DURGA VALVES

DVPL

3-STAGE SURGE SUPPRESSION AIR VALVE

MANAGE WATER HAMMER

DVPL stands at the forefront of Fluid Management Technology, a position earned through years of expertise and in-depth knowledge. The company is dedicated to creating advanced, innovative solutions for Water Management Systems, which have been successfully implemented in a wide range of projects, both large and small. This commitment to excellence allows DVPL to address complex water challenges with precision and efficiency.

Every day, the impact of DVPL's work is felt as its valves play a crucial role in providing clean, safe water to millions of people across India. These moments of service, however small they may seem, represent a larger vision of improving lives and contributing to the nation's well-being.

As a company, DVPL takes immense pride in supporting the Make-in-India initiative. By manufacturing high-quality, locally-made products, DVPL not only strengthens the country's industrial capabilities but also fosters innovation that resonates globally.

CI | CS | DI | SS | FAB

MANAGE WATER HAMMER

3-STAGE SURGE SUPPRESSION AIR VALVE

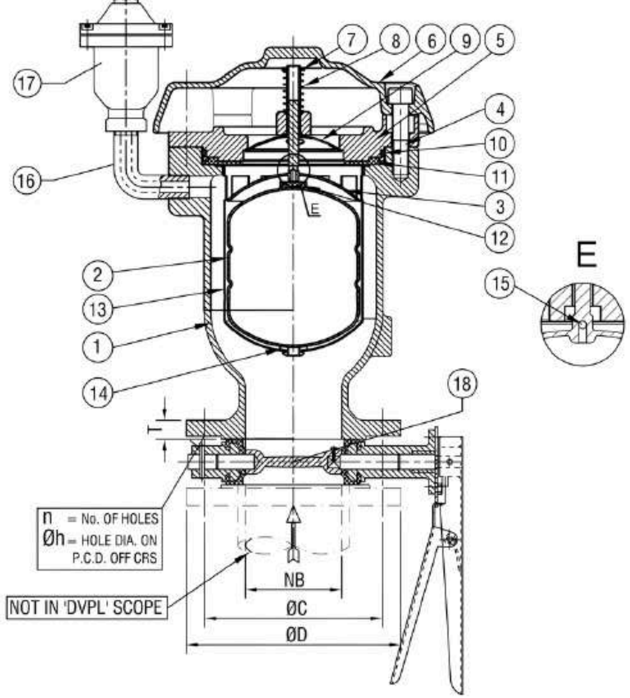
Full Bore Advantage

High Discharge & Intake
Anti Shock & Air Venting
Tamper Proof

PROUDLY MANUFACTURED IN INDIA

THE VALVE VALUE

PRESSURE, FLOW, LEVEL, & LEAKAGE SOLUTIONS



(APPROVAL STAMP)

MATERIALS OF CONSTRUCTION

SL.No.	DESCRIPTION	MATERIAL	SPECIFICATION
1	BODY (AIR VALVE)	DUCTILE IRON	EN 1563 / DIN 1693 Gr. GGG-50
2	FLOAT	STAINLESS STEEL	ASTM A 240 TYPE-304
3	SEALING ARC / ORIFICE SEAT	STAINLESS STEEL	ASTM A 240 TYPE-304
4	IN HEX. BOLT	CARBON STEEL	GALVANIZED
5	BONNET	DUCTILE IRON	EN 1563 / DIN 1693 Gr. GGG-50
6	SCREEN COVER	DUCTILE IRON	EN 1563 / DIN 1693 Gr. GGG-50
7	NUT	CARBON STEEL	GALVANIZED
8	SPRING	STAINLESS STEEL	ASTM A 276 TYPE-304
9	ANTI SHOCK DISC	STAINLESS STEEL	ASTM A 240 TYPE-304
10	O-RING	RUBBER	NBR
11	LARGE ORIFICE SEAL	RUBBER	EPDM
12	NOZZLE SEAT	RUBBER	EPDM
13	GUIDE BARREL	STAINLESS STEEL	ASTM A 240 TYPE-304
14	BUFFER	RUBBER	EPDM
15	SMALL NOZZLE	STAINLESS STEEL	ASTM A 276 TYPE-304
16	TUBE BEND	MILD STEEL	-
17	AUTOMATIC AIR VENT VALVE	DUCTILE IRON	EN 1563 / DIN 1693 Gr. GGG-50
18	ISOLATING VALVE	LEVER OPERATED WAFER TYPE BUTTERFLY VALVE	

HYDROSTATIC TEST PRESSURE FOR RATING-12 BAR

BODY TEST PRESSURE :- 18 BAR WITH WATER DURATION 5 MIN.
SEAT TEST PRESSURE :- 12 BAR WITH WATER DURATION 2 MIN.

NOTES

1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE STATED.
2. AIR VALVE AS PER AWWA C512 & BUTTERFLY VALVE AS PER IS:13095.
3. FLANGED ENDS SHALL BE FLAT FACED & DRILLED TO BS EN 1092-2 PN-10 TABLE-8.
4. ALL VALVES SHALL BE PAINTED ELECTROSTATIC FUSION BONDED BLUE COLOUR EPOXY PAINT.
5. MARKING:- BRAND NAME / SIZE / RATING / HEAT NO. / SL. NO & FLOW DIRECTION.

CLIENT'S REF.

PROJECT	SURGE PROTECTION SYSTEM FOR KMLIS NO. 2
P.O. NO	KMLIS-BV/24-25/02 DATE: 08.07.2024
CLIENT	EXECUTIVE ENGINEER, KRISHNA MARATHWADA CONSTRUCTION DIVISION No. 1, DHARASHIV
AGENCY	MAHAVIR HYDRO PVT. LTD.

DVPL
DURGA VALVES PRIVATE LIMITED
ICHAPUR ROAD, CANAL SIDE, HOWRAH-4 (W.B.)

2024	INITIAL	DATE
DRAWN	B.DAS	24.07.2024
CHECKED	S.PAL	24.07.2024
APPROVED	P.ROY	24.07.2024
JOB No.	J-2750	SCALE : N.T.S.

TITLE:- DI FLANGE END 3- STAGE SURGE SUPPRESSION AIR VALVE WITH LEVER OPERATED WAFER TYPE ISOLATING BUTTERFLY VALVE.

DRAWING No. : DVPL / DI-SAV / 13634 REV. 0

Durga Valves Pvt. Limited Ichapur Howrah

PN 10, 16, 20, 25
50 mm to 300 mm

	0	-	P.ROY	24.07.2024	ISSUED FOR APPROVAL
	REV	ZONE	APPVD BY	DATE	PARTICULARS
REFERANCE DRAWING	REVISION				

DVPL 3-stage surge suppression air and vacuum breaker air valve is a specialized valve designed for water pipelines to manage air-related issues while also mitigating surge pressures. It performs three main functions:

Key Functions:

Air Release (During Filling)

Expels large volumes of air during pipeline filling to prevent air pockets that can cause flow restrictions or pressure surges.

Vacuum Breaker (During Draining or Negative Pressure Conditions)

Allows air to enter the pipeline when it is draining or experiences negative pressure, preventing pipe collapse due to vacuum conditions.

Surge Suppression (During Transients or Sudden Pressure Changes)

Modulates float slamming and air release to prevent rapid closure, which can create damaging pressure surges (water hammer). An Anti-Shock disc and controlled air release dampens surge waves, protecting the pipeline.

Design Features:

Three-Stage Mechanism:

a. Large Orifice: For rapid air intake and release.
b. Small Orifice: For controlled air release to suppress surges.
c. Anti-Shock Disc and Spring for Float Mechanism: To regulate air movement in response to pressure fluctuations and prevent sudden slamming of the float

Non-Clogging Design: Ensures smooth operation even in raw water systems.

Corrosion-Resistant Materials: Suitable for harsh environments and potable water applications.

Anti-shock in a valve refers to a feature that helps mitigate sudden pressure surges or water hammer effects within a pipeline system. This function is particularly important in air valves, where rapid air release or closure can cause destructive pressure fluctuations.

An anti-shock orifice or modulating mechanism (such as a spring, disc, or controlled vent) gradually reduces the closing speed, preventing shock waves from forming.

Applications:

- Municipal Water Supply Networks
- Irrigation Systems
- Hydropower and Industrial Pipelines
- Wastewater and Sewage Systems

Design Features:

- Surge-dampening and slam-preventing design.
- Functions as both an air release valve and an air & vacuum valve.
- Aerodynamic design for high flow rates during air intake and discharge.
- Reliable operation reduces water hammer incidents.

- **Specifications:**
  - Working pressure range: 0.2-30 bar.
  - Maximum working temperature: 60°C.
  - Available in sizes: 50 mm to 300 mm
  - Equipped with regulated exhaust devices to limit secondary surges during column separation.
  - Provides full airflow into the pipeline during vacuum conditions to prevent vapor pockets.
  - Double-acting (3-stage) design combining high-volume air release, pressurized air release, anti-slam, and vacuum break functions.
  - Compact tubular design is suitable for various applications.

Installation Guidelines:

- Proper installation of air and vacuum breaker valves is crucial for optimal performance and system protection. Here are general guidelines to consider:
- Location:
- High Points: Install valves at pipeline high points where air is likely to accumulate.
- Long Horizontal Runs: Place valves at regular intervals along uniform grade lines to manage air pockets effectively.
- Pump Discharge: Position valves on the pump discharge side before check valves to handle air during pump start-up and shutdown.
- Orientation:
- Mount valves in a vertical position to ensure proper operation.
- Ensure that the valve inlet is aligned with the pipeline to facilitate unobstructed airflow.
- Isolation:
- Install an isolation valve below each air valve to allow for maintenance without disrupting the system.
- Consider including a drain valve for safe removal of water during servicing.
- Accessibility:
- Ensure valves are accessible for routine inspection and maintenance.
- Provide adequate space around the valve for operation and servicing tasks.
- Protection:
- Use protective covers or enclosures to shield valves from environmental factors and potential damage.
- In areas prone to contamination, consider installing strainers or filters upstream to prevent debris from entering the valve.
- Testing:
- After installation, test the valve to confirm proper operation.
- Regularly inspect and maintain the valve according to the manufacturer's recommendations to ensure long-term reliability.
- For detailed installation instructions, always refer to the guidelines provided with the valve. Proper adherence to these guidelines will enhance system efficiency and longevity.

Technical Specifications

Parameter Details as per Manufacturers Design

Body, Cover Material:

Ductile Iron (DI) GGG 50/SGI 500/7 - 400/15

Coating

Epoxy Coating/Liquid Epoxy 250 DFT minimum.

Float, Guide, Anti Shock Disc, Spring, Sealing Arc

Stainless Steel (SS 420/SS 304/SS 316)

Gasket

EPDM/NBR Rubber Seal

Pressure Ratings

PN10 / PN16 / PN20 / PN25 Higher Rating On Request in WC-B

Size Range

DN 50 to DN 300 mm

End Connections

Flanged as per IS 1538 / DIN PN10, PN16, PN25

Operation

Self Operated with Adjustable Anti Shock Disc Adjustment

Max Operating Temperature

Up to 60°C (Water Service)

Application (Suitable for Potable Water)

Water Transmission, Irrigation, Industrial Pipelines.

MANAGE WATER HAMMER

3-STAGE SURGE SUPPRESSION AIR VALVE

Water Hammer and Transients in Pipelines

1. What is a Water Hammer?

A water hammer (also called hydraulic shock) is a pressure surge or wave caused when a fluid in motion is forced to stop or change direction suddenly. This typically happens when:

- A valve is closed suddenly in a pipeline.
- A pump starts or stops abruptly. (Power Failure)
- There is a sudden change in flow rate due to operational adjustments.
- Column Separation: When water flow stops, air pockets form, leading to pressure surges.
- Pipe Bursts/Leaks: Rapid flow changes due to system failures.
- Check Valve Slam: Backflow causes check valves to close suddenly, generating shock

2. Effects of Water Hammer:

- High-pressure spikes that exceed the pipe's rated pressure.
- Damage to infrastructure like, fittings, valves, pumps, concrete blocks, water logging, road cave-ins, damage to property etc.
- Pipe bursts or joint failures due to extreme pressure changes.
- Noisy banging or thumping sounds in the system.

3. What are Transients in Pipelines?

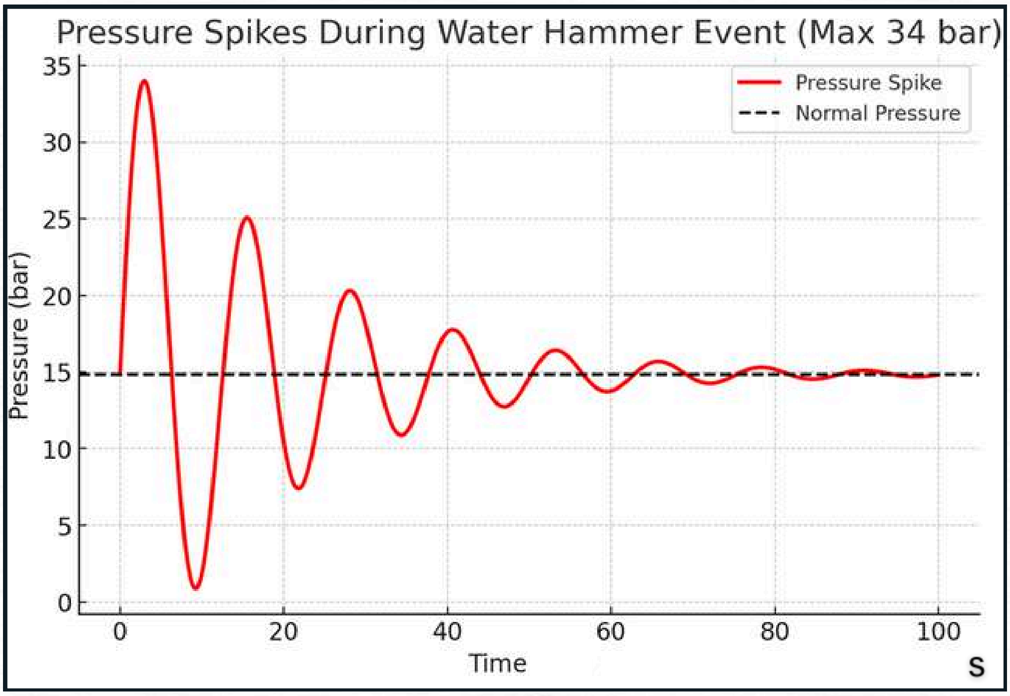
Transients are temporary pressure fluctuations in a fluid system caused by sudden changes in flow. Water hammer is a type of transient, but transients can also include:

- Surge waves from pump start/stops (Power Failure)
- Negative pressure transients that create vacuum conditions.
- Oscillations of pressure and flow rate due to system inertia.

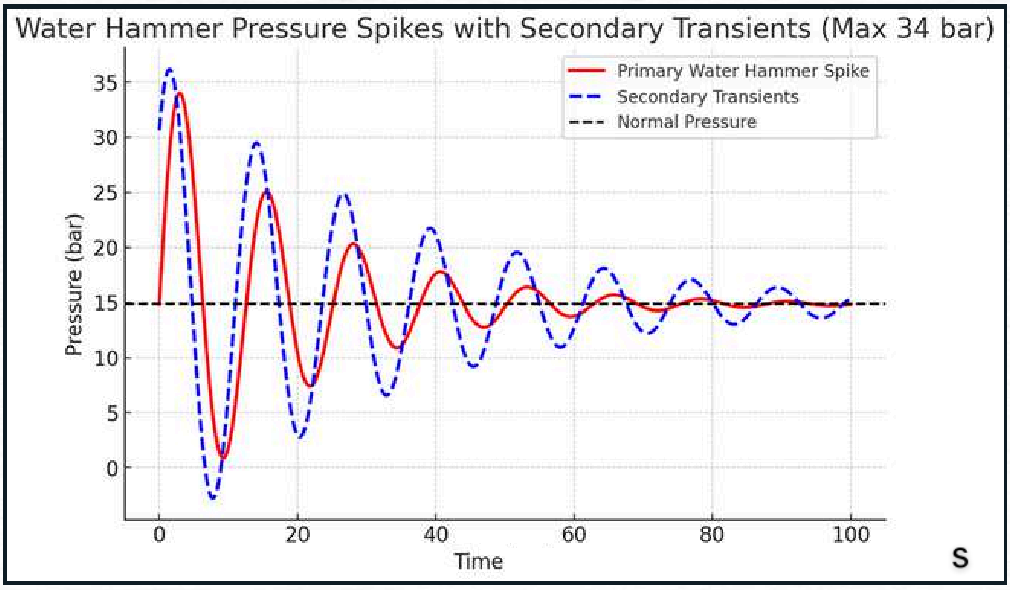
Secondary Transients in Pipeline Systems

1. What are Secondary Transients?
Secondary transients are additional or follow-up pressure surges that occur after the initial water hammer event. They are caused by the interaction of the primary pressure wave with system components like pumps, valves, air pockets, and pipe walls.
2. How Do Secondary Transients Form?
When the first pressure surge (primary transient) reflects off system boundaries (e.g., closed valves, pump stations, bends, or dead ends), it can create multiple pressure oscillations. These pressure waves can interact, amplifying or reducing the initial surge.

Key Triggers for Secondary Transients:
Rapid Air Release or Air Pocket Collapse – When trapped air suddenly escapes, it can create a follow-up pressure wave.
Check Valve Slam – If a check valve closes suddenly, a second wave of pressure fluctuation occurs.
Pipe Elasticity & Fluid Compressibility – Pipes expand and contract under pressure changes, influencing wave reflections.
Column Rejoining – When separated water columns reconnect, they generate a high-pressure surge.
Uncontrolled Pump Start/Stop – A sudden stop followed by a restart can trigger multiple pressure waves.
3. Effects of Secondary Transients
Extended Oscillations: Multiple waves can stress the pipeline over time.
Increased Surge Pressures: The second wave may be stronger than the first, causing greater damage.
Cavitation and Pipe Collapse: If negative pressures persist, vapor pockets form and collapse violently.
Component Fatigue: Repeated transient waves can lead to fatigue failure in valves, joints, and fittings.
4. How to Control and Mitigate Secondary Transients
- Surge Anticipator Valves – Open momentarily before a pressure wave arrives, preventing secondary shocks.
- Anti-Shock Air Valves – Release air at a controlled rate to avoid sudden vacuum or rejoining surges.
- Check Valve with Dashpot Mechanism – Slows down valve closure to prevent valve slam.
- Soft-Start/Soft-Stop Pumps – Gradually adjust pump speed to avoid abrupt changes.
- Surge Tanks & Accumulators – Absorb pressure fluctuations and prevent wave reflection.
- Proper Pipeline Design – Ensure correct pipe sizing, slope, and material selection to minimize wave propagation.



Here is a graph showing pressure spikes during a water hammer event. The red curve represents the sudden surge in pressure, followed by oscillations that gradually decay over time. The dashed black line represents the normal pipeline pressure.



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ASME B31.1 (Power Piping) & ASME B31.3 (Process Piping):

ASME (American Society of Mechanical Engineers) codes and standards emphasize that the design of pressure vessels, piping systems, and other mechanical components must consider ultimate conditions to ensure safety and reliability. The key ASME codes that address these considerations include ASME B31.1, B31.3, and ASME BPVC (Boiler and Pressure Vessel Code).

Key ASME Guidelines on Ultimate Conditions

- Design must consider maximum allowable working pressure (MAWP), temperature limits, and transient conditions (e.g., surge, water hammer, pressure spikes).
- Safety factors are applied to account for uncertainties in material properties, operating conditions, and potential failures.
- Pressure relief devices and other mitigation measures must be incorporated to handle extreme conditions.

Water Hammer & Transient Analysis:

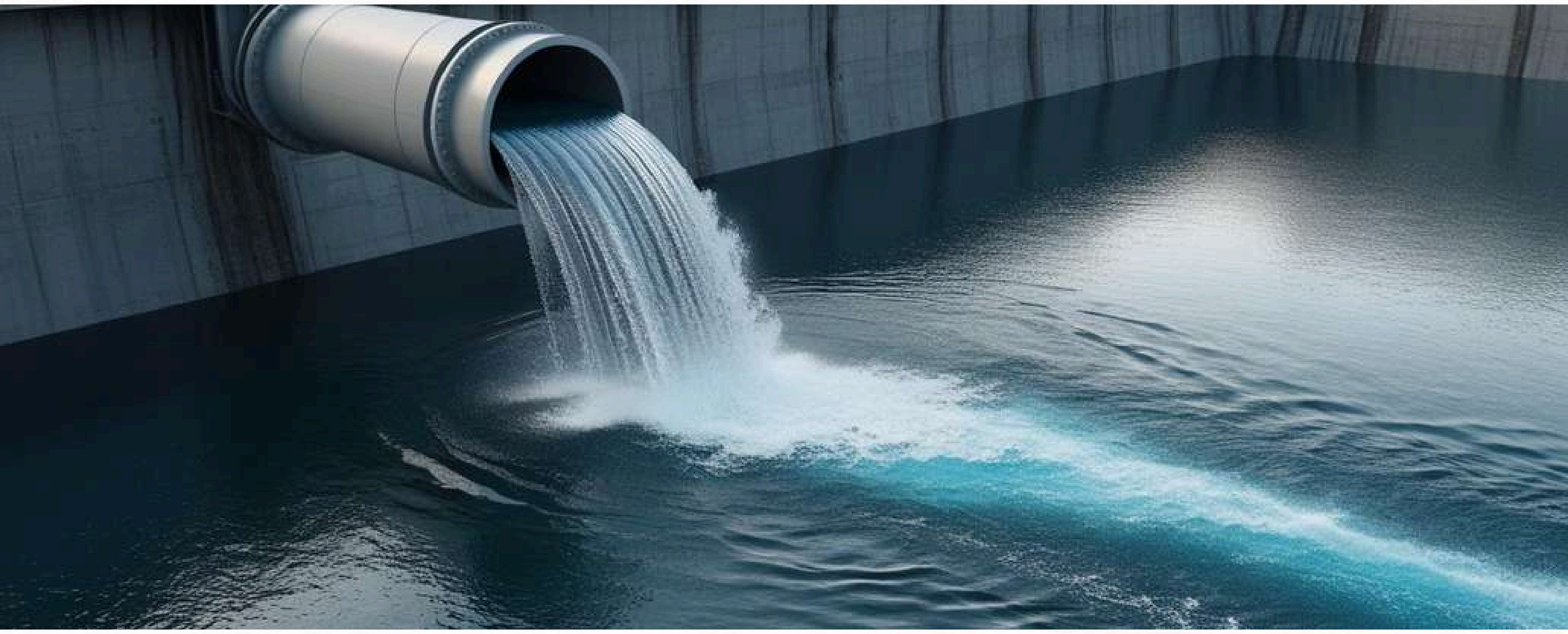
ASME requires transient analysis to account for dynamic loads caused by sudden valve closures, pump starts/stops, or rapid flow changes.

Piping flexibility and support design must account for potential forces induced by transient pressure waves.

Conclusion

ASME mandates that ultimate conditions (such as surge, water hammer, overpressure, and extreme thermal stresses) be analyzed, justified, and mitigated through proper design considerations. A transient analysis is often essential to ensure compliance with ASME codes and to prevent catastrophic failures.

Disclaimer



MANAGE WATER HAMMER

3-STAGE SURGE SUPPRESSION AIR VALVE

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