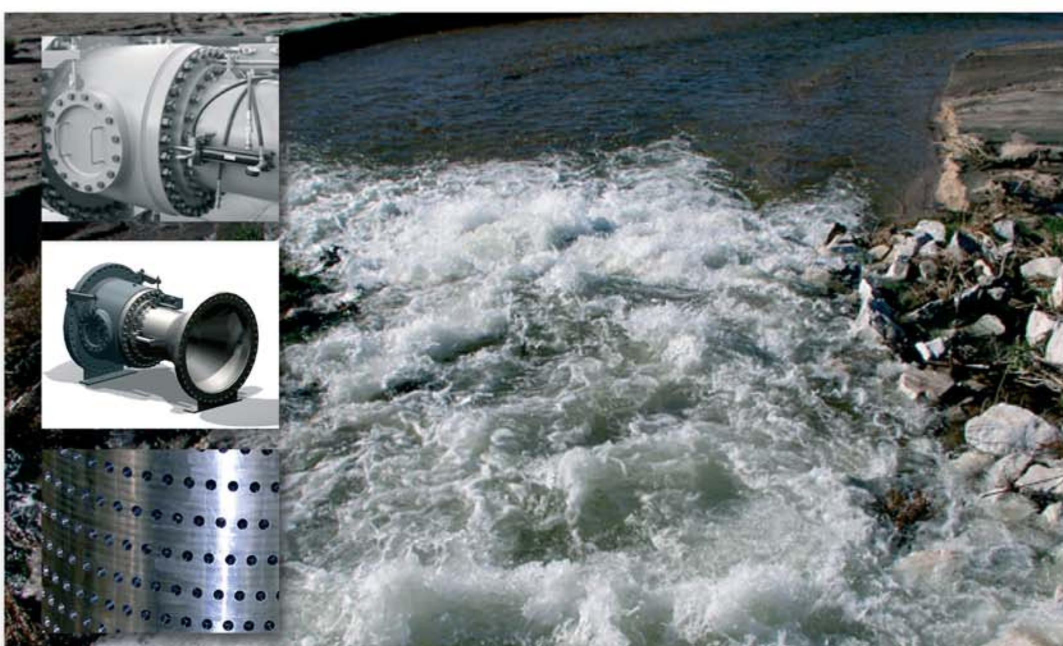
INTRODUCTION

Bailey Valve is an industry-leading internationally distributed valve manufacturer, providing a broad range of valve solutions to meet any industrial and water application. Bailey Valve's diverse offering of sleeve valves are designed in accordance with the needs and standards of each industry. Our Bailey Valve design and application team garners over 30 years of combined application experience, ensuring you a superior product for your applications. We recognize the highly specialized nature of the "severe service Valve market", and the demands of the equipment. You will benefit with our superior products and systems performance. Bailey Valve total system life cost can be the lowest available solution for your specific system or custom project needs.

Bailey Valve field engineering services offer customers with in-line service and maintenance on all of our valve products. Our team of engineers and technicians can help you with product start-up, refurbishment, and warranty work.

Bailey Valve development was fueled by customer demand, and it has since grown into a dynamic and diversified company, helping government and industrial clients achieve their goals through the application of innovative technologies. We have been able to meld our original core competencies in engineering valve design with our ever-growing skills in system application to offer a highly desirable and adaptable valve product range.

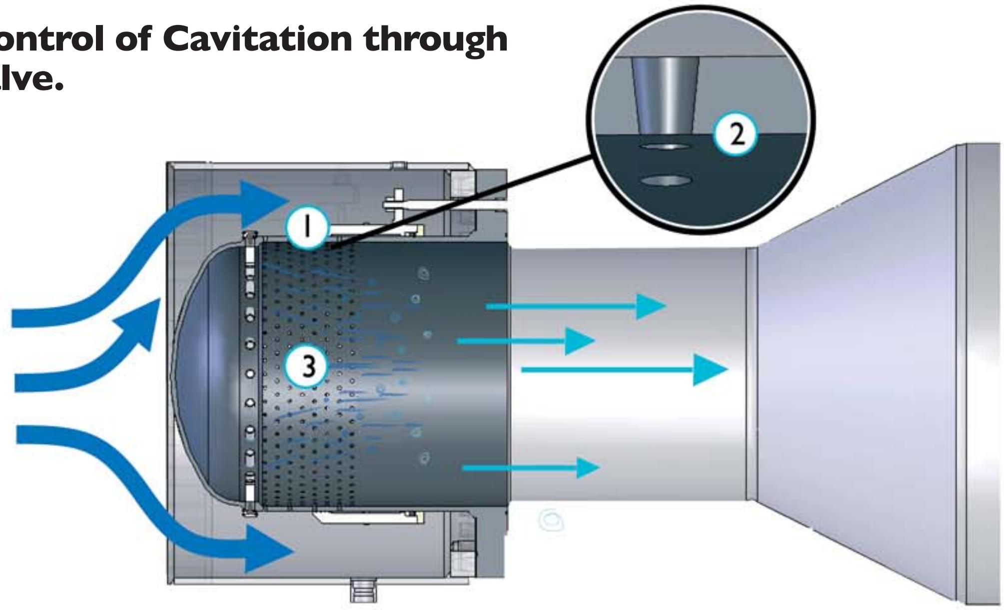
Innovative products and product improvements are priority at Bailey Valve engineering. Let our engineering and application team harness our experience in applying, maintaining and providing valve solutions across the globe for your next project!



SLEEVE VALVE BENEFITS

What Makes a Bailey Valve Superior?

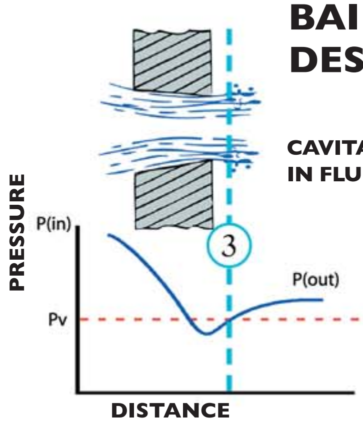
The Control of Cavitation through the Valve.



The fundamental design of the sleeve valve starts at the core of the valve. The sleeve element of a sleeve valve contains multiple nozzles arranged in a helical pattern around the sleeve (1). Each nozzle (2) is tapered to increase the velocity of the water jet as it passes though the restriction. This increase in velocity projects the start point of increased pressure called the vena-contracta, or cavitation (3) beyond the exit of the nozzle. By moving the cavitation away from the exit of the nozzle, turbulence in the nozzle is reduced and will therefore increase the efficiency and reduce the vibrational effects experienced in standard straight through drilling.

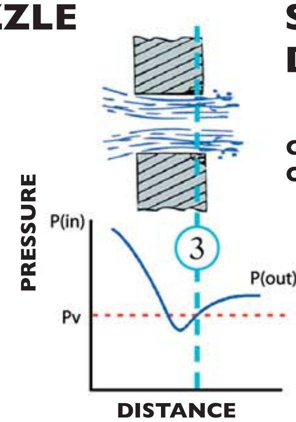
BAILEY NOZZLE DESIGN

CAVITATION IN FLUID



STRAIGHT NOZZLE DESIGN

CAVITATION ON METAL



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FEATURES & MATERIALS

VALVE STANDARD MATERIALS:

Valve Body: Epoxy Coated Steel or Ductile Iron
Sleeve: 304 or 316 Stainless Steel
Gate: Stellite Hardfaced 304 or 316 Stainless Steel
Seat Ring: 304 or 316 Stainless Steel
Seals: Buna-N

VALVE FEATURES:

1:1 Stroke to Diameter Ratio

- Provides better flow control over short stroke configuration by increasing the sleeve nozzle spacing.
- Reduces the risk of oscillating the gate on the seat under low flow and high delta P condition.
- Allows for more cavitation dissipation inside valve compared to shorter stroke valves.
- Reduces vibrations by spreading discharge energy over broader range compared to shorter stroke valves.
- High flow turndown allows the use of one valve in lieu of multiple parallel valves and eliminates oscillation off the seat for most applications.

Stellite Hardfaced Gate or Seat Ring

- Provides superior hard surface edge to reduce high velocity erosion of the gate or wire drawing.
- Creates dissimilar hardness on sliding contacts.
- Provides leading edge hardness on the valve sufficient to shear debris without damage to the gate.

Custom Valve Configuration

- Allows for matching flanges between the valve and associated piping.
- Multiple access port options.
- Valve material options (Carbon Steel, Stainless Steel).

Actuation Configurations

- Electric Motor Operated.
- Oil Hydraulic Operated W/ Hydraulic Power unit.
- Water hydraulic from pipeline pressure.
- Electro-hydraulic.
- Pneumatic Operated.

Valve Function

- Pressure reduction.
- Pressure sustaining.
- Flow Control.

Valve Pressure Class:	ANSI B16.42 (Ductile Iron)	ANSI B16.5 (Steel)
Class 150	250 psi	275 psi
Class 300	600 psi	720 psi
Class 600	-	1440 psi

Valve Size Range:
3" (200mm) through 60" (1500mm)

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VALVE MODELS

B-5 : 3 thru 12 inch Inline Y- pattern valve with flanged inlet/outlet

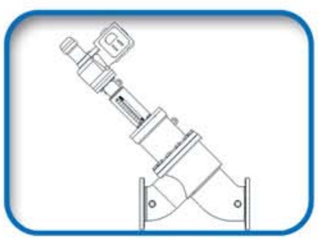
B-10 : 8 thru 72 inch Inline valve with flanged inlet/outlet

B-11 : 8 thru 72 inch Submerged discharge valve with flanged inlet

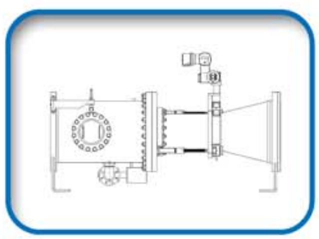
B-12 : 8 thru 66 inch 90 degree valve with flanged inlet/outlet

B-14 : 8 thru 72 inch Open or submerged discharge valve with flanged inlet

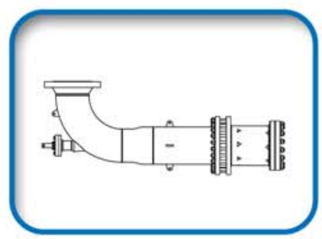
B-16 : 3 thru 72 inch Fixed orifice valve with flange



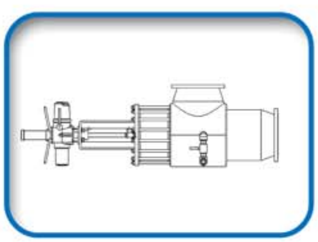
B-5



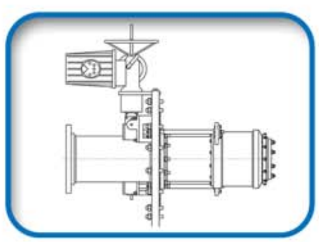
B-10



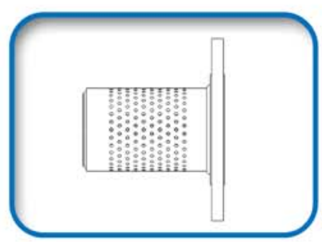
B-11



B-12



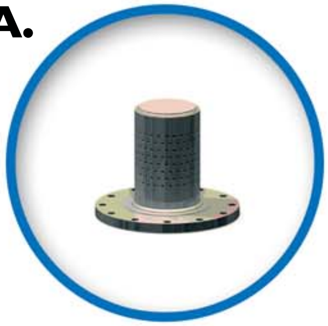
B-14



B-16

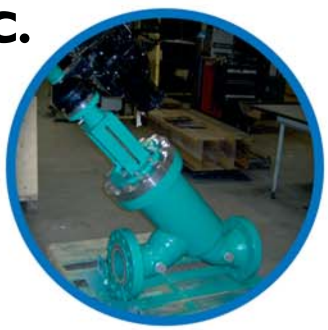
TYPICAL PRODUCT INSTALLATIONS

A.



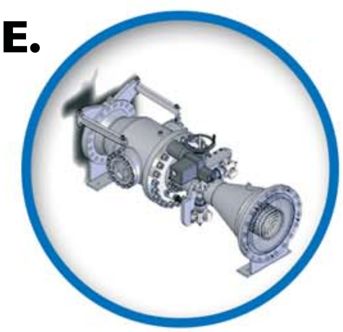
B.

C.



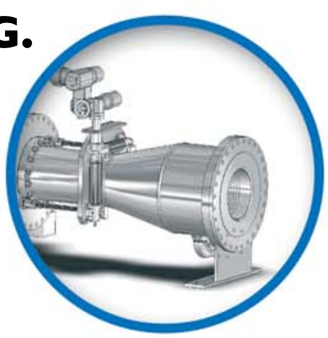
D.

E.



F.

G.



H.

A. Glendale - Oasis Water Treatment Plant

8x12" Class 150 lb Model B-16
Pi = 90 PSI Po = 0 PSI Q = 5 MGD

B. Palmdale - Water Treatment Plant Re-Build

20" Class 150 # Model B-12
Pi = 150 PSI Po = 2 PSI Q = 40 MGD

C. Ute - Pressure Reduction Valve

6" Class 600 # Model B-5
Pi = 750 PSI Po = 140 PSI Q = 2650 GPM

D. Klein - Water Treatment Plant

8" Class 150 # Model B-5
Pi = 90 PSI Po = 3 PSI Q = 3141 GPM

E. Colorado Springs - Turbine Bypass

16x10x24" Class 600 # Model B-10
Pi = 900 FT Po = 6 FT Q = 15 CFS

F. Mojave - Rock Springs

48x30x54" Class 150 # Model B-10
Pi = 240 PSI Po = 0 PSI Q = 80 CFS

G. Texas - Lake Fork Raw Water Line

30x18x30" Class 150 # Model B-10
Pi = 200 PSI Po = 0 PSI Q = 47 CFS

H. Utah - Big Sand Wash

12" Class 300 # Model B-11
Pi = 350 PSI Po = 0 PSI Q = 19 CFS

VALVE SIZING

DETERMINING MODEL AND SIZE OF VALVE

The Bailey Valve sleeve valve has been designed to incorporate features that provide superior valve performance for inline, angle and terminal flow control and pressure reduction applications. The Bailey Valve sleeve valve dissipates energy and controls flow by diverting the water through multiple orifices located in the sleeve or valve body. The valve modulates flow by sliding an outer pipe called the gate over an inner pipe called the sleeve. This design controls cavitation by directing damaging implosions away from any metallic surfaces, thus reducing vibration and noise normally associated with modulating valves. The nozzles are placed within the sleeve in a helical pattern that allows for specifically desired incremental volume change with movement of the gate. Each sleeve nozzle configuration is designed for the application needs to produce a superior flow and pressure control over the entire requested flow range. Flow passes through tapered nozzles in the sleeve and energy is dissipated during a mixing process in the center of the valve prior to exiting the valve body. The sigma value or cavitation index is calculated and used to configure the performance class of the sleeve valve or to determine if alternate options such as ball valves or butterfly valves are acceptable for the application conditions.

With six models available, the first step in selecting the correct valve for the application is to collect key application data. The operating conditions (key application data) will determine the type (based on cavitation), size (based on volume flow rate) and configuration (Inline, Y-Pattern, submerged, angle or non-modulating).

STEP 1 - DATA

Maximum Flow Rate → Qmax
Inlet Pressure at Qmax → Pi @ Qmax
Outlet Pressure at Qmax → Po @ Qmax
Minimum Flow Rate → Qmin
Inlet Pressure at Qmin → Pi @ Qmin
Outlet Pressure at Qmin → Po @ Qmin

STEP 2 - SIGMA

The sigma value or cavitation index is calculated and used to configure the performance class of sleeve valve or to determine if alternate options such as ball valves or butterfly valves are acceptable for the application conditions. The following equation is used to calculate the sigma value: σ **= Po - Pv / Pi - Po**

Where: Pi = Inlet Pressure (psig)
Po = Outlet Pressure (psig)
Pv = Vapor Pressure (-14.6 psig for 60°F water at sea level)

σ - Operating Range	Valve Option
2.50 & up	**Mild** A ball valve or butterfly valve can be used in this range, however, they are not recommended for continued modulating service and special care should be taken when sizing valve to ensure correct disc or ball position during operation.
0.15 to 2.49	**Standard** Standard sleeve valve operating range. All of the Bailey valve models will provide years of superior cavitation resistance for these application ranges.
0.02 to 0.14	**Critical** Application conditions that require a hybrid solution such as B-11 & B-14 series valves. Please contact the factory for application assistance.

VALVE SIZING CONT.

STEP 3 - VELOCITY FLOW

The maximum flow rate (Qmax) is compared to the figure in the following sample table to determine the corresponding valve size based on an allowable continuous velocity through the valve port. Higher velocities can be attained for intermittent operating conditions and it is recommended that you contact the factory for sizing. Your flow rate should be rounded up to the nearest table value and corresponding valve size noted (or recorded). Various units are provided for simplicity.

Valve Size		Flow Rate (Based on 30 ft/sec port velocity)			
(in)	(mm)	gpm	cfs	mgd	cms
3	80	661	1.5	1.0	0.04
4	100	1,174	2.6	1.7	0.07
6	150	2,642	5.9	3.8	0.17
8	200	4,698	10.5	6.8	0.30
10	250	7,340	16.4	10.6	0.46
12	300	10,570	23.6	15.2	0.67
14	350	14,387	32.1	20.7	0.91
16	400	18,791	41.9	27.1	1.19
18	450	23,782	53.0	34.2	1.50
20	500	29,361	65.4	42.3	1.85
24	600	42,280	94.2	60.9	2.67
30	750	66,062	147.2	95.1	4.17
36	900	95,130	212.0	137.0	6.00
42	1000	129,482	288.5	186.5	8.17
48	1200	169,120	376.8	243.5	10.67
54	1400	214,042	476.9	308.2	13.51
60	1500	264,249	588.8	380.5	16.67

STEP 4 - FLOW CAPACITIES (Cv)

The maximum flow rate (Qmax) and associated inlet pressure (Pi) and outlet pressure (Po) are used to calculate the required Flow Capacity or Cv of the application. The Cv equation is a follows:

$$Cv = Q / \sqrt{Pi-Po}$$

Once the application Cv is calculated from the above equation a safety factor of 20% is added to the value for valve Cv deviation and potential nozzle fouling from entrapped debris whithin the flow media. The Cv plus 20% value (C20) is compared to the following table to determine the appropriate valve size for the application. The choosen valve size must have a higher capacity than the C20 calculated from the operating conditions. The valve size choosen from the Cv table is then compared to the valve size chosen from the previous table (Velocity Flow) and the larger of the two valves is the correct size for the application conditions.

Valve Size Flow Coefficient (Cv)								
(in)	(mm)	gpm/√psi	cfs/√psi	mgd/√psi	gpm/ft^.5	cfs/ft^.5	mgd/ft^	cms/m^.5
8	200	987	2.20	1.42	650	1.45	0.94	0.07
10	250	1548	3.45	2.23	1019	2.27	1.47	0.12
12	300	2232	4.97	3.21	1469	3.27	2.12	0.17
14	350	3040	6.77	4.38	2001	4.46	2.88	0.23
16	400	3973	8.85	5.72	2615	5.83	3.76	0.30
18	450	5029	11.21	7.24	3310	7.37	4.77	0.38
20	500	6210	13.84	8.94	4087	9.10	5.88	0.47
24	600	8942	19.92	12.88	5885	13.11	8.47	0.67
30	750	13972	31.13	20.12	9195	20.49	13.24	1.05
36	900	20117	44.82	28.97	13239	29.50	19.06	1.51
42	1000	27379	61.00	39.43	18018	40.14	25.95	2.06
48	1200	35756	79.66	51.49	23531	52.43	33.88	2.69
54	1400	45250	100.82	65.16	29779	66.35	42.88	3.40
60	1500	55860	124.46	80.44	36761	81.90	52.94	4.20

** Cv values are +/- 5%. Above table represents B-10 Cv Values*

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NOMENCLATURE

The following section serves as a reference tool for various nomenclature throughout the catalog.

BAR

A unit of pressure; equivalent to 14.5 psig.

C_V

The flow coefficient, is the relative measure of a device's ability to flow water. In a constant established water flow, the flow coefficient is determined by the volume of water flow through the valve and the inlet and outlet pressure. When holding the inlet and outlet pressures constant, the C_V of a given value is also constant. Why do we use C_V? C_V gives us a method to compare flow capabilities of different valves. The flow coefficient allows us to determine what size valve is required for a given application.

$$C_V = \frac{Q}{\sqrt{\Delta P}}$$

CAVITATION

In a control valve handling a pure liquid, cavitation may occur if the static pressure of the flowing liquid decreases to a value less than the fluid vapor pressure. At this point, continuity of flow is broken by the formation of vapor bubbles. Since all control valves exhibit some pressure recovery, the final downstream pressure is generally higher than the orifice throat static pressure. When downstream pressure is higher than vapor pressure of the fluid, the vapor bubbles revert back to liquid. This two-stage transformation is defined as cavitation.

CAVITATION INDEX (σ)

The measure of potential cavitation based on pressure drop across the value.

$$\sigma = \frac{P_{(out)} - P_V}{P_{(in)} - P_{(out)}}$$

GATE

A sliding sleeve structure, supported by a bronze ring and stellite hardfacing that slides over the sleeve to cover the perforations for full or partial shutoff.

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NOMENCLATURE CONT.

HEAD
The pressure usually measured in feet or meters.

HEAD LOSS
The difference between the inlet pressure and the outlet pressure across the valve in feet or meters.

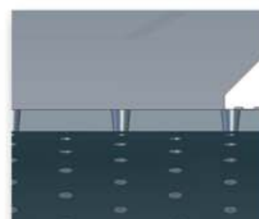
$P_{(in)}$
Inlet pressure in gage units (psig).

$P_{(out)}$
Outlet pressure in gage units (psig).

ΔP
Inlet Pressure - outlet pressure; $\{P_{(in)} - P_{(out)}\}$, or pressure in psi or bar.

P_V
Vapor pressure in gage units (-14.6 psig for 60°F) water at sea level.

NOZZLE
The tapered hole located within a helical pattern around the sleeve.



Q
Fluid flow rate in cubic feet per second (cfs), gallons per minute (gpm), million gallons per day (mgd) or cubic meters per second (cms).

SEAT
The area of the valve where the valve gate or sleeve contacts in order to shut off the flow.

SLEEVE (or body on models B11 or B14)
The perforated cylinder of the valve that allows fluid to pass.

STROKE
The length of travel to open valve. The longer the length of travel, the greater the flow control.

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