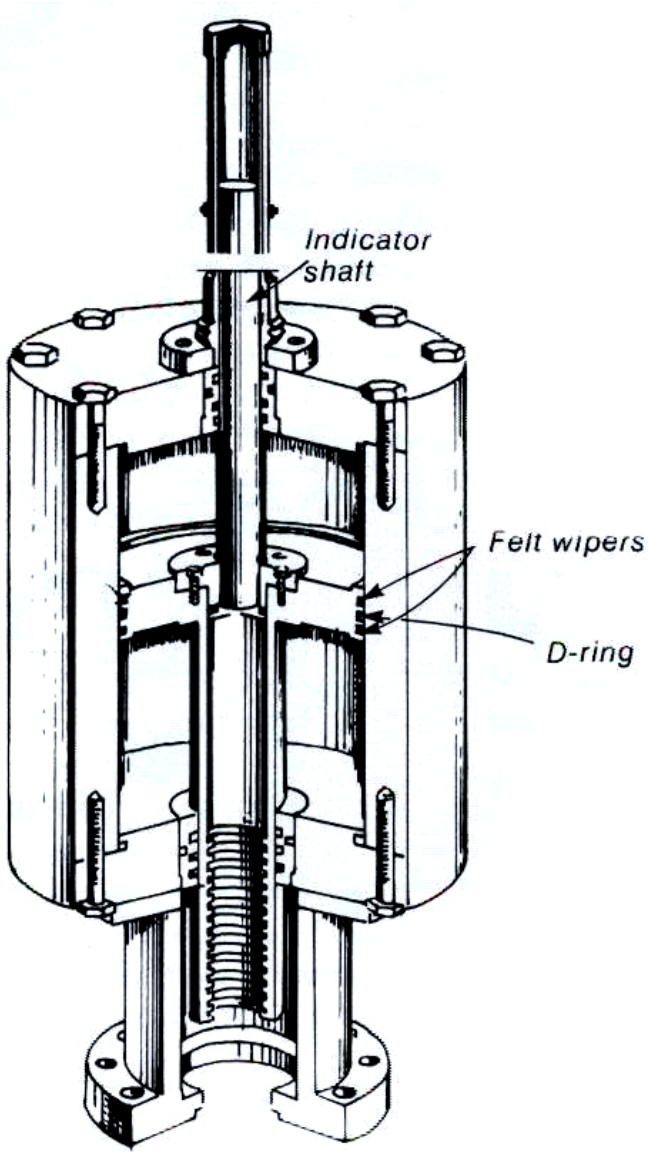
(a) Direct Acting

(b) Reverse Acting

Failure Mode

Actuator	Valve Body	Valve Action	Failure Mode
Direct	Direct	Air to Close	Fail Open
Reverse	Reverse	Air to Close	Fail Open
Direct	Reverse	Air to Open	Fail Closed
Reverse	Direct	Air to Open	Fail Closed

Piston Actuators



Piston Actuator

Diaphragm Valve Operator

Actuator and Positioner

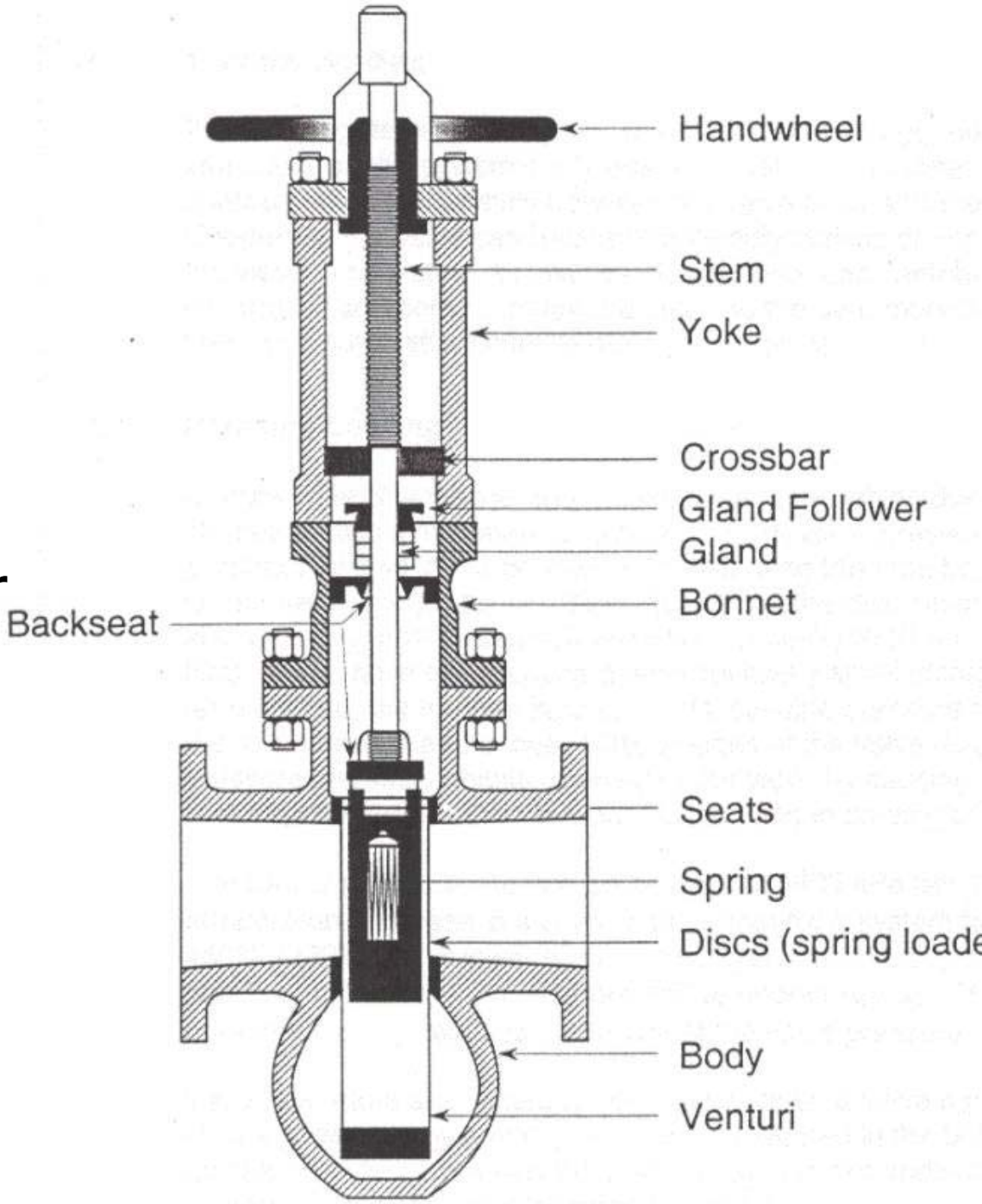
Actuator and Positioner

Actuator Fluids

- Air
- Oil (mineral and synthetic)
- Clean
- Moisture Free

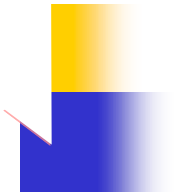
Isolating Valves

- Manual
- Pneumatic
- Electric Motor



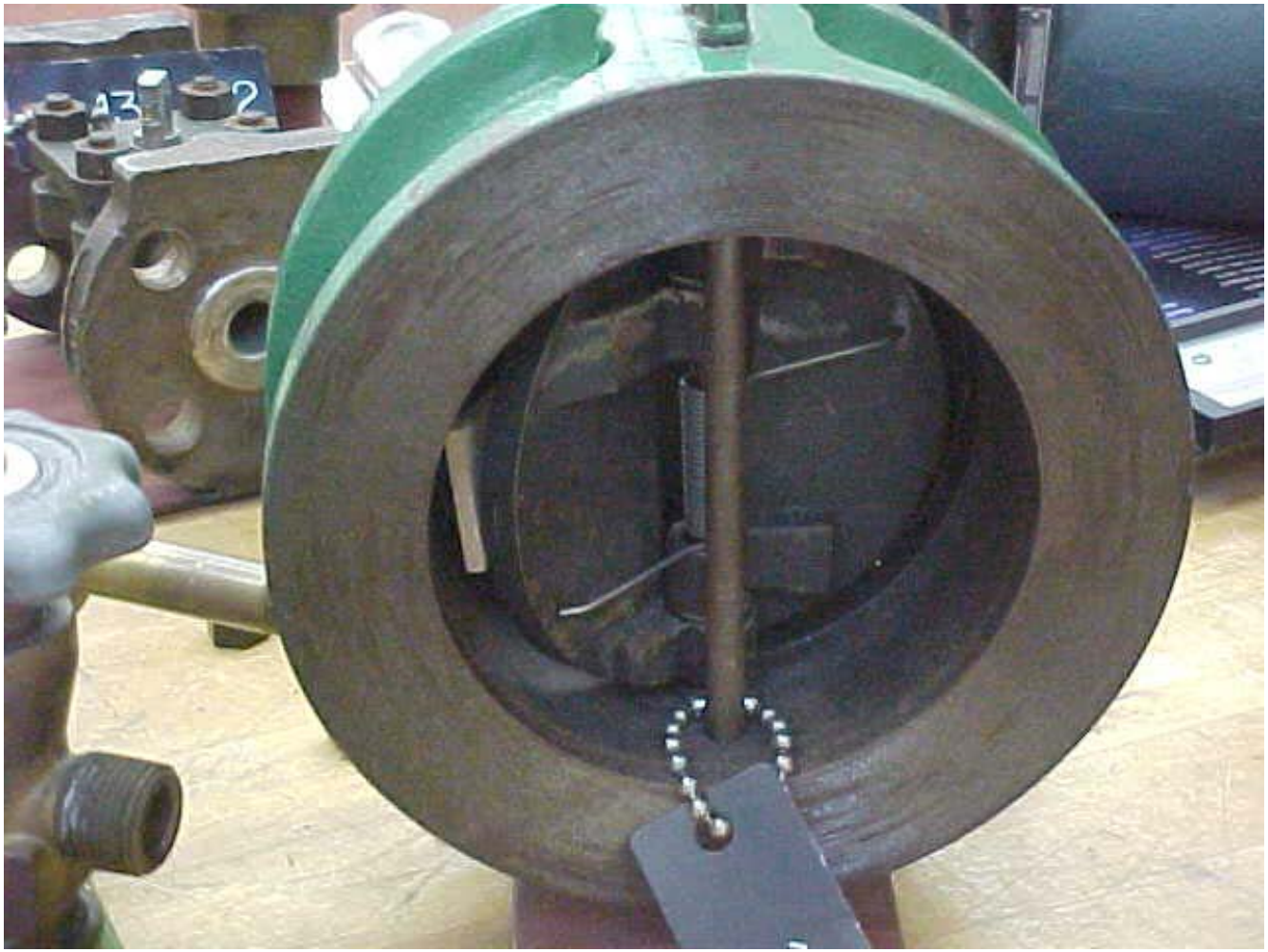
Manual Valve

Handwheel



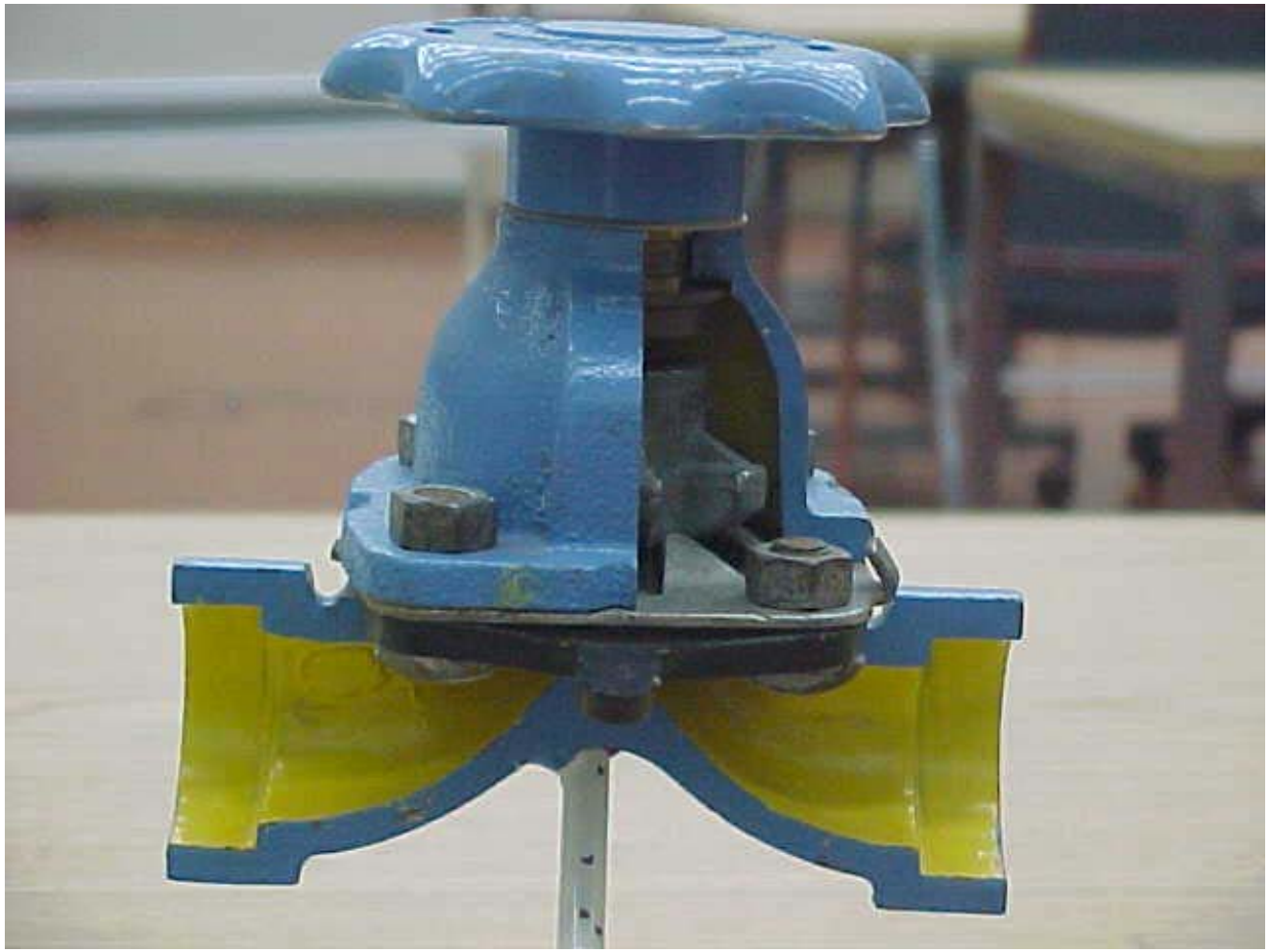
Gate Valve

Butterfly Valve



Ball Valve

Diaphragm Valve

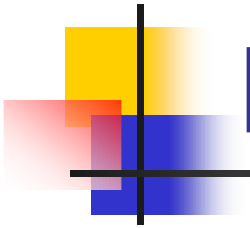


Checking Valve Position

- Visual Check
  - Position of handle
  - Indicator on valve
- Operational Checks
  - Situational Information
    - temperatures, levels, pressures
  - Direction of flow
  - Hearing and touch

Manual Operating Valves

- Safety equipment
- Watch for body mechanics

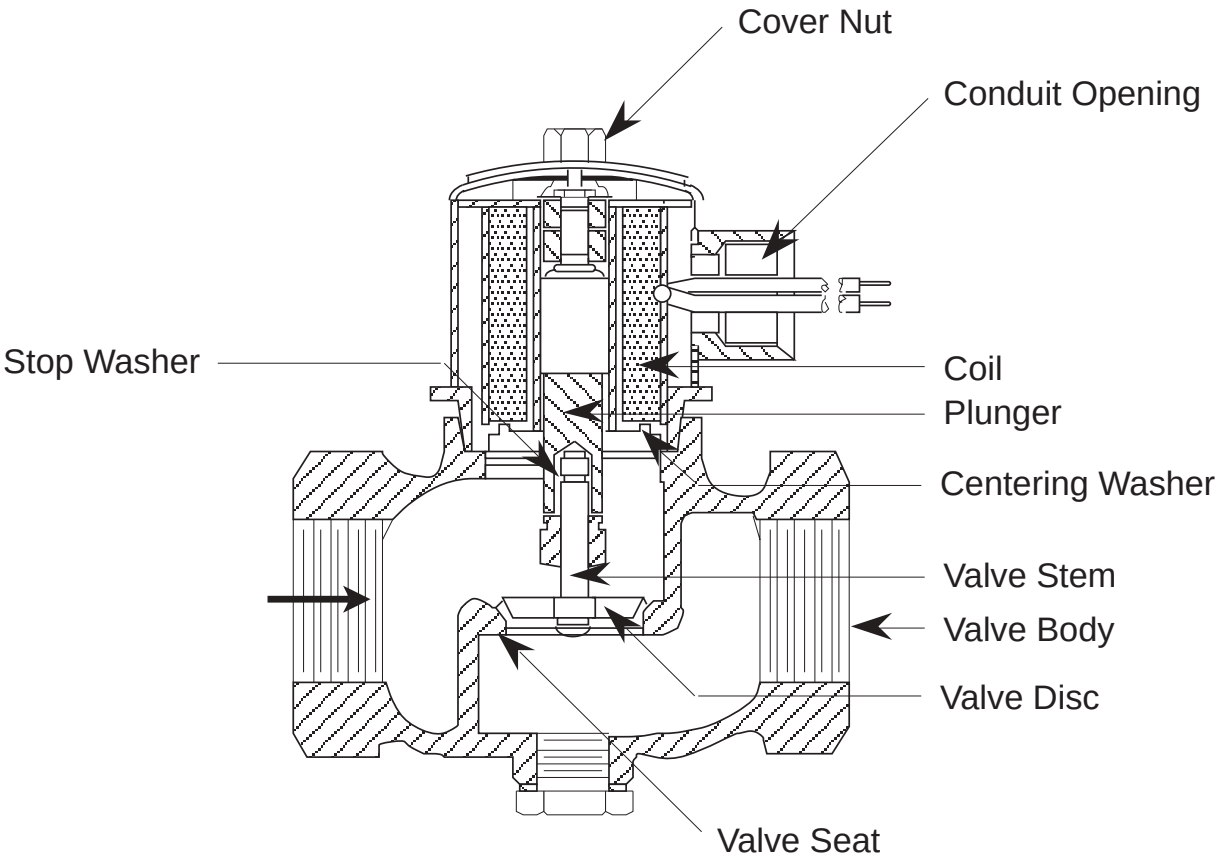


Pneumatic

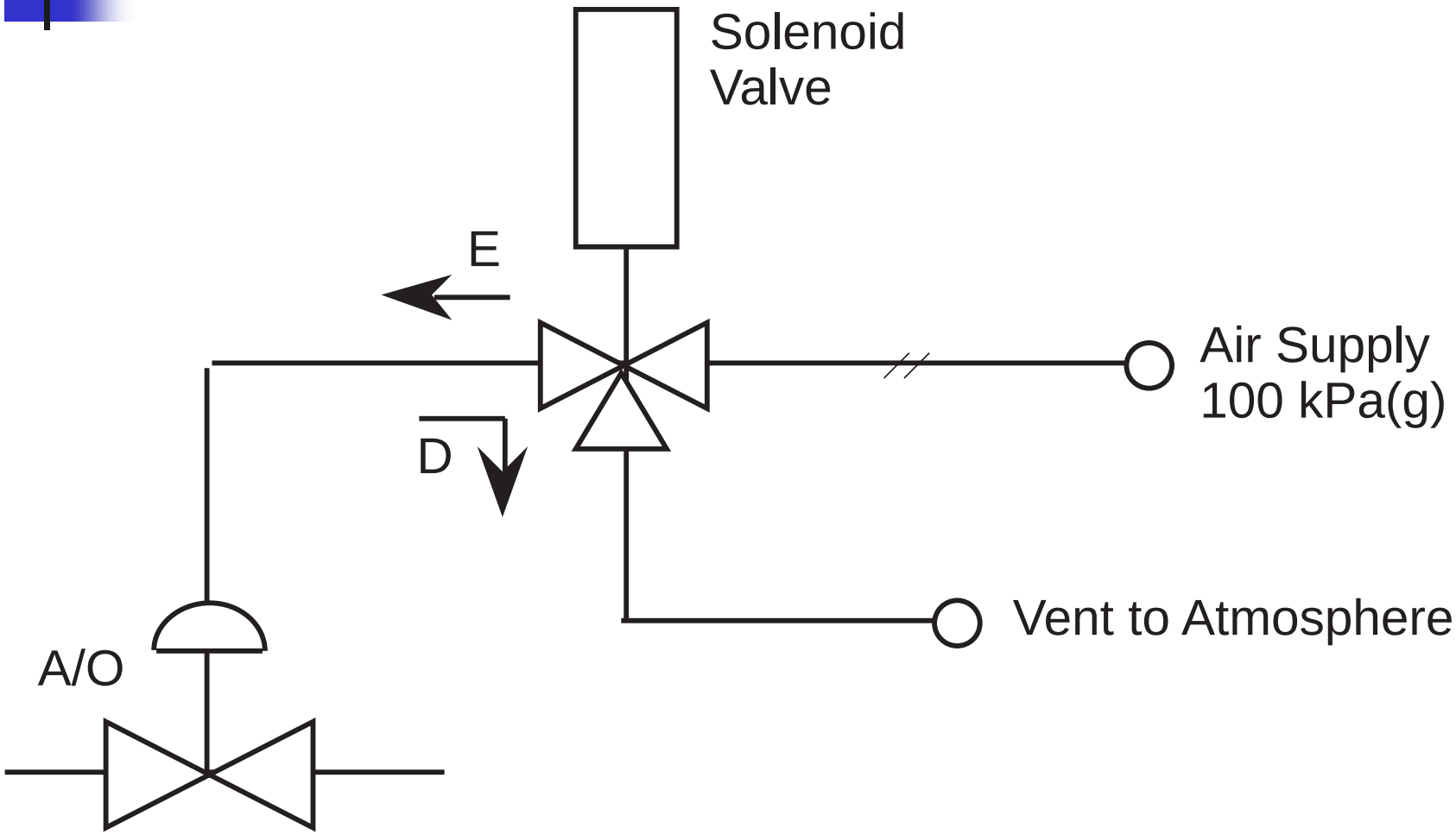
Isolating

Valves

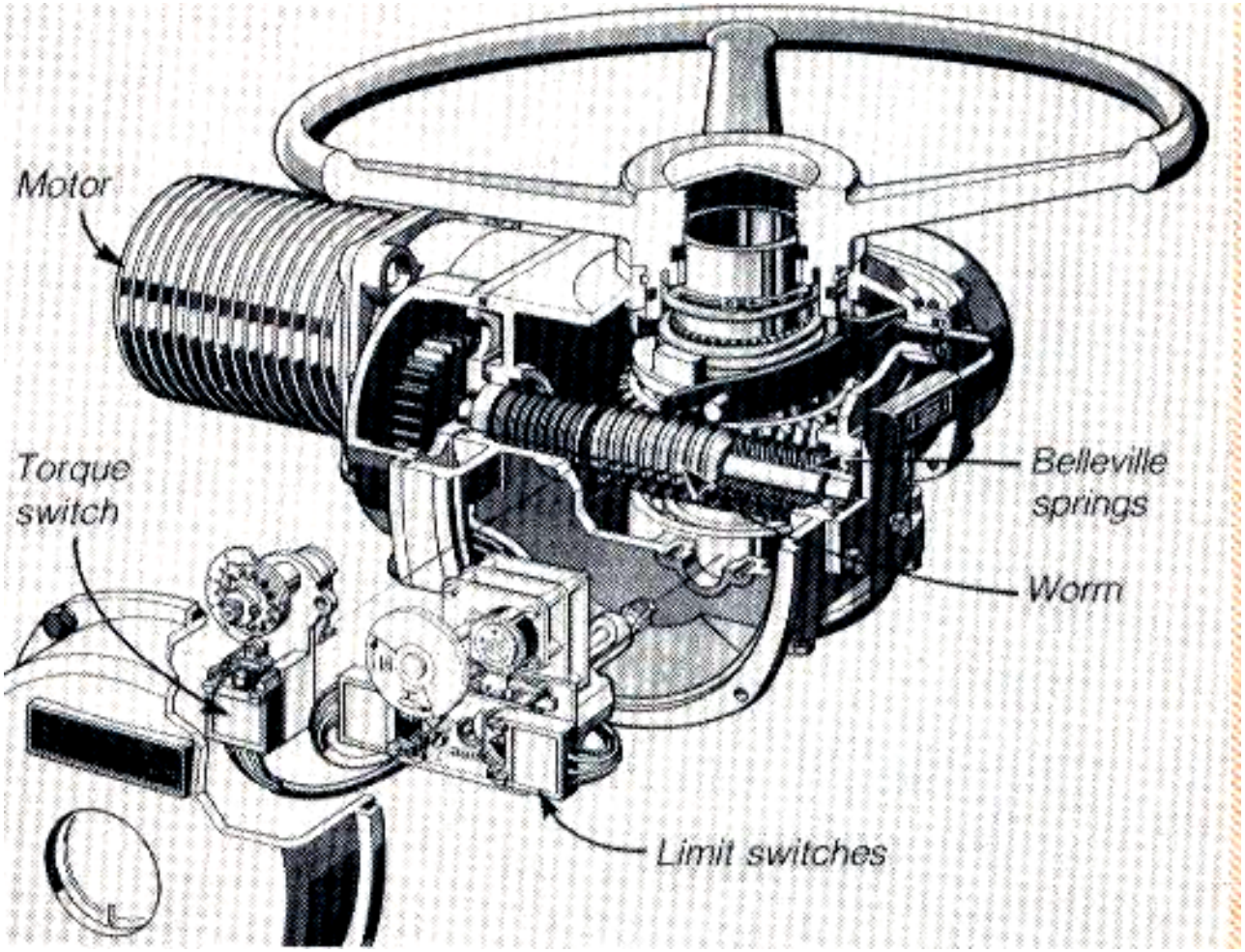
2 Way Solenoid Valve



3 Way Solenoid Valve



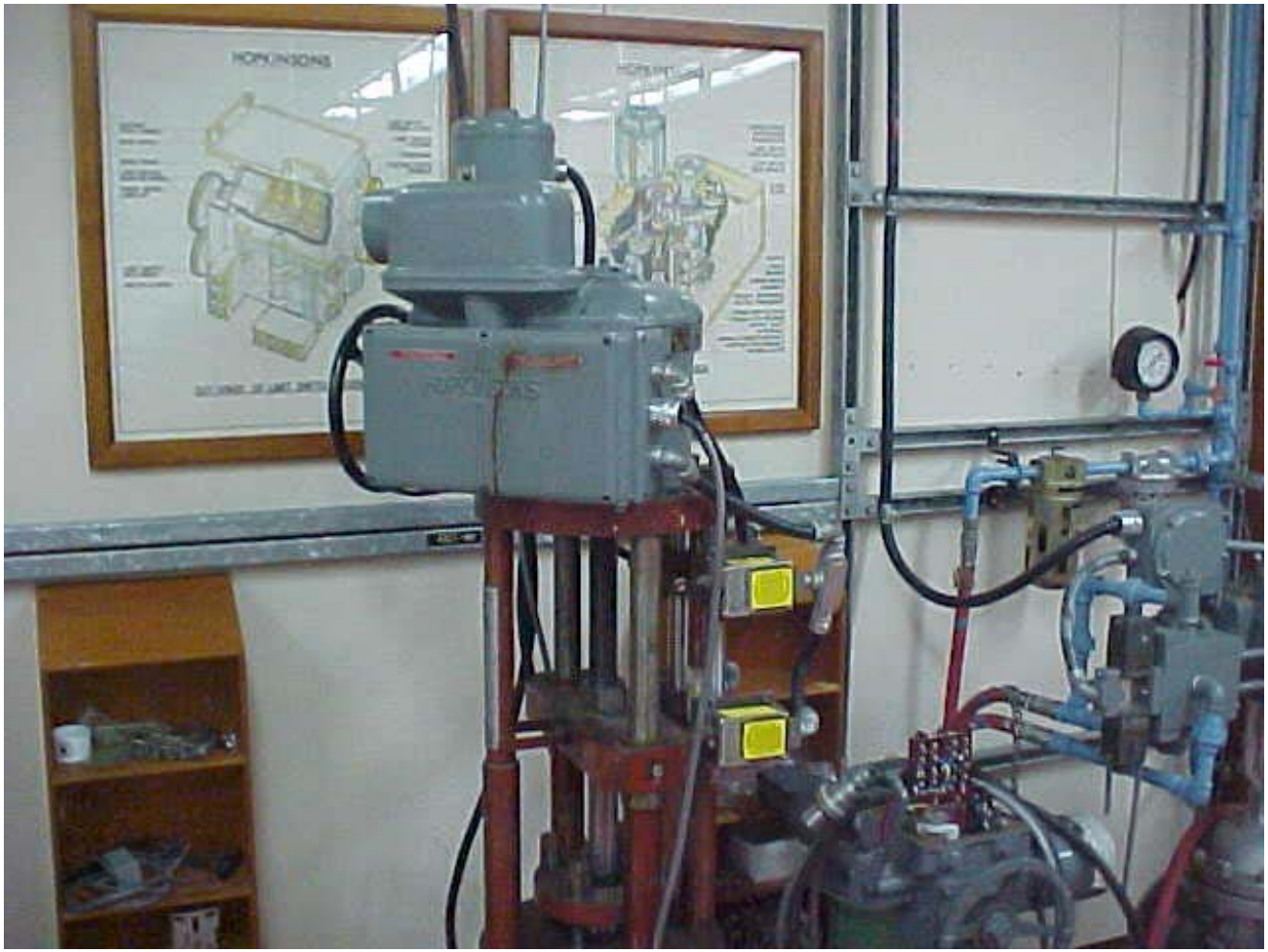
Electric Valve Operator



Electric Actuator

Valve Limit Switches

Electric Actuator



Valve Limit Switches

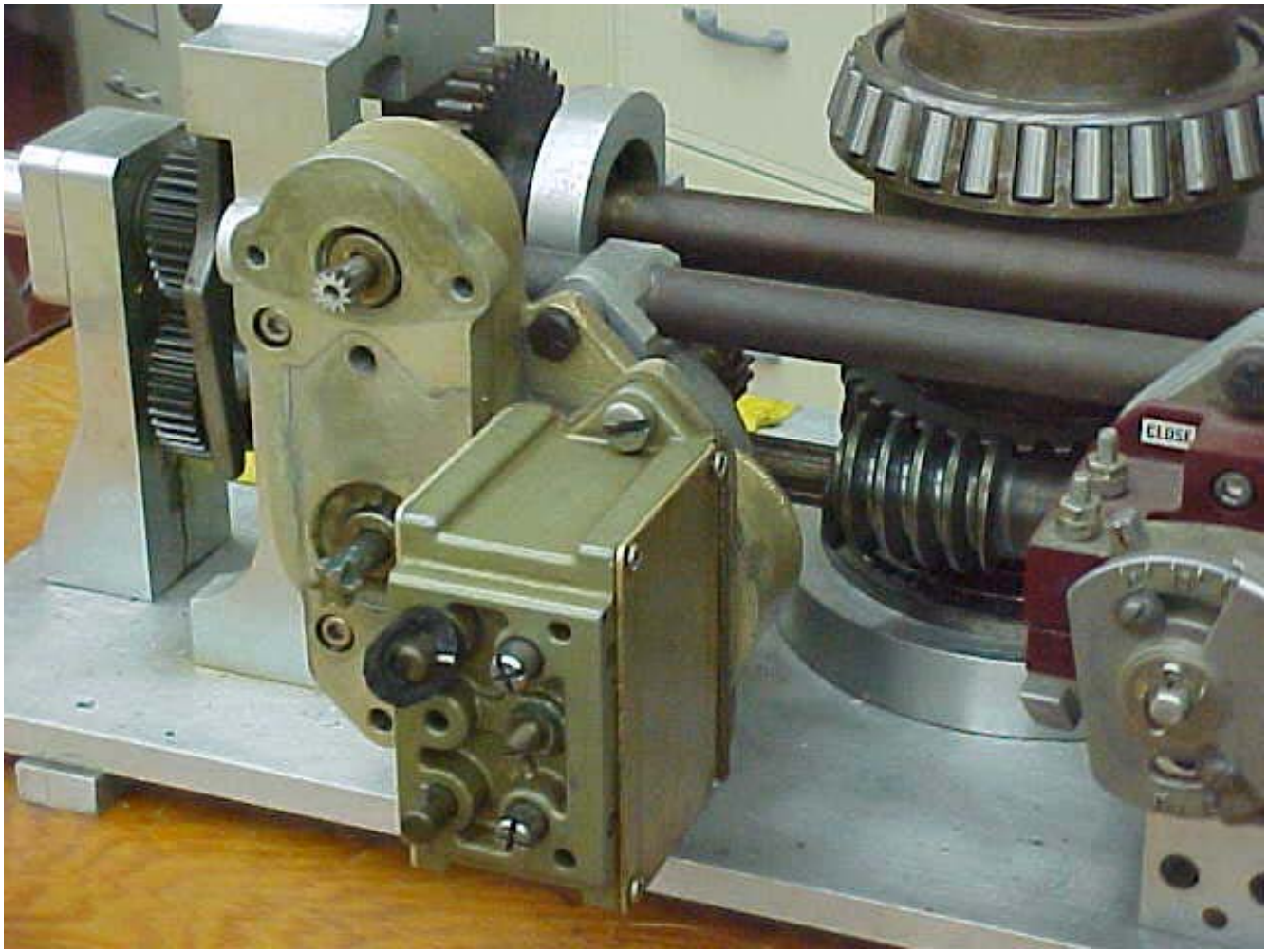
Limitorque Valve Actuator

Limitorque Valve Guts

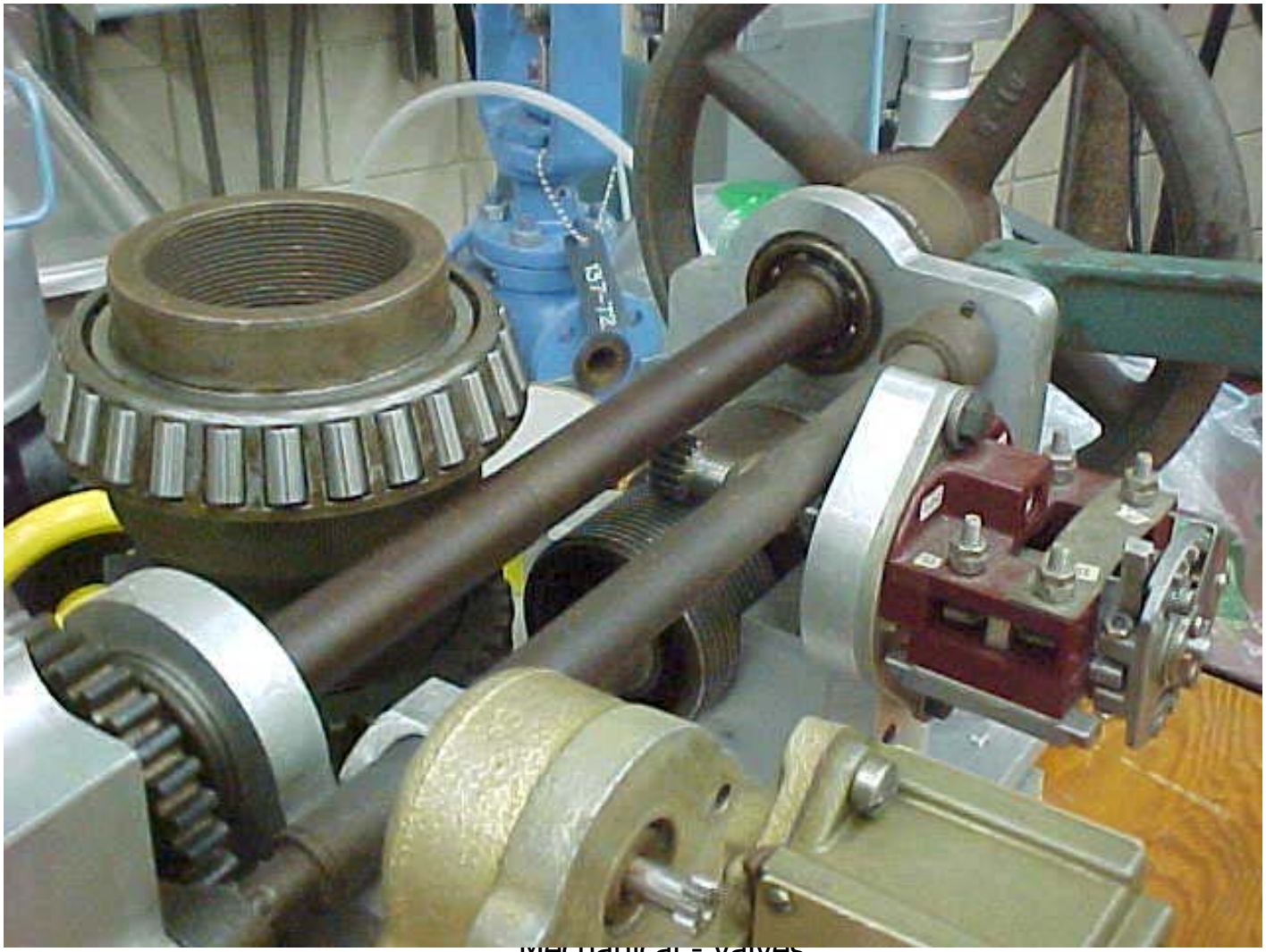
Motor Gear Drive

Worm Gear

Limit Switch



Torque Switch



Electric Valve Operator Switches

- Limit
- Torque
- Speed

Manual Operation

- Hand wheel is engaged with a handle
  - Disengages when motor starts
- Valve can be taken off seat by slack in gearing

Backseating

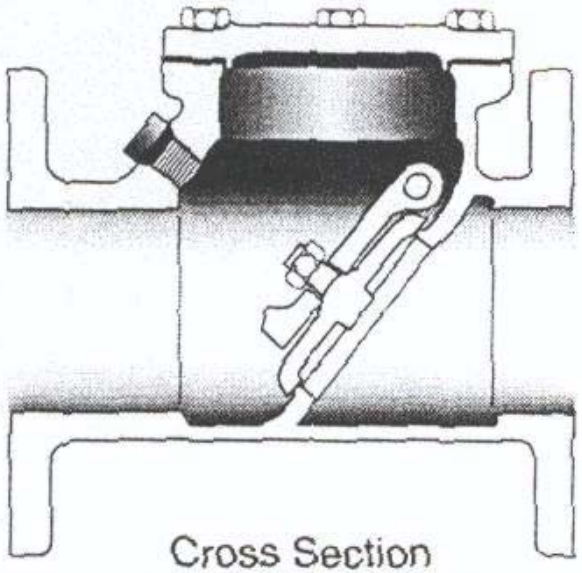
- Some valves
- Seat at top of valve to remove pressure from packing

Intergate Valve

Backflow Prevention

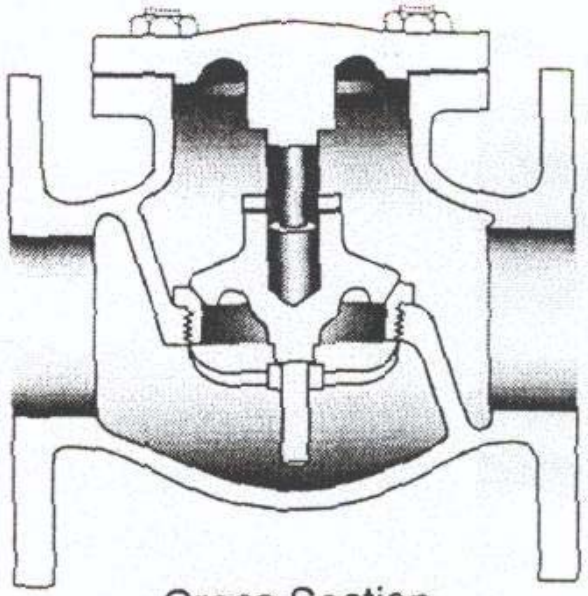
Check Valves

Swing Check



Cross Section
Horizontal Swing

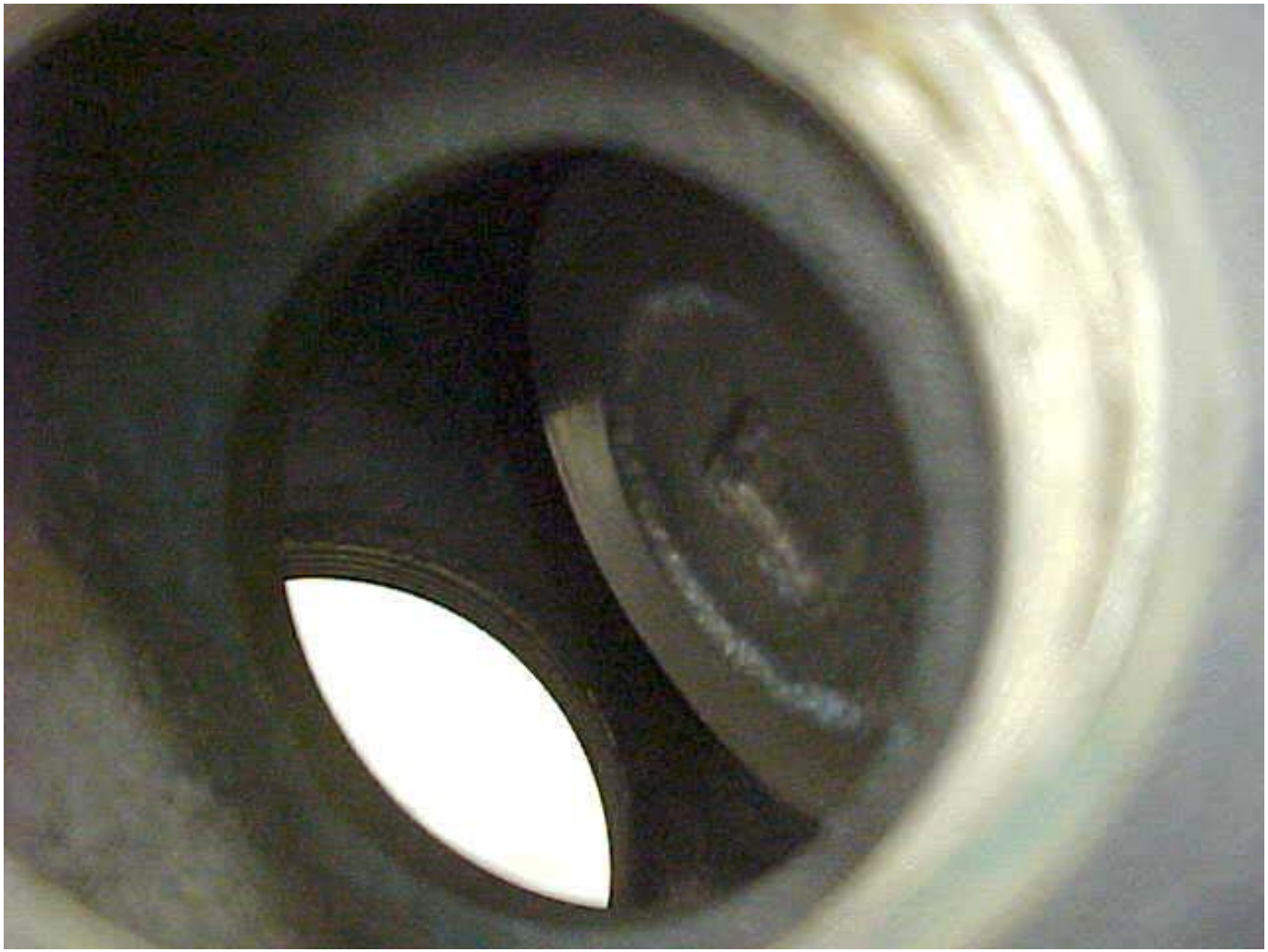
Lift Check



Cross Section
Horizontal Lift

Check Valve Body

Check Valve Gate Open



Check Valve Gate Closed

Safety --- Relief

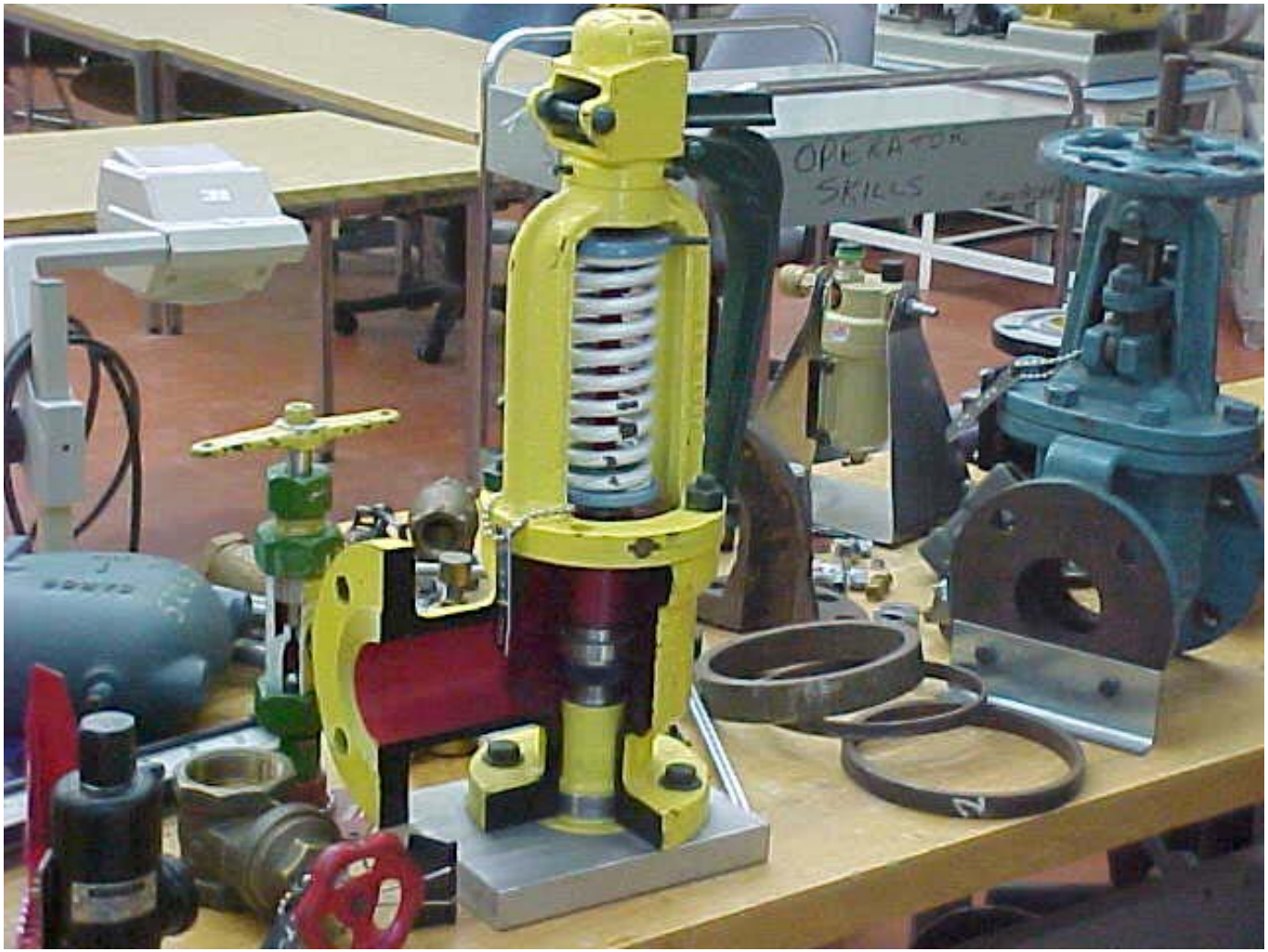
- Relief
  - Lift proportional to overpressure
  - Liquid service
- Safety
  - Open quickly and completely on overpressure
  - Generally for gases
- Safety Relief
  - Good for liquid and gas service

Safety/Relief Valves

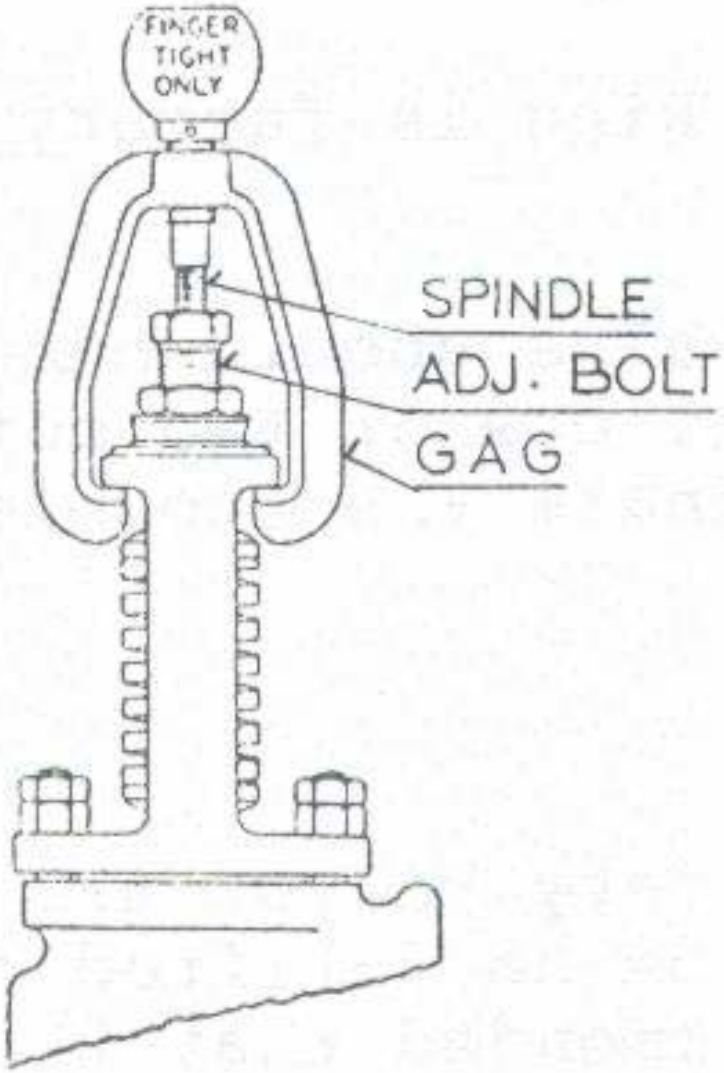
- Lifting pressure
- Capacity
- Popping
- Blowdown
- Chatter
- Flutter
- Simmering

Safety or Relief Valve

Safety or Relief Valve

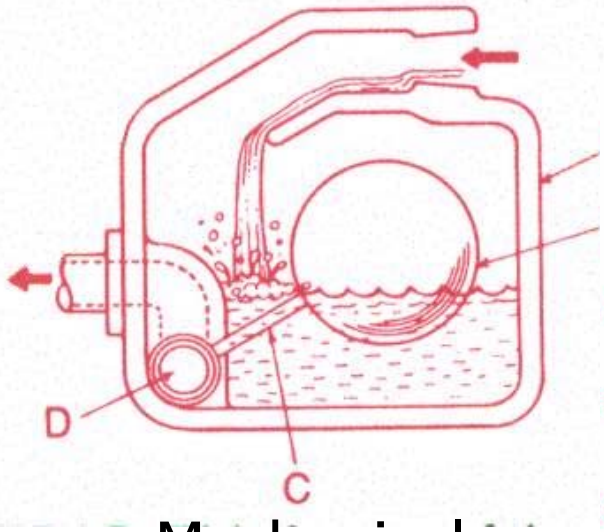


Valve Gags

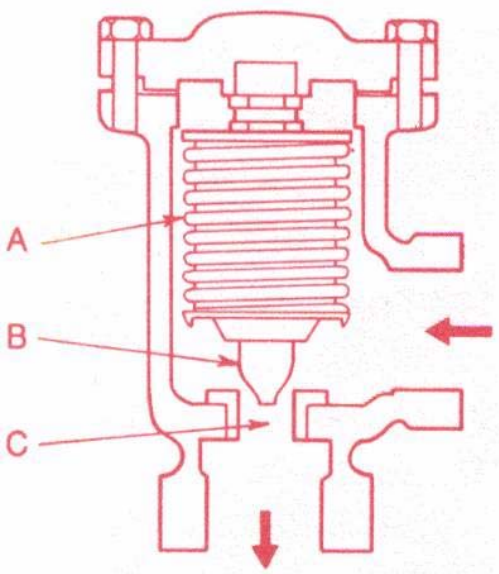


- Require TSSA approval
- ASME Section III requires CNSC approval
- No-approval required for testing

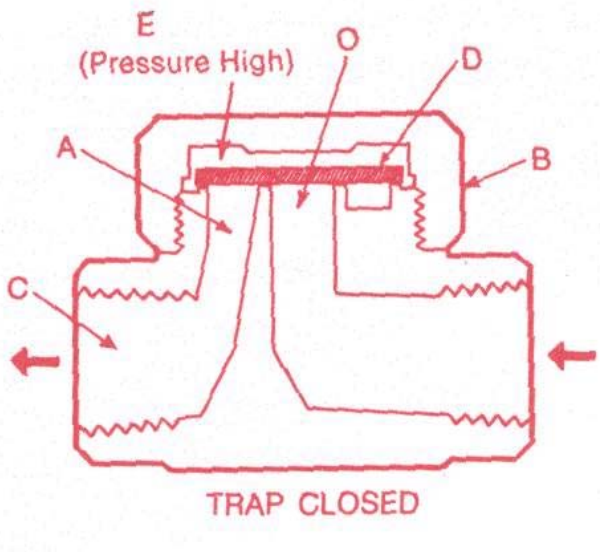
Steam Traps



Mechanical



Thermostatic

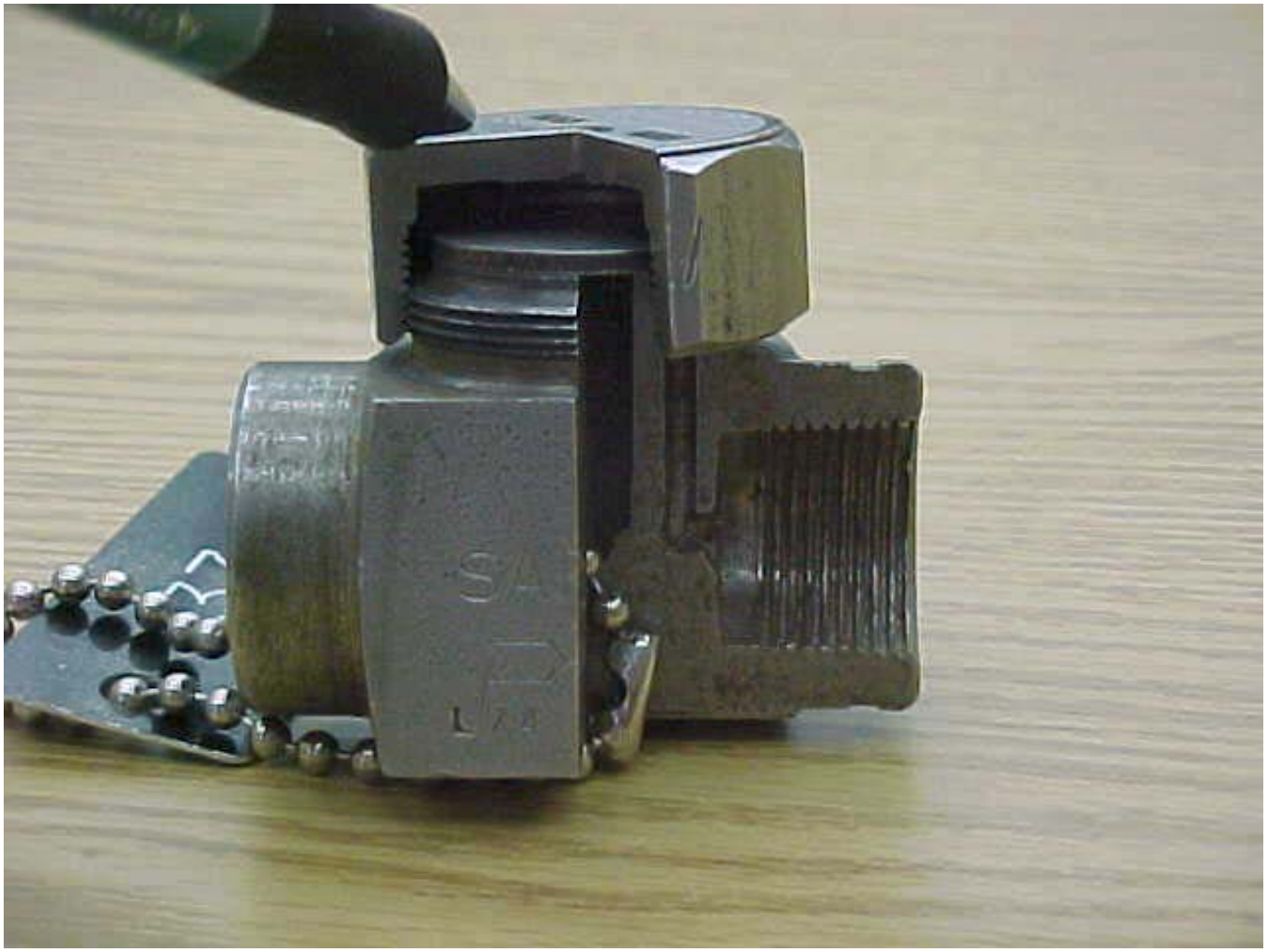


Thermodynamic

Mechanical Steam Trap

Thermodynamic Steam Trap

Again



Trap Operation

- Visual
- Sound
- Temperature
  - Infrared measuring

Trap Open