

# **INTRODUCTION TO VALVES**

<p style="text-align: center;"><b>VALVES</b> <b>Program Objectives</b></p>
--

**By the end of this module, trainees will be able to:**

- **Define a valve**
  
- **Identify the different types of common valves used at Sunrise Dam and their purposes**
  
- **Understand the hazards and safe operating practices for valves**

# VALVES

## General

- *Definition*

A valve is a device for isolating or regulating the flowrate of gases, liquids and slurries through pipework and launder systems.

- *Mode of Operation*

The force required to operate a valve can be carried out either manually (by hand) or mechanically.

Mechanical attachments (actuators) to a valve are usually either electrically or pneumatically operated.

The actuators can be controlled manually (ie a technician pushing a button/switch) or by the plant control system.

## **VALVES**

### **Common Types**

- *Valves at Sunrise Dam*

**Ball**

**Butterfly**

**Knifegate**

**Diaphragm (Saunders)**

**Non Return or Check**

**Tech Taylor**

**Pinch**

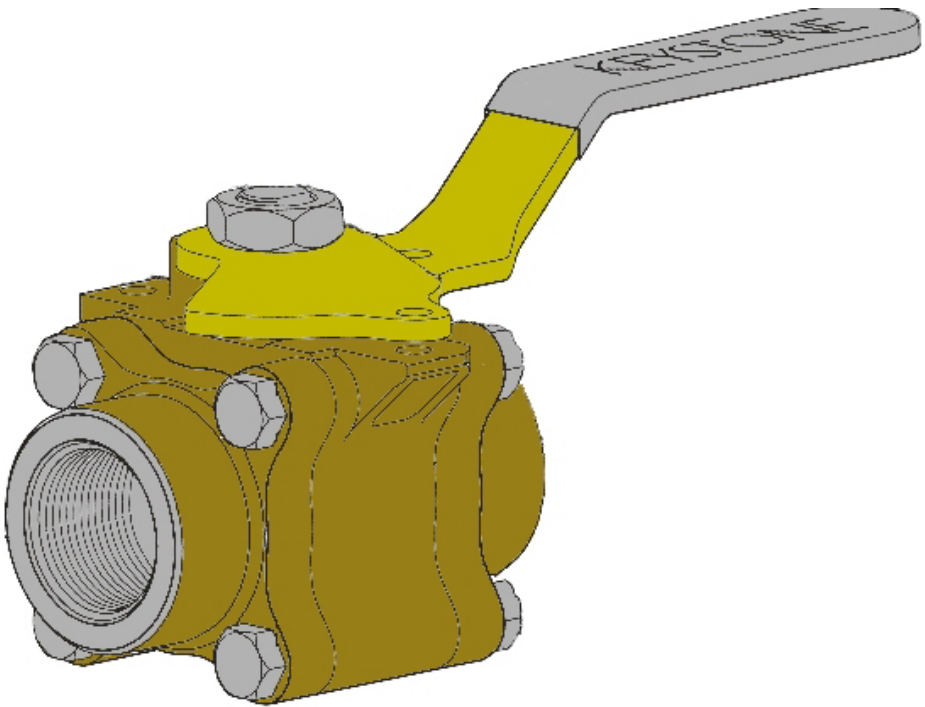
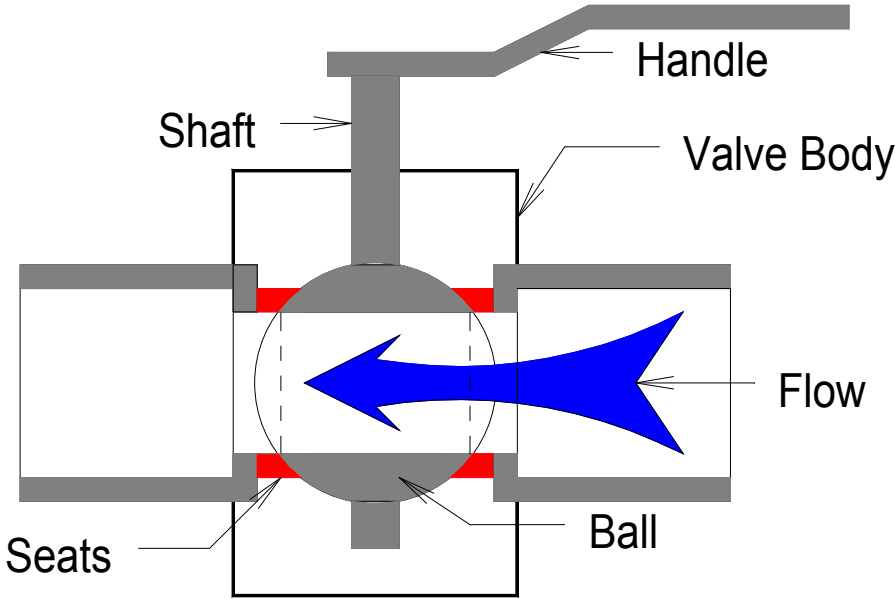
**Pressure Relief**

**There are hundreds of different types of valves available. Any used at Sunrise Dam not covered in the above list will be pointed out during the plant tours.**

# VALVES

## Common Types

- Ball Valves*



VALVES

## Common Types

- *Ball Valves*

**Ball Valves, as the name implies, have a ball with a hole drilled through the centre swivel mounted within the valve body.**

**When the hole in the ball is orientated in the same direction as the pipe, this will result in full flowrate.**

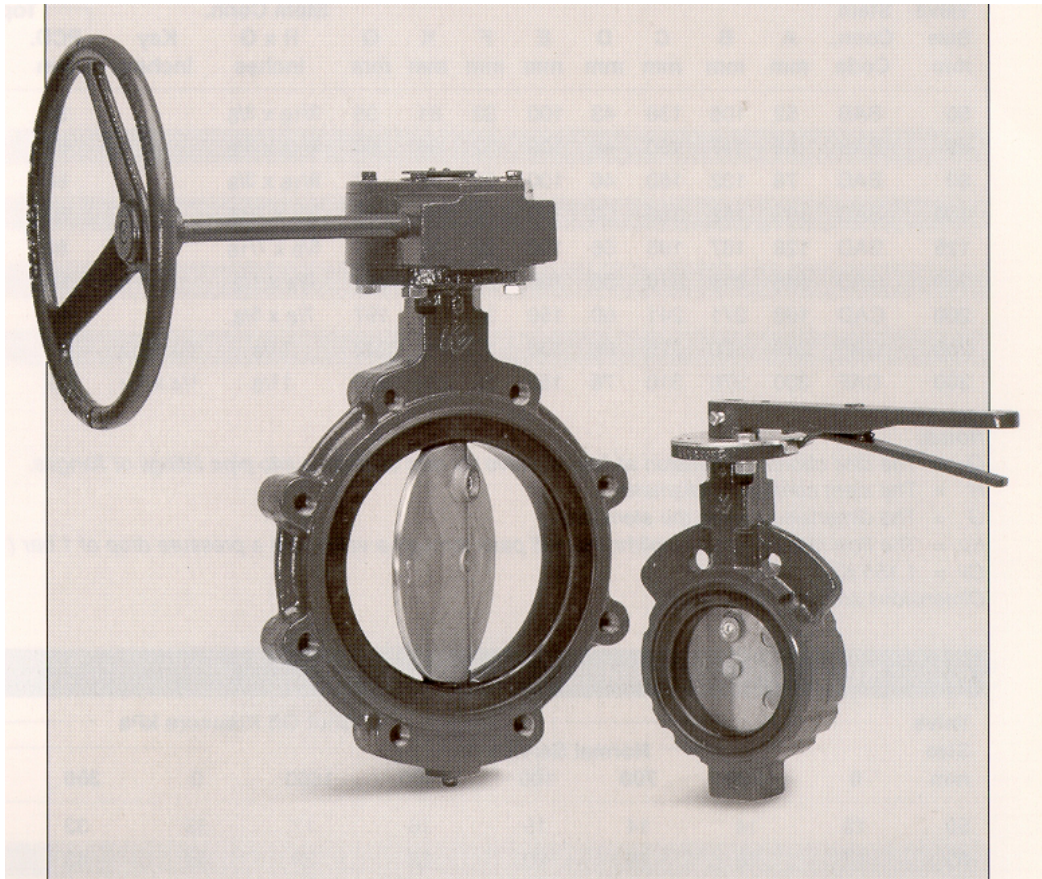
**As the hole in the ball is oriented away from the direction of the pipe, the flowrate will be restricted and finally cut off completely when the hole is oriented at 90 degrees to the pipe direction.**

**Note that the hole in the ball is a lesser diameter than the nominal bore of the pipe.**

# VALVES

## Common Types

- *Butterfly Valves*



## VALVES

### Common Types

- *Butterfly Valves*

**Butterfly valves use a similar principle to ball valves. However, instead of a ball mounted in the valve body a circular disc (called a butterfly because the two half circles around the vertical shaft appear like wings).**

**Again the orientation of the butterfly determines the flowrate. When the butterfly is oriented in the same direction as the pipe (ie presenting the least cross sectional area to the moving fluid), this will result in full flow.**

**As the butterfly is oriented away from the direction of the pipe, the flowrate will be restricted by the increased area of obstruction to the fluid and finally cut off completely when the butterfly is oriented at 90 degrees to the pipe direction.**



# VALVES

## Common Types

- *Knifegate Valves*



## VALVES

### Common Types

- *Knifegate Valves*

Often just called gate valves, these are used as isolation valves.

The principle is simply a knife or gate which is dropped in front of the flow.

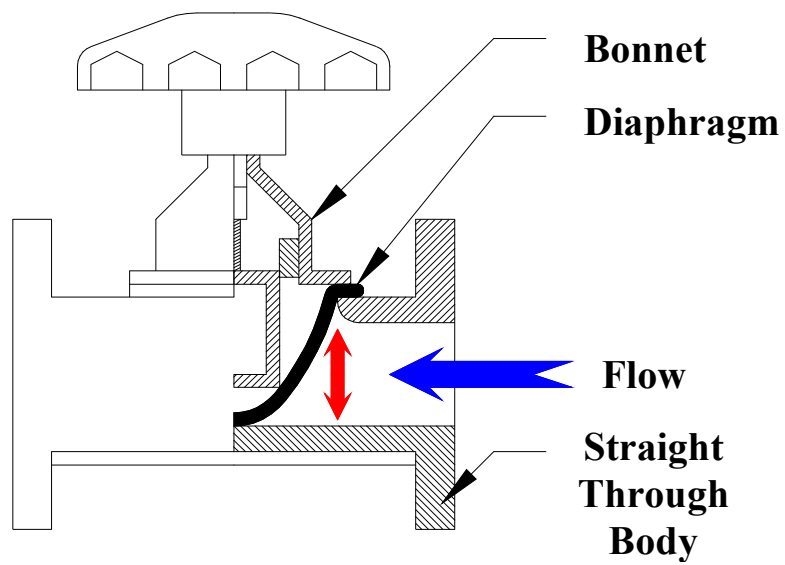
Knifegate valves should never be used in a restrictive role (ie half open) as the base of the knifegate will wear rapidly and not seal properly when closed.

Knifegate valves come in all sizes and can have manual hand wheels or pneumatic actuators to raise and lower the knifegate.

# VALVES

## Common Types

- *Diaphragm (Saunders) Valves*



## VALVES

### Common Types

- ***Diaphragm (Saunders) Valves***

**Diaphragm valves (commonly known as a Saunders, after a popular brand name) work on the principle of a rubber diaphragm or bladder opening and closing.**

**Saunders valves are ideal for restrictive or flow control duties (ie valve half closed to reduce flowrate).**

**There are two main types of Saunders valve body types:**

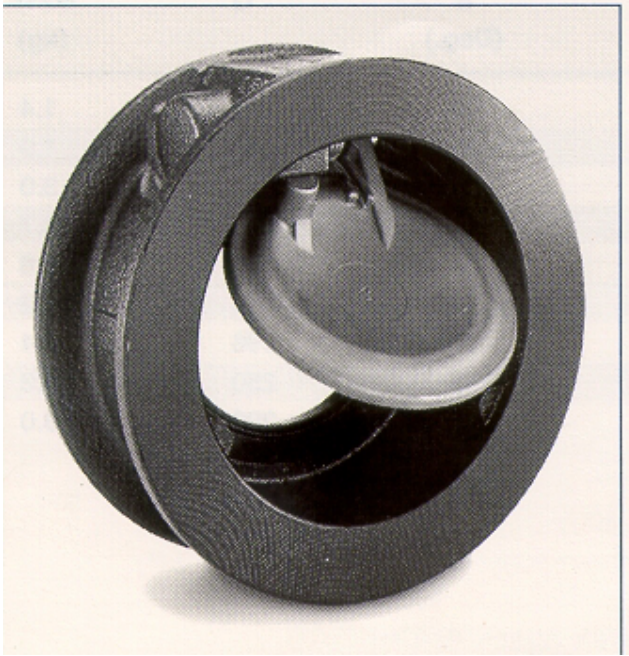
- **Weir type**
- **Straight through type**

**The diaphragm action can be actuated manually or with a pneumatic actuator (the valve body base remains the same).**

## VALVES

### Common Types

- *Check (Non Return) Valves*



## **VALVES**

### **Common Types**

- ***Check (Non Return) Valves***

**Check valves or non return valves are designed to ensure one way flow only.**

**Usually used in water pipework systems and installed immediately after the pump.**

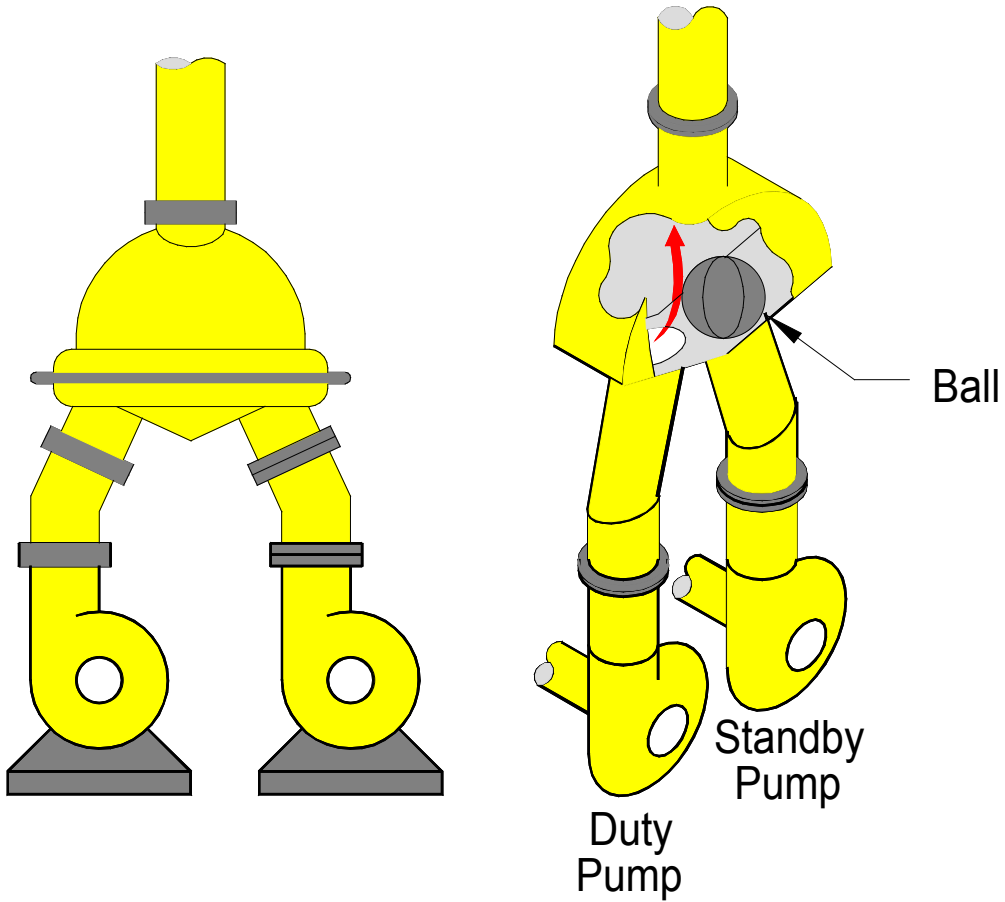
**The most common check valve is the disc type (horizontal or vertical).**

**When flow is sufficient the disc is pushed out. When flow reduces (or reverses if the pump fails) then the disc falls back into a seat blocking the flow.**

# VALVES

## Common Types

- *Tech Taylor Valves*



## VALVES

### Common Types

- *Tech Taylor Valves*

**Tech Taylor Valves (supplied by Warman International) are designed for duty/standby applications where two pipes join into one.**

**The Tech Taylor valve operates on a simple principle where a rubber coated ball is allowed to move freely within the valve body. The ball is forced over to one side to block the standby inlet by the fluid motion entering through the duty inlet and out the exit.**

**Usually used in conjunction with slurry pumps, Tech Taylor valves are rubber lined for wear resistance. The rubber lining and the ball will need to be periodically replaced.**



## VALVES

### Common Types

- *Pinch Valves*

## VALVES

### Common Types

- *Pinch Valves*

**Pinch Valves are used for flow control application, usually to regulate another parameter such as slurry level or thickener underflow % solids.**

**The valve operating principle relies on a flexible section of pipe being flattened between (pinched) two moving bars (like a vice). The tighter the pinch the lower the flowrate.**

**The pinching mechanism can be manual but is usually pneumatically operated and controlled by a PLC system.**

**The rubber section will perish with time and will need to be periodically replaced. The most common brand of pinch valve is Larox. Larox pinch valves are used on the thickener underflow lines at Sunrise Dam**

## VALVES

### Common Types

- *Pressure Relief Valves*

## **VALVES**

### **Common Types**

- ***Pressure Relief Valves***

Obviously as the name suggests pressure relief valves are a safety device designed to open when system pressure (ie in a vessel or pipework) becomes too great and may damage equipment or endanger personnel if not relieved.

The most common type is the spring operated valve. A valve feather under spring pressure is seated in the valve body and exposed to system pressure.

When the system pressure overcomes the spring pressure the valve feather will move in the seat creating an exit to atmosphere allowing the system gas or liquid to escape.

**VALVES**  
**Golden Rules for Valves**

- ***Golden Rule 1***

**Thou shalt not close a valve before opening another!!!!**

**AND/OR**

- ***Golden Rule 2***

**Thou shalt not close a valve before stopping a pump!!!!**

## VALVES Malfunctions

- ***Valve Leaking or not sealing correctly***

**Causes**

- **Wear**
- **Foreign material**
- **Corrosion**
- **Flange or flange bolt failure**

**Effect**

- **Contamination of other streams**
- **Contamination of the environment**
- **Low pressure sequence Trips**
- **Bogging of pipework**
- **etc**

**Actions**

- **Attempt to flush**
- **Remove and clear**
- **Contact maintenance and replace valve**

## VALVES Malfunctions

- ***Valve not operating correctly (ball, butterfly)***
  - Causes**
    - Corrosion of internal
    - Foreign material
    - Corrosion of handle
    -
  - Effect**
    - Valve not sealing
    - Low pressure sequence Trips
    - High pressure sequence Trips
    - etc
  - Actions**
    - Attempt to flush
    - Remove and clear
    - Contact maintenance and replace valve

## **VALVES**

### **Safety**

- **High pressure systems**
- **Confined spaces**
- **Heights**
- **Over exertion to turn a tight valve**