Glenfield Invicta TECHNICAL GUIDANCE

TECHNICAL GUIDANCE

Glenfield Invicta
Delivering Project Solutions

GLENFIELD INVICTA
GLOBAL LEADERSHIP & LOCAL COMMITMENT

Over 160 years of experience in dams and reservoir installations

WE CAN PROVIDE WHATEVER YOU MAY NEED

GLENFIELD INVICTA is a leading supplier of large diameter valves for dams and reservoir installations around the world.

Glenfield Invicta's product portfolio includes an extensive range of:

- Free discharge valves
- Submerged discharge valves
- Needle control valves
- Reservoir specification metal seated gate valves
- Butterfly valves
- High performance recoil check valves
- Double orifice and anti-vacuum air valves
- Automatic pressure and level control valves
- Penstocks and sluice gates

Within our vast range of capabilities Glenfield Invicta can provide a comprehensive range of engineering and site solution packages. Our specialist teams come to you to identify the perfect solution - from feasibility and site audit to network leakage management and repair.

DAMS AND RESERVOIRS

Dams and Reservoirs is one of the key market segments with over a 100 years involvement. With control valves installed in well over 100 dams around the world Glenfield Invicta continue to be a highly rated supplier of valve products and solutions for dams and reservoir projects.

Within the range we also offer specialist terminal discharge valves which provide accurate flow control as well as excellent energy dissipating characteristics. These discharge valves can be used for a number of applications such as emergency drawdown, compensation / ecological flow, flood control and pressure relief.

Because of the nature of these projects, flexibility in product design is highly important and Glenfield Invicta work closely with customers to ensure that the optimal valve size and type is chosen for each application.

Glenfield Invicta also offers supervisory support for valve selection, installation and commissioning on products and are available to discuss your requirements and projects.

ENGINEERING AND SITE SOLUTIONS:

- Valve, penstock and actuator: site surveys and health checks
- Valve supply, installation, refurbishment and replacement
- Design and manufacture of ancillary equipment
- All associated enabling, electrical and civil engineering services
- Equipment commissioning
- Scheduled maintenance and servicing Contracts
- Extended warranties
- Post contract training

WHEREVER YOU ARE, SO ARE WE

Our geographical presence and product range may be global, but our focus is local. We stay close to our customers throughout the entire process. The proximity allows us to better understand our customers' needs and tailor our solutions to fit them.

Being a global player, we are able to provide highly engineered products and service solutions approved to international standards whilst always understanding and adapting to local specifications and project requirements.

GLENFIELD INVICTA
QUALITY & A LONG-TERM PARTNERSHIP

QUALITY IS ESSENTIAL! WHEN IT COMES TO VALVES, FITTINGS AND ACCESSORIES, OUR CUSTOMERS EXPECT LONG LASTING SOLUTIONS

WHERE DO YOU GO FOR...

...TECHNICAL INFORMATION

- ONLINE PRODUCT SELECTION
- PDF BROCHURES
- WEBSITES
- VIDEO TUTORIALS
- INTERACTIVE ANIMATIONS
- 2D DRAWINGS
- 3D DRAWINGS
- TECHNICAL DOCUMENTS

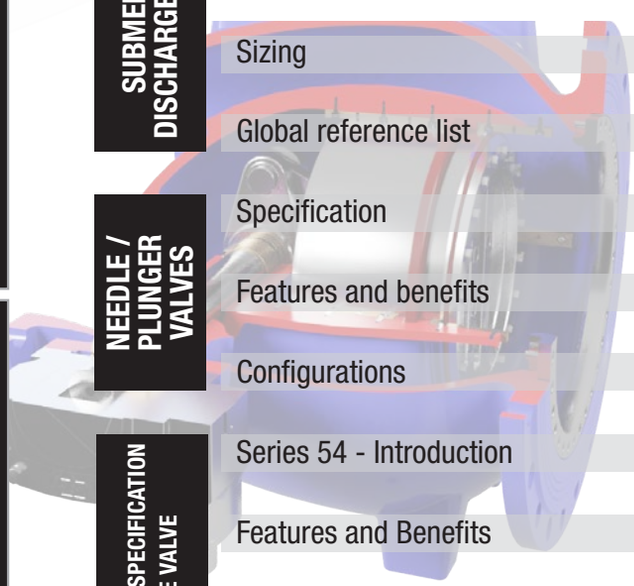
...ENGINEERING

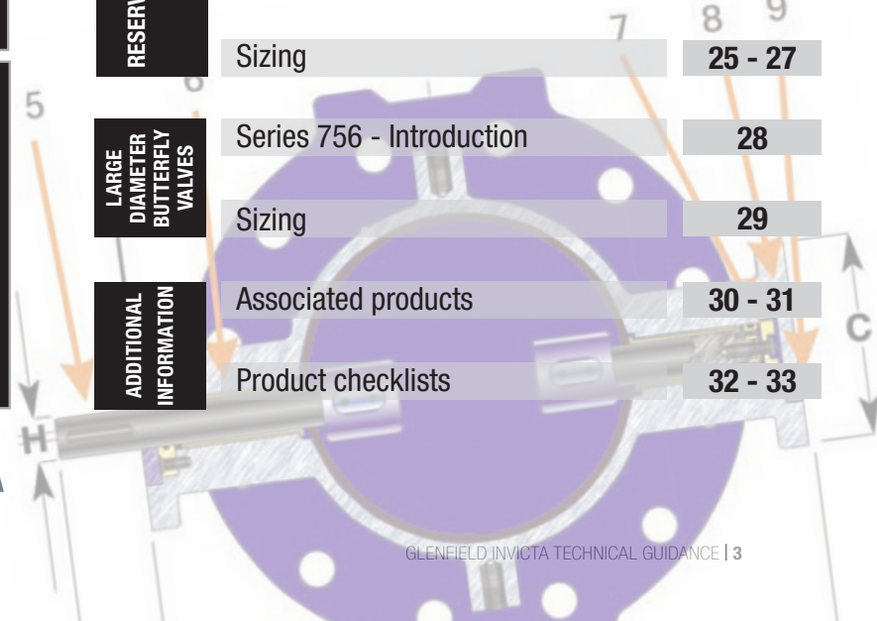
- NETWORK MODELLING
- CFD ANALYSIS
- FE ANALYSIS
- HYDRAULIC SYSTEM CALCULATIONS
- FLUID TEST LABORATORY

...SUPPORT

- ENGINEERING AND SITE SOLUTIONS
- SUSTAINABLE SMART WATER MANAGEMENT SOLUTIONS
- TECHNICAL PRODUCT TRAINING

...GLENFIELD INVICTA





SERIES 857
FREE DISCHARGE VALVES (FDV)

Glenfield Invicta have been designing and supplying Free Discharge and Fixed Cone Valves since the 1950's. These valves have been developed from extensive in-house laboratory testing and thorough field installations.

Fixed cone valves are used to pass a controlled amount of water downstream with no damage to the immediate surroundings due to its considerable energy dissipating characteristics. These valves also offer an effective method of aeration due to atmospheric dispersion.

The valve body is designed to operate with minimum vibration over its full stroke and uses multiple, specially shaped aerodynamically designed ribs leading to a downstream cone.

The outlet cone ensures that discharge is in the form of a hollow expanding jet, which is ideal for energy dissipation as the water is spread over a rapidly increasing surface area, thus permitting effective atmospheric cushioning. If partial / controlled containment of the jet is desired, a hood can be installed downstream of the valve.

The valve bodies are manufactured in either ductile iron or fabricated stainless steel dependant on installation and application. The sleeve is made from stainless steel and uses upstream and downstream seals to ensure drop-tight shutoff. Operation of the valve sleeve is via twin screwed spindles, worm gearboxes, intermediate rods and a double bevel input gearbox. Actuating gear may be manually, electrically or hydraulically operated.

Features and benefits

There are a number of important features and benefits when using a FDV, these include:

- Terminal Siting - Low civil building costs
- Free discharge - No cavitation
- Resilient seal - Drop tight closure
- External operating mechanism - Simple and effective maintenance
- Cylindrical geometry - Hydraulic balance with low operating torque
- Low head loss characteristics - Maximum flow discharge potential
- Atmospheric dispersion - Maximum energy dissipation / Minimum erosion
- High velocity capabilities - most economical sizing of terminal discharge valve products

SERIES 857
SPECIFICATION

Valve assembly comprises of; body, sleeve, seal retaining ring, operating screws and nuts, worm and double bevel gear units, face and back end seals, intermediate drive shafts and universal couplings.

Valve Body Is a cylindrical single piece unit in ductile iron or fabricated stainless steel, with a flange at the inlet, faced and drilled to specific requirements (BS EN1092-1 & 2). The downstream end is formed as an inverted cone integral with, and attached to, the cylinder by integral radial ribs.

The outer edge of the ribs and adjacent body sections are faced with extruded bronze strips of length to suit control sleeve travel.

Facings are provided at the upstream end to carry the worm gear units on the horizontal centre-line and the double bevel drive on top of the valve. A support foot is situated adjacent to the inlet flange on the underside of the valve.

Valve Sleeve Is a fabricated assembly comprising stainless steel cylinder and side brackets on which are mounted the operating nuts. The bore has a fine machined finish on which the back end sealing ring makes the sliding contact throughout the full length of the valve travel. The downstream end is chamfered to mate with the face seal and provides droptight contact in the closed position.

Valve Seals The back end seal is housed in a body recess adjacent to the upstream end of the valve ports and provides sealing contact with the bore of the sleeve through the full valve travel. The face seal is located between the downstream end of the body and the retaining ring, thus providing a combination of resilient seal and positive stop with the end of the valve sleeve in the closed position. Both seals are formed from extruded or moulded rubber sections, sized and formed to suit.

Valve operating gear Controls axial movement of the sleeve, when covering or uncovering the body ports, comprising of:-

Two operating nuts, mounted on side brackets of the sleeve, threaded to match the mating operating screws which are protected by resilient gaiters.

Each screw is keyed at the back end, to a worm gear unit mounted to the upstream end of the valve body.

The drive is taken from each side of the valve via the worm gear units, up to the double bevel unit mounted on top of the body, by steel intermediate shafts and totally enclosed universal couplings. The worm and double bevel gear units are all totally enclosed grease filled assemblies, designed for long periods of maintenance free service.

The valve assembly can be operated by electrical actuator coupled direct to, or alternatively remote from, the double bevel unit input shaft.

For smaller valves (DN200 & 300), operation of the valve is by a lever/ crank mechanism which can be connected to a manual gearbox or electrical actuator.

Valves can be supplied with hydraulic actuation, especially suitable for submerged applications.

SERIES 857
SIZING

The size of the valve is determined by the required flow rates at the minimum net head at the valve. The net head is measured from the minimum upstream water surface to the centre line of the valve, less any friction losses from the conduit.

The graph below can be used as a general guide for valve size selection. Please contact Glenfield Invicta for final valve selection:

Kilmarnock - +44(0) 1563 521150
Maidstone - +44(0) 1662 754613
E: enquiries@glenfieldinvicta.co.uk

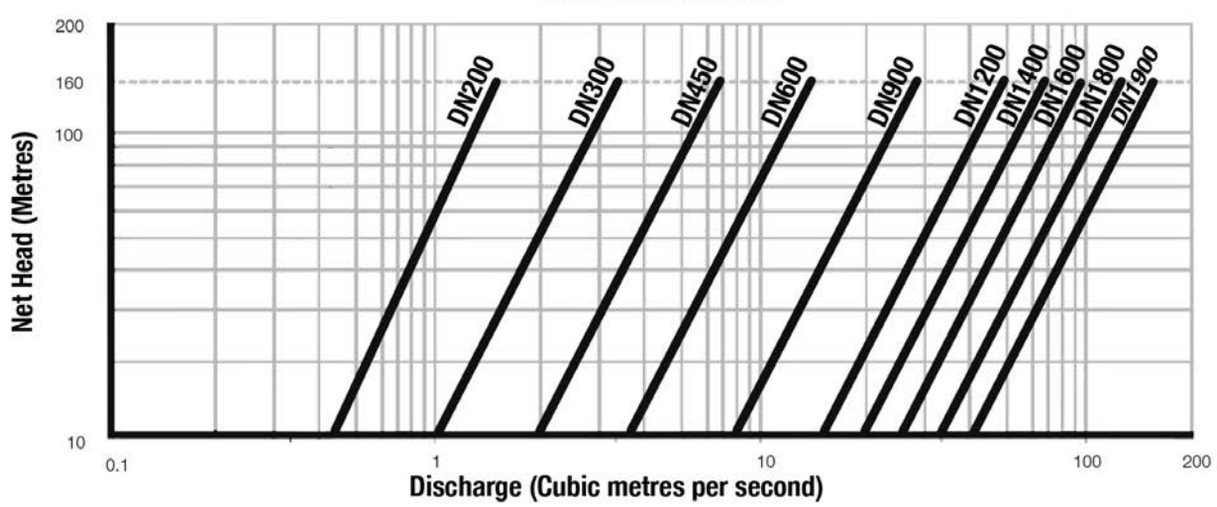
The equation to determine discharge is:

$$Q = Cd\ A\sqrt{2gH}$$

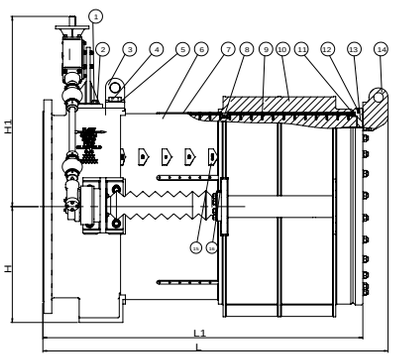
Where :

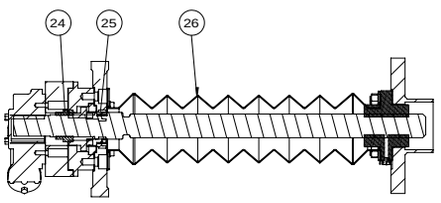
Q = Flow Discharge (m^3/s)
C_d = Discharge coefficient of valve in fully open position without hood (0.83)
A = Area of valve based on nominal valve diameter (m^2)
H = Net head (m)

Valve Selection Chart

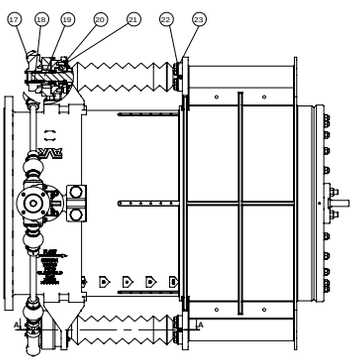


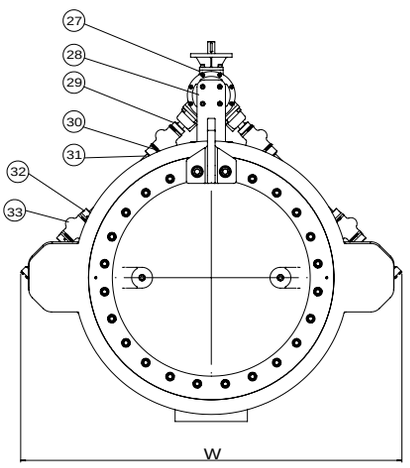
SERIES 857
CAST VERSION





SECTION A-A





Components		Material
1	Stud bolt	Grade A4-70
2	Washer	Stainless steel, 1.4401
3	Lift bracket,Top	Stainless steel, 1.4301
4	Bolt	Grade A4-70
5	Lock washer	Grade A4-70
6	Body	Ductile Iron GJS-500-7
7	Guide strip upstream	Al.bronze CW307G
8	Sealing Strip	Neoprene
9	Rivet Pin	Phosphor Bronze PB102
10	Sleeve	Stainless steel, 1.4401
11	Face ring seal	NBR, 70 Shore
12	Screw	Grade A4-70
13	Seal retaining ring	Ductile Iron GJS-500-7
14	Lift bracket, End	Stainless steel, 1.4301
15	Indicator plate, close	Stainless steel, 1.4401
16	Nipple	Brass EN 12165 CW602N
17	Gear unit	Cast Alloy steel

18	Key	Stainless steel, 1.4401
19	Drive shaft, LH	Al.Bronze CC333G
20	Bracket side gearbox	EN 10025 S275JR
21	Backing plate bracket	Stainless steel, 1.4401
22	Backing plate nut	Stainless steel, 1.4401
23	Drive nut, LH	Stainless steel, 1.4401
24	Lock nut	Stainless steel, 1.4401
25	Bushing	Al.bronze CW307G
26	Protection cover	Flexible PVC
27	Gearbox housing	Ductile Iron GJS-500-7
28	Bracket main gearbox	EN 10025 S275JR
29	Universal joint 30/30	Stainless steel, 1.4301
30	Jubilee clip	Stainless steel, 1.4401
31	Transfer shaft	Stainless steel, 1.4401
32	Universal joint 30/15	Stainless steel, 1.4301
33	Cover Single Joint	Rubber

Ref	DN	Flange drilling	L1	L	H	H1	W	Approx Weight
	mm		mm	mm	mm	mm	mm	Kg
857-0400-1-1010000	400	PN16	1059	1135	381	770.5	1052	1200
857-0600-1-1010000	600	PN16	1351	1446	457	851	1259	1500
857-0700-1-1010000	700	PN16	1524	1619	550	807	1410	1900
857-0800-1-1010000	800	PN16	1524	1619	533	972.5	1412	2000
857-0900-1-1010000	900	PN16	1676	1808	610	1001.5	1592.5	2700
857-1000-1-1010000	1000	PN16	1796	1928	720	1075.5	1690	3800
857-1200-1-1210000	1200	PN16	2132	2264	838	1334.5	2074	4500
857-1400-1-1210000	1400	PN16	2414	2546	916	1456.5	2524	6000
857-1500-1-1010000	1500	PN16	2415	2521	916	1339	2286	6500
857-1900-1-1210000	1900	PN16	2803	2929	1344	1642	2894	11200
857-2200-4-3210000	2200	PN10	3347	3515	1350	2239	3492	15300

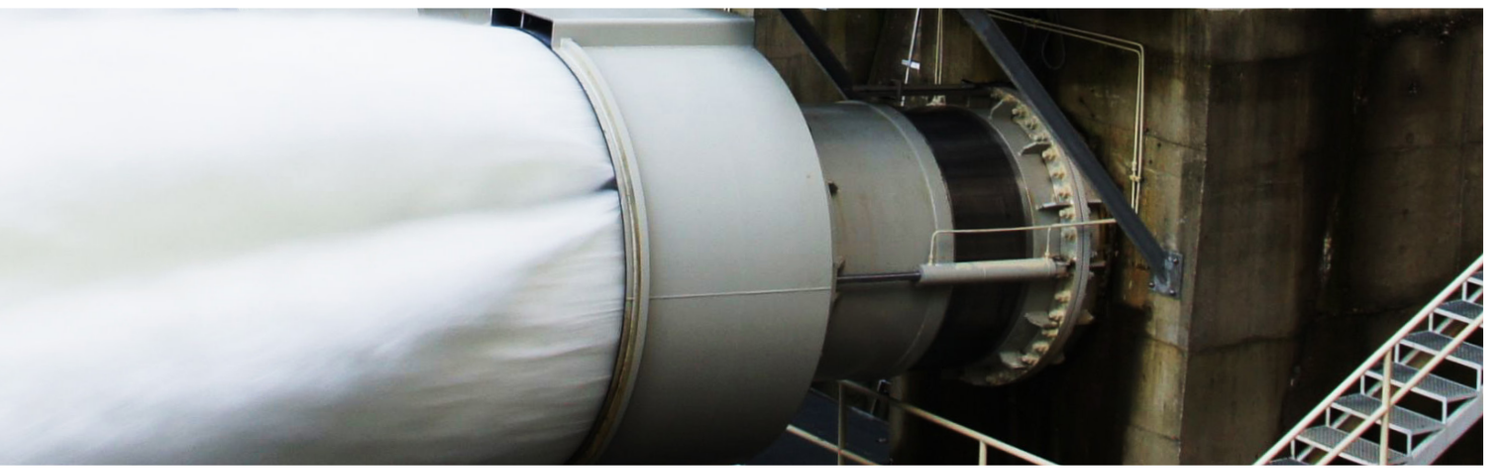
NOTE: DN200 & 300 valves with lever & crank operating mechanism also available. Please contact Glenfield Invicta for further information. Kilmarnock - +44(0) 1563 521150
Maidstone - +44(0) 1662 754613

SERIES 857
SELECTED GLOBAL REFERENCE LIST

Over 160 years experience and over 75 global installations

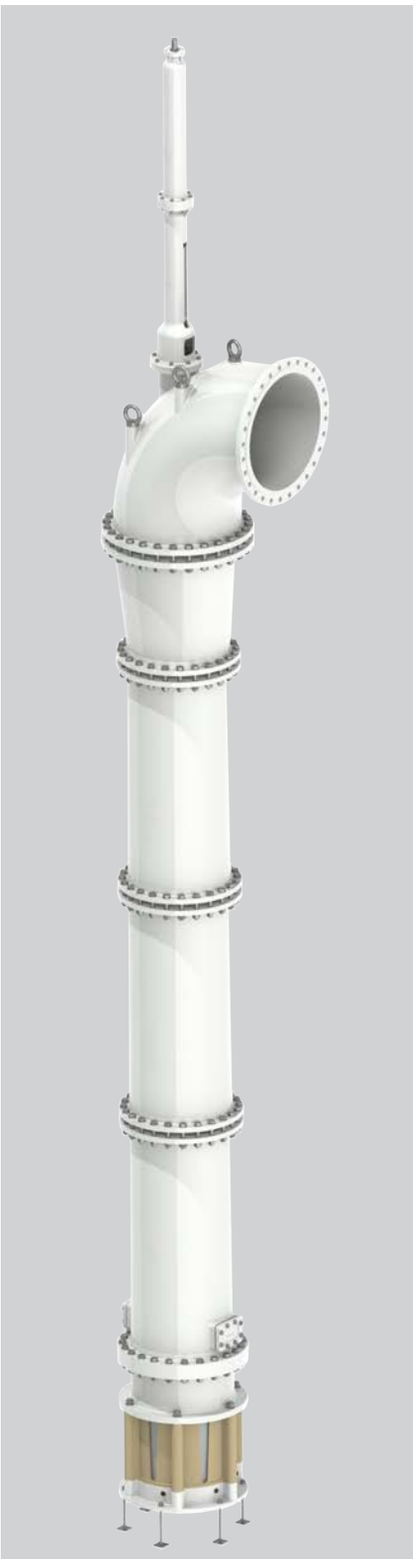
ORDER YEAR	DN	CUSTOMER	LOCATION
1955	84/72	N.O.S.H.E.B.	Ericht Dam (Scotland)
1955	72	N.O.S.H.E.B.	Lubreoch Dam (Scotland)
1955	60	N.O.S.H.E.B.	Lednock Dam (Scotland)
1955	48	Govt. of India	Madupatty Dam (India)
1956	48	N.O.S.H.E.B.	Giorra Dam (Scotland)
1958	36	C.E.G.B.	Stwlan Dam (Wales)
1959	48	Central Elec. Authority	Tan-Y-Grisiau (Wales)
1959	48	C.E.G.B.	Dinas Dam (England)
1960	36	City of Revelstoke	Cranberry Creek (England)
1960	72	N.O.S.H.E.B.	Monar Dam (Scotland)
1961	36	Commonwealth Dept. of Works	Upper Cotter Dam (Australia)
1963	36	Govt. of Hong Kong	Plover Cove(Hong Kong)
1963	54	Swaziland Elec. Board	Edwaleni Dam (South Africa)
1964	48	C.E.G.B.	Mentwrong Dam (Wales)
1965	60	Govt. of Tanzania	Nyumba-Ya-Mungu Dam (Tanzania)
1966	72	Ceb. Fed. of Malaya	Batang Padang (Malaya)
1966	46	N.Z. Elec Dept	Mangahad P.S. (New Zeland)
1967	21	City of Birmingham	Craig Goch (England)
1967	30	Dundee Corporation	Backwater Dam (Scotland)
1967	66	Dept. Water Affairs	Oppermandrift Dam (South Africa)
1967	90	I.N.O.S.	Ocumarito Dam (Venezuela)
1968	8	Mid Scotland Water Board	Longhill Weir (Scotland)
1969	24	Pembroke Water Board	Llysyfran (Wales)
1970	36	Govt. of Hong Kong	Plover Cove(Hong Kong)
1971	36	Ayrshire & Bute W.B.	Loch Brandan (Scotland)
1973	42	Govt. of Hong Kong	High Island
1974	30	Auckland Reg. Authority	Mangatangi Dam (New Zealand)
1974	12	Electricidade de Portugal	Amadora Project
1974	54	Fife & Kinross W.B.	Castlehill Dam
1975	18	Fife & Kinross W.B.	Castlehill Dam
1975	24	South West W.A.	Wimbleball Res
1975	12	South West W.A.	Wimbleball Res
1976	36	Wyoming City CL	Greybull Valley Irr Project
1976	36	Northumbrian W.A.	Keilder Dam
1976	66	Northumbrian W.A.	Keilder Dam
1976	30	West Coast Elec. P.B. (N.Z.)	Dillimans Hydro Elec Scheme
1977	18	Electricidade de Portugal	Amadora Project
1979	66	Nigerian W.A.	Oyan River Dam
1980	24	Isle of Man W.B.	Sulby Reservoir
1980	24	Irish W.B.	Caban Dam
1981	36	Govt. of New Zealand	Cosseys Dam
1982	8	Strathclyde R.C.	Daer Reservoir
1984	12	Sri Lanka W.S.	Kotemale Dam
1985	30	Govt. of Hong Kong	High Island Scheme
1985	12	U.A.E.	Khor Fakkan

SERIES 857
SELECTED GLOBAL REFERENCE LIST



ORDER YEAR	DN	CUSTOMER	LOCATION
1990	18	Cyprus W.D.D.	S. Conveyor
1991	8	N.O.S.H.E.B.	St. Fillans
1991	54 (1400)	Malaysia W.B.	Linggu Dam
2002	54 (1400)	Govt. of Malaysia	Sungai Selangor
2002	39 (1000)	Govt. of Malaysia	Jus Dam
2002	18 (400)	Govt. of Malaysia	Jus Dam
2002	12 (300)	Govt. of Malaysia	Jus Dam
2002	30 (700)	Govt. of Panama	Chiriqui Dam (Esti.)
2002	18 (400)	Govt. of Panama	Barrigon Dam (Esti.)
2003	48 (1200)	Govt. of Malaysia	Chereh Dam
2003	48 (1200)	Govt. of Malaysia	Chereh Dam
2003	48 (1200)	Government of Iran	Aydogmoosh Dam
2003	18 (450)	Government of Iran	Aydogmoosh Dam
2003	36 (900)	Government of Malaysia	Kelalong Dam
2003	16 (400)	Government of Malaysia	Sungai Kesang Dam
2003	18 (450)	Government of Malaysia	Sungai Muar
2004	48 (1200)	Snowy Hydro, Australia	Jindabyne Dam
2004	76 (1900)	Snowy Hydro, Australia	Jindabyne Dam
2005	48 (1200)	Government of Iran	Vanyar Dam
2006	600	Government of Sarawak	Gerugu Dam
2007	1000	Government of Iran	Gheighaj Dam
2008	600	Sydney Catchment Authority	Tallowa Dam
2008	200	Sydney Catchment Authority	Cordeaux Dam
2008	300	Sydney Catchment Authority	Nepean Dam
2008	300	Sydney Catchment Authority	Broughtons pass Dam
2009	1200	Manila Water Company, Philippines	Angat Dam
2009	1400	Manila Water Company, Philippines	Angat Dam
2009	600	Baulderstone Pty Ltd, Australia	Mardi Dam
2010	600	Department of Energy, Malaysia	Sungai Teriang
2010	1000	Department of Energy, Malaysia	Sungai Teriang
2010	1200	Carillion Civil Engineering	Abberton Reservoir
2011	200	HydroPlan	Rannoch Dam
2012	300	Sino Hydro, Brunei	Ulu Tutong Dam
2012	1200	Sino Hydro, Brunei	Ulu Tutong Dam
2013	900	KECT, India	Wilson Dam
2013	2200	MADA, Malaysia	Pedu Dam
2014	900	Scottish Water	Backwater Dam
2014	900	Welsh Water	Ystradfellte Reservoir
2014	400	Specialist Maintenance Contractors JV, Cyprus	Symvoulos Dam
2015	900	KECT, India	Wilson Dam Phase II
2016	600	Central Highlands Water, Australia	White Swan
2016	600	Czech Water	Prague,
2017	2000	UJVN Ltd	Khatima, India
2019	400	Specialist Maintenance Contractors JV, Cyprus	Symvoulos Dam

SERIES 856
SUBMERGED DISCHARGE VALVES (SDV)



Glenfield Invicta have been designing and successfully supplying Submerged Discharge Valves since the 1960's. The valve and corresponding sump sizing were developed through extensive laboratory testing and field investigations.

The SDV is always used in the terminal position of the system. One of the key advantages it has over other terminal discharge valves is the combination of a compact stilling sump to assist with kinetic energy dissipation quietly and, at the same time, providing a tranquil water surface in the sump. Because the jet velocity of the partially closed valve can be excessive, cavitation can occur as the jet leaves the valve. However, as the jet disperses in the body of water in the sump surrounding the valve, any cavitation under severe flows is quite harmless as the implosions are directed away from the valve.

In common with so many of the best engineered products, the basic valve form is simple. It consists of an inlet pipe bend and a vertical down pipe terminated by the valve outlet and base plate. Flow is regulated by the vertical movement of an internal cylindrical sleeve operated by a central spindle.

The valve operates on the principle of throttling pressure across multiple ports (or orifices) which are specially sized, shaped and positioned around a circular sleeve. The design of the optimised port area and geometry is based on the hydraulic consideration of each specific site. Energy is dissipated in the water immediately surrounding the submerged part of the valve.

This valve, in ductile iron construction, is suitable for flow control and energy dissipation over a wide range of flows and pressures throughout its full travel and is not subject to vibration and cavitation.

The vertical moving stainless steel sleeve uncovers the customised ports in the bronze body thus creating a horizontal radial existing jet. The large porting shapes help to minimize potential port plugging from any contamination / debris contained within the medium. The sleeve is operated by a central vertical spindle rising through a sealed gland in the inlet bend.

Features and benefits

- Stilling sump - compact energy dissipation
- Resilient seal - drop tight shut off
- External mechanism - simple maintenance
- Submerged discharge - quiet, safe, cavitation free
- Ported sleeve - near linear flow control
- Cylindrical sleeve - low operating effort
- Rising stem design - improved visual indication
- Cast construction - minimum vibration
- Fine screw thread - smooth flow transition

SERIES 856
SPECIFICATION

The Series 856 SDV is designed to control the discharge of water at the reservoir inlet or terminal point of a pipe or dam, discharging into a compact stilling sump.

The vertical sleeve type, regulating valve is designed primarily to present an optimum means of controlling flow under submerged discharge conditions. Jet energy is dissipated in the turbulence of the water immediately surrounding the submerged part of the valve.

The basic assembly of the valve comprises of the following components:

Inlet Bend Ductile iron cast, double flanged 90° bend. The inlet flange is drilled to requirements. The bend incorporates a stuffing box gland and mounting flange facing to take the support pillar/ thrust tube. External bosses are cast on the bend for fixation of suitable lifting eyebolts.

Guide Spiders Ductile iron cast, flange with a centrally located boss which is attached to the flange by integrally cast radial ribs. The spiders are fitted with bronze bushes to aid support and alignment of the valve spindle. The top face of the flange has a spigot and the bottom face recessed for location purposes. Both faces seal by means of resilient cord joints. The boss and ribs require to be streamlined to reduce flow disturbance.

Taper Pipe (for unequal inlet / outlet size valve) Ductile iron cast, double flanged concentric taper which is located between the two guide spiders. The top flange has a spigot and the bottom flange is recessed for location purposes. Both faces sealed by means of resilient cord joints.

Extension Pipe (depending on required height of valve) Ductile iron cast, double flanged pipe which is located between the guide spider on the taper pipe and the guide spider on the stopper pipe, provides the required height between inlet bore centreline and the base of the sump.

Stopper Pipe Ductile iron cast, double flanged pipe, with four internal stopper pads integrally cast to limit the travel of the sliding sleeve. Located at the lower end of the stopper pipe are two openings faced, studded and provided with cast hand-hole covers / gaskets, which can be removed to allow inspection of the valve internals.

Upper Valve Body Ductile iron cast, double flanged pipe, with its top portion machined to accommodate the gland and guide rings and dynamically activated resilient sealing ring. The upper valve body top flange has a spigot and cord joint and is bolted to the stopper pipe. The bottom flange is recessed to suit the contour of the cord joint on the ported body.

Ported Body Bronze cast cylindrical component which has external bosses cast, and has the required porting equally spaced between the bosses. The ports are specially designed to provide suitable flow control for the conditions specified. The top face of the ported body has a spigot which is located in the upper valve body and the bore of the lower part of the ported body is machined to suit the contour of the resilient face ring.

Base Plate Ductile iron casting having its top end cast solid with the underside having internal radial ribs each of which has a rectangular shaped hole adjacent to the solid end. These holes allow passage of grout between the ribs, the grout being introduced through tapped holes inside of the cylinder portion.

Through this flange, the foundation bolts are located offset from equally spaced bosses, which are on the same centreline as the ribs. The top surface of the base plate is machined to accept the ported body and to suit the contour of the resilient face ring.

The ported body is secured to the baseplate by means of stainless steel stay bars through the upper valve body flange held in place by stainless steel nuts.

Resilient Face Ring A rubber face ring is securely clamped in position between a check formed on top of the baseplate and a check in the lower end of ported body and clamped by stay bars as previously described.

SERIES 856
SPECIFICATION

Sleeve A stainless steel fabrication with a centrally located inner boss connected with radial ribs. The outside diameter of the sleeve is accurately machined and is a close fit in the ported body. The sleeve is guided by means of bronze ring located in the upper valve body.

The resilient sealing ring, also located in the upper valve body, is pressurised by the passage of water through a series of holes in a retaining gunmetal gland ring, to ensure positive contact with the sliding sleeve thus forming a seal which is effective at all positions of valve travel.

In the closed position, the lower or leading edge of the sleeve makes contact with the rubber face ring which is secured between ported body and baseplate as previously described.

In the open position the sleeve is raised to expose the full area of the ports.

Operating Spindle manufactured from stainless steel and operates as a rising spindle. It comprises of sections (dependent on valve length) valve spindle, extension spindle and a screwed headstock spindle. The sections are machined at the ends to make them suitable for joining together. The lower end of the valve spindle is secured to the stainless steel valve sleeve by a shoulder formed on the spindle, bearing on the top of the centrally located boss. A stainless steel lifting nut is screwed to the bottom end of the spindle and bears on the underside of the boss and so locks the spindle to the sleeve. The valve spindle can be extended.

Headstock Pillar Ductile iron cast pillar which is mounted onto the inlet bend. The height is adjusted to position the handwheel at a convenient height above the operating platform. Two hand hole openings are provided for access to the gland and stuffing box and two machined slots are provided for engagement of the torque plate.

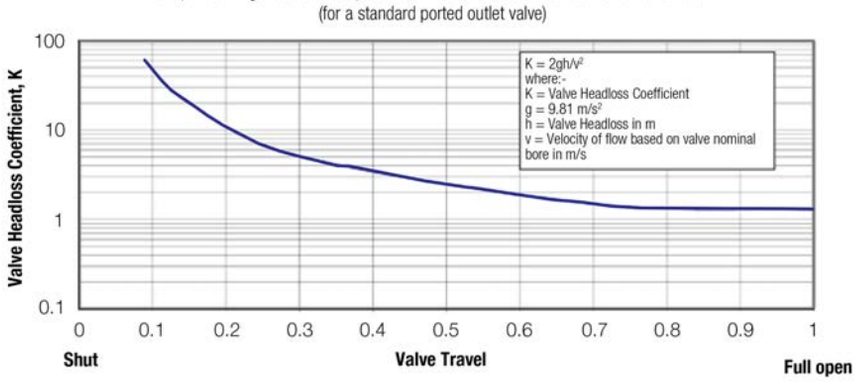
Valve Control Equipment The valve can be operated manually or fitted with an electric / hydraulic actuator.

SERIES 856
SIZING

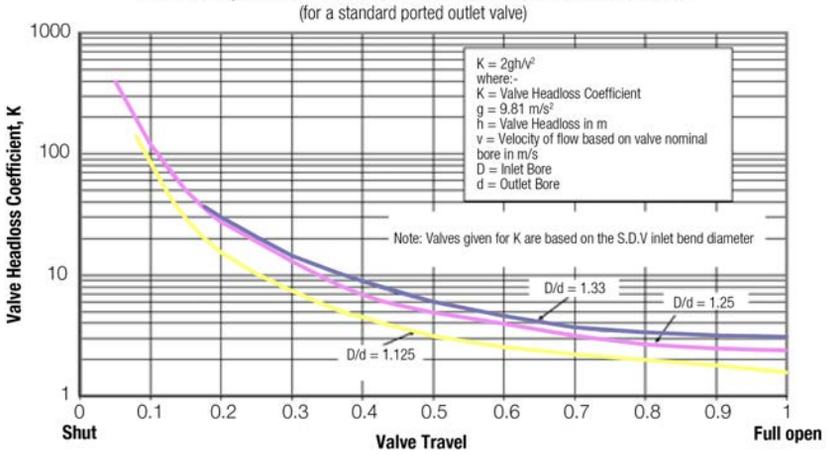
The flow velocity in the inlet bend should be limited to 6m/s and the flow velocity in the vertical section of the valve should be limited to 12m/s. A larger elbow can be used with a smaller downstream valve to provide the desired maximum flow rate.

The headloss characteristics for standard ported valves are shown in the curves on the graphs (please note that the porting design of the valve can be modified to achieve a near-linear flow control across the valve stroke and that this will modify the headloss curves below.

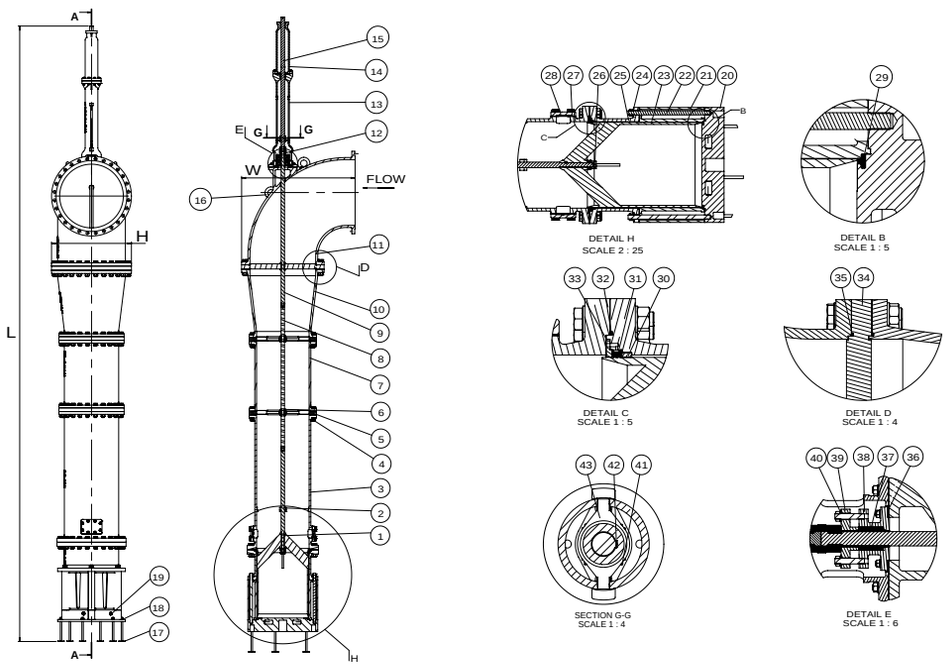
Series 856 Submerged Discharge Valve (Inlet/ Outlet Diameter Equal)
Graph showing the relationship between valve headloss coefficient and valve travel
(for a standard ported outlet valve)



Submerged Discharge Valve (Tapered outlet type)
Graph showing the relationship between valve headloss coefficient and valve travel
(for a standard ported outlet valve)



SERIES 856
CAST VERSION



Components		Material
1	Stopper pipe	Ductile Iron GJS-500-7
2	Bottom valve spindle	Stainless steel, 1.4057
3	Guide spider	Ductile Iron GJS-500-7
4	Bush	Alu-Bronze; BS EN12163; CW307G
5	Screw	Grade A4-70
6	Extension pipe	Ductile Iron GJS-500-7
7	Bolt	Grade A4-70
8	Intermediate spindle	Stainless steel, 1.4057
9	upper spindle	Stainless steel, 1.4057
10	Taper pipe	Ductile Iron GJS-500-7
11	Inlet bend	Ductile Iron GJS-500-7
12	Tensional coupling	Ductile Iron GJS-500-7
13	Extended stool	Ductile Iron GJS-500-7
14	Upper pillar	Ductile Iron GJS-500-7
15	Screwed spindle	Stainless steel, 1.4057
16	Eye bolt	Hot dip galvanized steel
17	Foundation bolt	Stainless steel, 1.4401
18	Spring washer	Grade A4-70
19	Plug	Bronze
20	Baseplate	Ductile Iron GJS-500-7
21	Ported body	Alu-Bronze; EN1982; CC333G
22	Stay bar	Stainless steel, 1.4057

23	Sleeve	Stainless steel, 1.4401
24	Washer	Grade A4-70
25	Upper valve body	Ductile Iron GJS-500-7
26	Lifting nut	Stainless steel, 1.4057
27	Gasket	EPDM
28	Handhole cover	Ductile Iron GJS-500-7
29	Face ring	Neopren
30	Guide ring	Bronze
31	Seal ring	Neopren
32	O-ring	EPDM
33	Gland ring	Bronze
34	Guide spider	Ductile Iron GJS-500-7
35	O-ring	EPDM
36	Gasket	EPDM
37	Packing	PTFE
38	Stuffing box	Ductile Iron GJS-500-7
39	Gland	Ductile Iron GJS-500-7
40	Washer	Stainless steel, 1.4401
41	Hexagon nut	Grade A4-70
42	Key	Grade A4-70
43	Torque plate	Stainless steel, 1.4401

Ref	DN/DN	Flange drilling	H	W	L	Approx Weight
	mm		mm	mm	mm	Kg
856-0200-0-110000000100	200 - 200	PN16	515	563	4760	1000
856-0300-0-110020020200	300 - 300	PN16	460	660	8150	1500
856-0300-1-110010010100	300 - 250	PN16	460	660	8150	1300
856-0400-2-110090090100	400 - 250	PN16	580	790	6991	1481
856-0450-1-110030030200	450 - 400	PN16	714	853	6894	1600
856-0600-2-110040040100	600 - 450	PN16	840	1120	8250	5000
856-0800-1-100050050200	800 - 600	PN10	1025	1215	11480	7000
856-1000-2-110060060200	1000 - 800	PN16	1255	1728	12840	12500
856-1400-1-110070070300	1400 - 1200	PN16	1685	2123	16150	20000
856-1600-2-110080080000	1600 - 1200	PN16	1930	2222	16500	21000

*Sizes, dimensions and weights in this table are for general information purposes only. Valves are designed to ensure they meet the specific requirements of a particular system.

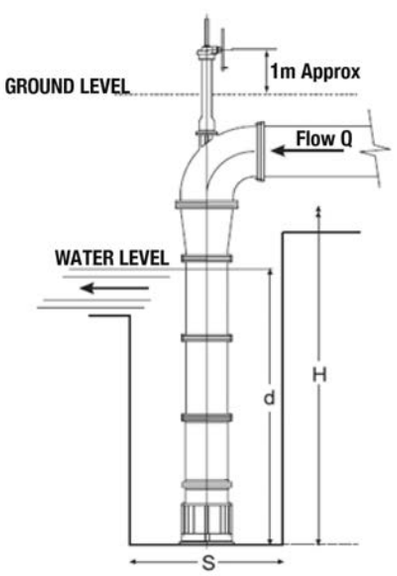
SERIES 856 - STILLING SUMP / BASIN SIZING

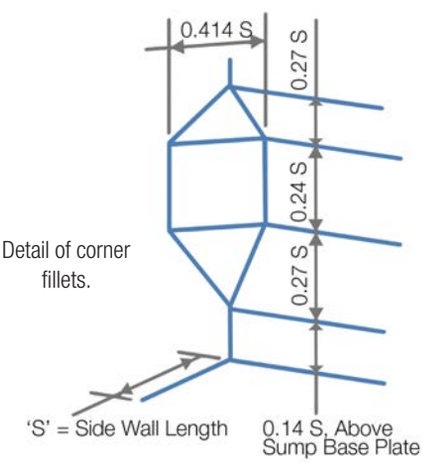
The design of the stilling sump (or chamber) is crucial for the optimization of energy dissipation. Dimensions from the valve to the stilling sump wall are critical.

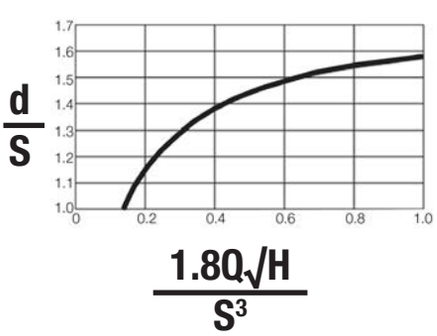
Please contact Glenfield Invicta for stilling sump dimensions to suit your application +44 (0) 1292 670404.

The following calculations and graphs can be used as a guideline for stilling sump requirements:

Where:
Q = maximum discharge flow (m^3/s)
H = maximum head of water (m)
d = minimum submergence depth (m)
S = side length of sump wall (m)







The uniformity of free surface conditions in the stilling well can be improved by the addition of short corner fillets. The diagram to the right can be used as a guideline for sizing and positioning of the fillets.

SERIES 856
SELECTED GLOBAL REFERENCE LIST

Over 160 years experience and over 80 global installations

ORDER YEAR	DN	CUSTOMER	LOCATION
1968	36/36	Central Scotland W.B.	Glen Hove (Scotland)
1968	24/18	East Scotland W.B.	Backwater Dam (Scotland)
1969	42/30	Essex River Authority	Ely-Ouse (England)
1969	72/72	Dept. of Water Affairs	Orange River (S. Africa)
1969	24/18	Ross & Cromarty Water Board	Invergordon (Scotland)
1969	18/18	Central Scotland W.B.	Blairlinnans (Scotland)
1969	24/24	Central Scotland W.B.	Balmore (Scotland)
1969	30/30	Central Scotland W.B.	Gowanbank (Scotland)
1970	24/24	Furness Water Board	River Duddon (England)
1970	30/24	E.S.B. Dublin	Turlough Hill (Ireland)
1970	18/15	Ayrshire & Bute W.B.	Loch Bradan (Scotland)
1972	30"/600mm	Auckland R. Auth.	Wairoa Dam (New Zealand)
1973	42/42	Hong Kong W.A.	High Island Scheme
1973	1600/1200mm	The Dee & Llwd River Auth.	Brenig Reservoir (Wales)
1974	42"/800mm	Crane Australia Pty. Ltd	Melbourne & Metro WB (Australia)
1974	800/600mm	Farid Ahmar & Farouk At-tar Sir M. MacDonald & Part. (cCons.Eng)	Mandali Irrig. Project (Iraq)
1975	42/42	Ward Ashcroft & Parkman	Kangimi Res. (Nigeria)
1976	1000/800	Welsh National W.D.A.	Marchlyn Reservoir
1976	500/400	Northumbrian W.A.	Keilder Scheme
1976	500/400	Welsh National W.D.A.	Towy & Lliw Res.
1976	500/400	Northumbrian W.A.	Keilder Scheme
1976	1200/1067	Northumbrian W.A.	Keilder Dam
1978	450/400	North West W.A.	High Lane Res.
1978	450/450	Central Scotland W.B.	Blairlinnans
1978	1000/800	Lothian Reg. Council	Megget Dam
1978	1200/800	Lothian Reg. Council	Megget Dam
1979	800/800	Lothian Reg. Council	Megget Dam
1980	300/300	Southern W.A.	Darwell/Beauport
1980	400/300	U.A.E.	Al Ain Wed 24 Pump
1981	400/400	Auckland R. Auth.	Cosseys Dam
1981	800/600	Government of Cyprus	Asprokremmos Dam
1982	800/800	Kenya Water Dept.	Chania Thika
1983	1000/1000	Government of Nigeria	Balanga Dam
1984	200/200	Government of Sri Lanka	Kotmale Dam
1985	500/400	Bombay M.W.C.	Panjarapur PS
1985	200/200	Government of U.A.E.	Khor Fakkan Dam
1986	600/600	Algiers W.S.	Gue De Constantine
1986	400/400	Government of Hong Kong	Harbour Island
1987	600/600	Central Scotland W.B.	Balmore T.W.
1987	900/800	Government of Hong Kong	Pak Kong T.W.
1987	600/600	Strathclyde R.C.	Bradan Dam
1988	1200/1200	Government of Hong Kong	Harbour Island Sch.
1988	600/600	Government of Thailand	Lat Phrao Dam
1988	1200/1200	Government of Brunei	Benutan Dam
1988	400/400	Government of Brunei	Benutan Dam
1989	900/800	Government of Hong Kong	Au Tau P.S.
1989	800/600	S.W.W.A. England	Roadford Dam

SERIES 856
SELECTED GLOBAL REFERENCE LIST

ORDER YEAR	DN	CUSTOMER	LOCATION
1989	300/300	Strathclyde W.A.	Afton Res.
1990	900/36	Central Scotland W.B.	Blairlinnans
1990	300/300	Malaysia R.W.S.S.	Malaysia
1990	1200/1000	Goverment of Singapore	Pak Kong T.W.
1990	450/300	Anglian W.A.	Littlehempston
1992	800/600	North West Water	Woodford Reservoir
1992	800/600	North West Water	Shap Aqueduct
1993	600/600	Bombay Municipal Corporation	Panjrapur Pumping Station
1993	1600/1200	Government of Hong Kong	Tai Po Tau Pumping Station
1995	800/800	WOSWA 65/6411	Balmore WTW
1997	400/300	Government of Zimbabwe	Pungwe to Matare Christmas Pass
1997	400/300	Government of Zimbabwe	Odzani Scheme
1999	800/600	Government of Malaysia	Sungai Kelinchi
2000	400/400	Government of Malaysia	Sungai Kelinchi
2002	1100/800	Sydney Catchment Authority	Woronora Dam
2002	1000/800	Sydney Catchment Authority	Woronora Dam
2003	375/250	Sydney Catchment Authority	Woronora Dam
2003	450/300	Government of Malaysia	Sungai Muar
2004	800/600	Government of Iran	Sanegerd Dam
2004	600/450	Government of Malaysia	Sungai Kinta TW
2004	800/600	Snowy Hydro, Australia	Jindabyne Dam
2005	1000/800	Government of Iran	Tangab Dam
2005	1400/1200	Government of Hong Kong	Lower Shing Mun
2006	400/300	Government of UAE	Shobaisi Dam
2006	400/300	Government of Australia	Goro Nickel Project
2006	450/400	Government of Ethiopia	Koga Dam
2006	400/300	Government of Australia	Mooney Mooney Dam
2007	600/450	Government of Iran	Gheighaj Dam
2007	800/600	Government of Australia	Palmtree Creek
2008	1000/800	Melbourne Water	Sugarloaf Reservoir
2009	300/300	Government of Malaysia	Kargu Dam
2009	1000/800	Government of Malaysia	Kargu Dam
2009	300/300	Alstom / EDF	Rizzanese Dam, Corsica
2011	1000/800	California Department of Water Resources	Citrus Reservoir
2011	450/400	California Department of Water Resources	Citrus Reservoir
2011	1000/800	ACM	Baghdad
2011	800/600	ACM	Baghdad
2013	400/250	Leed Engineering & Construction Pty Ltd, Australia	Onkaparinga Dam
2012	200/200	Fred Olsen / Hydroplan	Burnhead 2
2013	300/250	Bristol Water	Heron Green
2013	1000/800	Watercare, New Zealand	Hunua No. 4
2014	600/450	Sinohydro, Malaysia	Hulu Terengganu
2014	1400/1200	JN Bentley, UK	Eccup Reservoir
2017	750/900	Scottish Water	West of Scotland
2017	450/600	Salamah Trading	Beirut
2019	400/300	Poyry	Marmorera Dam, Switzerland

NEEDLE / PLUNGER VALVES
PRODUCT SPECIFICATION

Main Features

- Product range from DN80-2000
- Pressure classes PN10/16/25/40/64/100
- Design and manufactured according to EN 1074-1 / EN 1074-5 / EN 1349
- Face-to-face according to EN 558 S15 (F5)
- Flanges according to EN 1092-1/2 or ANSI B16.5 CL 150/300/600
- Easy installation
- Corrosion protection by FBE coating 300 microns, colour RAL 5005.
- Potable water approved DM174 / WRAS / ACS / DVGW
- Class A tightness according to EN 12266
- Standardised face-to-face for the whole range

Benefits

- State of the art design.
- Innovative design for flow optimisation with a reduced pressure loss in open position.
- Reduced torque.
- Long life sealing systems. All gaskets are located safely in the no-flow zone.
- Long-Life of the valve in all conditions with all internal and moving parts in stainless steel. The body is completely protected by Heavy Duty Corrosion Protection FBE coating. (Small diameter valves supplied with stainless steel body)
- Linear flow control up to 96% of the total stroke of the valve.
- Cavitation prevention using bespoke solutions for all conditions.
- Compact, lightweight and economic efficient design.

Application Fields

DRINKING WATER / WATER TREATMENT
- Flow control
- Pressure control

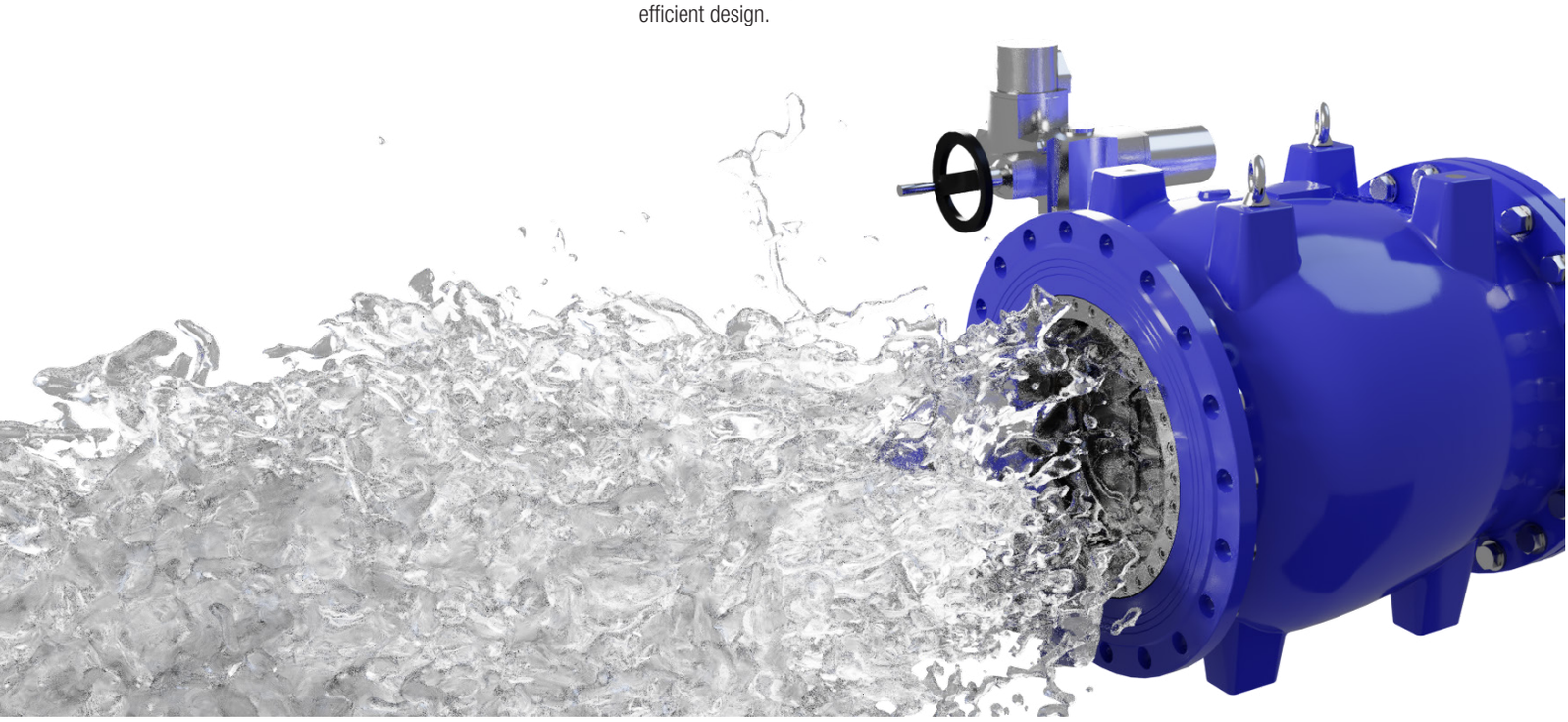
IRRIGATION
- Flow control
- Pressure control
- District Metering Area (DMA)
- Level control

SNOW MAKING
- Pressure control
- Flow control

PRESSURE MANAGEMENT
- Dynamic pressure control
- District Metering Area (DMA)
- District Metering Zone (DMZ)

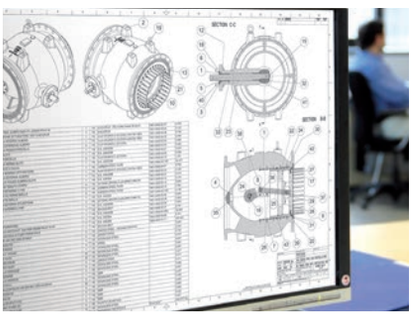
INDUSTRY
- Flow control
- Pressure control

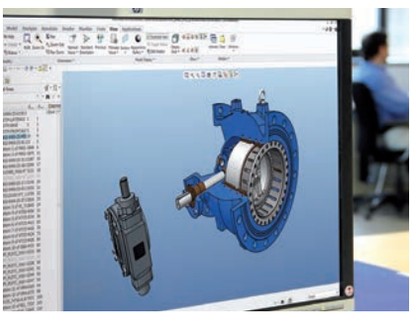
DAMS & RESERVOIRS
- Flow control
- Pressure / level control
- Emergency drawdown
- Compensation flow



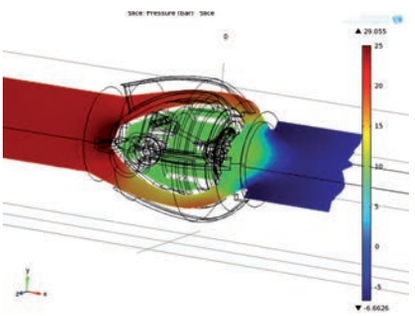
NEEDLE / PLUNGER VALVES
TECHNICAL EXPERTISE

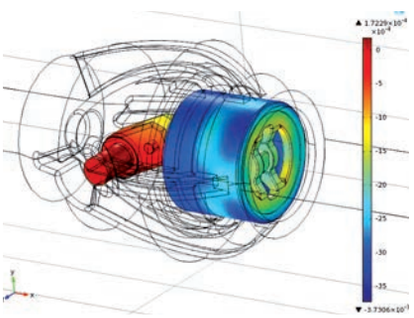
DESIGN
State of the art design and cutting edge technology. Using the most sophisticated CAD-CAE programs available on the market (SolidWorks, Pro/E).



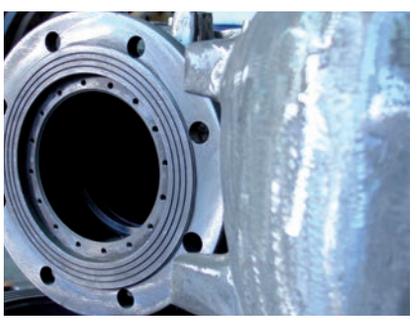


KNOW-HOW
Calculations using COMSOL software (FEM + FLUID DYNAMICS) and in depth CFD analysis are used to optimise valve design.





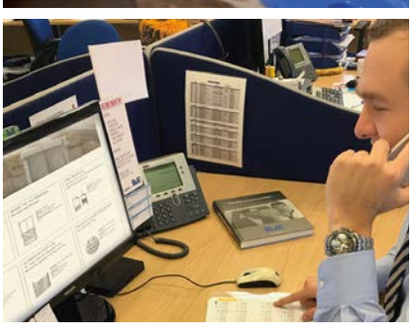
MANUFACTURING - HIGH QUALITY MATERIALS
- Castings
- Machining
- Painting / Coating
- Assembly



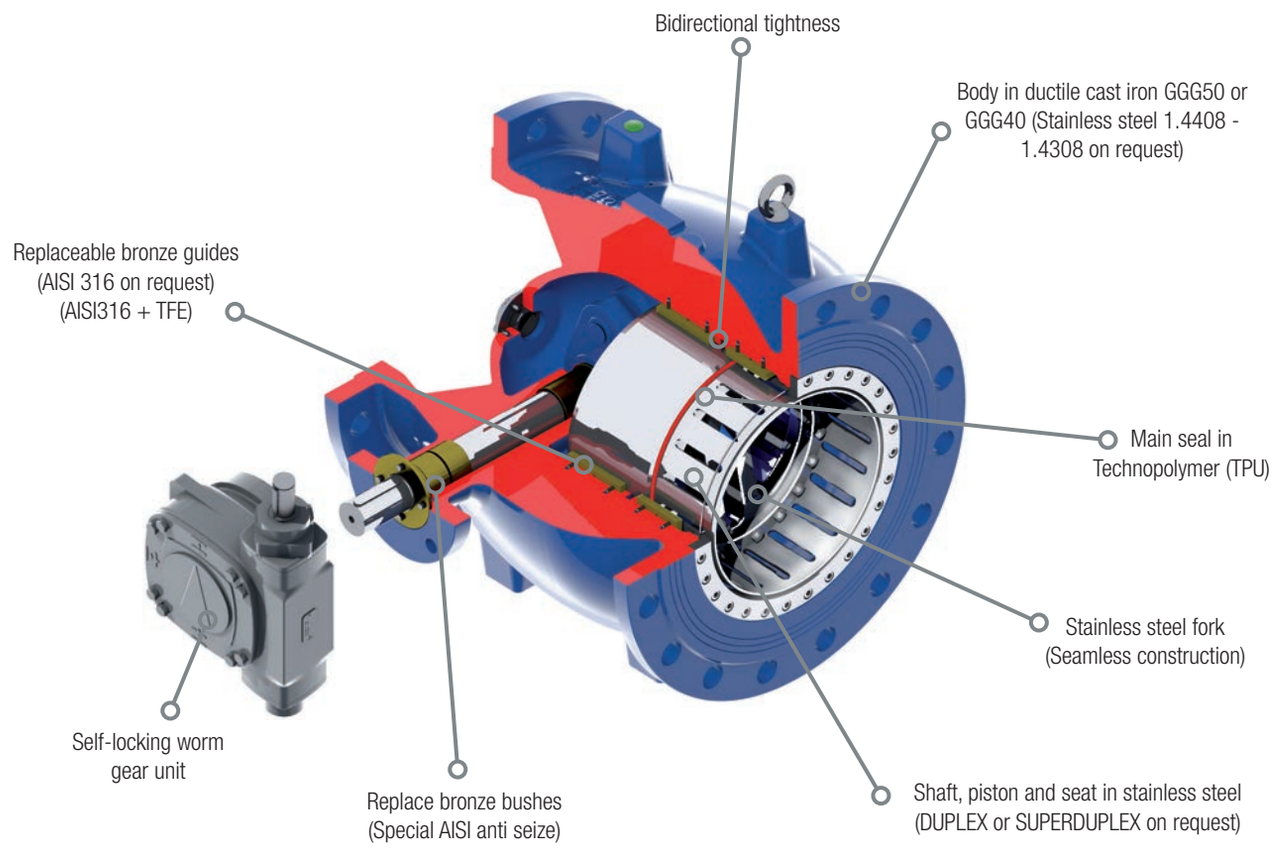
QUALITY CONTROL
The quality control is carried out using state-of-the-art equipment, in addition to static and dynamic test apparatus.

Stringent quality parameters are carefully checked by highly qualified staff.

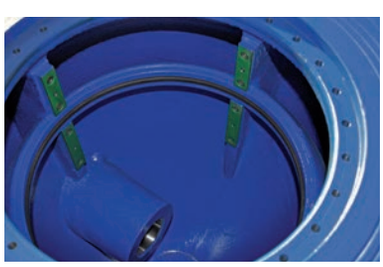
TRAINING AND TECHNICAL SUPPORT
A highly skilled team of engineers is available for:
- Training courses on or off site
- Pre-post sales support
- “On-site” technical assistance



FEATURES AND BENEFITS

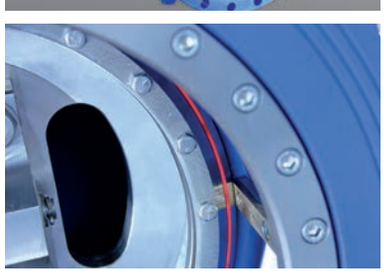


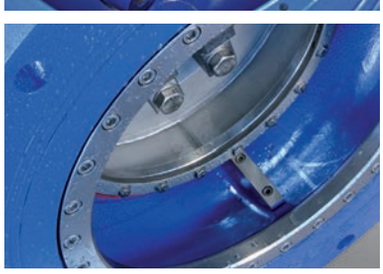
State of the art solutions for a high performance long lasting product.



A special and innovative internal gasket for a perfect and bidirectional seal.

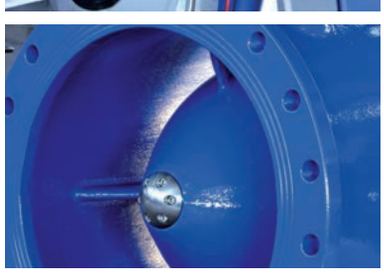
High performance seal, located in the no-flow zone, easily replaceable without disassembling the valve from the pipeline.





Compact piston with bronze guide strips (Replaceable).

One-piece body (L=DN+200 mm) EN 558 S15 (F5).



Heavy duty corrosion protection by FBE epoxy coating 300 microns.

CONFIGURATIONS
“THE MOST RELIABLE SOLUTION FOR CONTROL”

Worm gear box and handwheel

Electric actuator

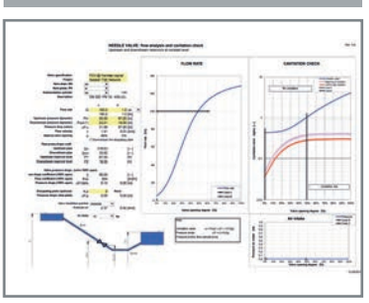
Hydraulic brake and lift unit

Double acting hydraulic piston

Simple acting hydraulic piston

Double and single acting pneumatic actuator

Dedicated software and accessories for sizing and cavitation analysis

INTRUSIVE Dissipating cylinder	NON INTRUSIVE Dissipating plate	NON INTRUSIVE Venting device	Flow & Cavitation Analysis
			

Certifications and construction standards
The high quality standards and strict controls during the manufacturing have led to obtain major awards with internationally recognized certification bodies.

EN 1074-1
EN 1074-5
EN 1349

CE | ICIM | WRAS Approved Coating | DM 174

SERIES 54
RESERVOIR SPECIFICATION GATE VALVE

Gate valves are generally designed to be used for infrequent isolation applications and are commonly installed for this purpose in water and wastewater systems.

Standard water systems with a pressure rating of PN16 are commonly designed with flow velocities ranging up to and including a maximum of 4m/s as per EN1074-1. However, there are instances when this maximum flow velocity must be exceeded and for these special installations, it is important to select a suitable isolation gate valve that can perform and operate safe and well under these conditions.

Typical examples involving increased flow velocities may occur on older existing piped systems that require an increased flow rate and also on dam and reservoir installations. A large percentage of UK Reservoirs incorporate draw-off pipework that facilitates the release of water from the reservoir. This draw-off can be used for several functions including flow compensation.

However, it is commonly used to enable the scour of silt and also to provide a means of emergency drawdown of the reservoir to prevent issues such as flooding and over-loading of the dam structure.

The emergency drawdown rates can be different depending on the reservoir requirements however, the resulting flow velocities through the pipework and valves can be considerable. Increased flow velocities can be problematic for piped systems as they can lead to an increased risk of cavitation, vibration, noise and accelerated wear and tear.

The use of standard gate valve products in these applications could be considered as sacrificial and by selecting a suitable gate valve for isolation on high velocity systems, this will ensure that the valve will achieve a longer service life resulting in reduced downtime, reduced valve repairs, reduced whole-life costs and an overall increase in system efficiency.

Water Companies in the UK have gate valves that have been in use for several decades and in some cases in excess of 100 years. These assets are understandably at the end of their service lives and Water Companies require a more robust gate valve that will provide a longer lifetime compared to standard gate valve products - especially in applications that are deemed to have a high cost of failure, such as reservoirs. At Glenfield Invicta, we recognise the importance of this application and are pleased to offer a product that meets these high velocity requirements.

FEATURES AND BENEFITS

The Reservoir Specification gate valve is an enhanced version of the AVK Series 54 product range and has several key features which allows it to be used under more extreme conditions and can be used for isolation of piped systems with flow velocities of up to 9m/s.

Shoes & Channels

The inclusion of aluminium bronze shoes and channels as standard has a number of important benefits, each of which are described here. This feature greatly reduces the potential for vibration and fatigue damage as it ensures there is a small and uniform clearance between the body and wedge throughout the complete valve stroke. Therefore, the potential for excessive movement is greatly reduced compared to standard wedge gate valves and the risk of wear and tear is reduced. Operational torques are also reduced due to the reduced frictional coefficients of the smooth machined finish of the shoe and channel surfaces. These shoes and channels are installed on both sides of the valve as standard, providing full flexibility of installation. The inclusion of this feature also has the added benefit of allowing the gate valve to be installed with the valve on its side and the stem in the horizontal orientation as these components reduce the bearing stresses on the contact surfaces between the body and wedge as well as improving the alignment and sealing performance of the valve. This can be greatly important, especially in installations where space limitations exist. Figure 1 shows a cross-sectional and elevational view of the valve with the shoes and channels installed. The number and size of fasteners varies depending on valve size.

Jacking Screw (or Easing Screw)

The addition of one or two jacking screws (depending on valve size) fitted as standard on the underside of the valve body allows an axial thrust to be applied directly to the base of the wedge. If the valve has been closed for long periods of time, it can become increasingly difficult to operate. By rotating the jacking screw(s), this pushes the wedge up a small distance that is sufficient to crack the valve off of its seated position. Any build up or residue between the body seat and wedge face rings will tend to be flushed through the valve. Operation of the valve from the main valve stem can then be carried out as normal. The jacking screw also acts as a mechanical stop which prevents over travel of the wedge which can cause considerable operational issues with metal seated gate valves. It is important that the jacking screw(s) be adjusted afterwards to its original position. This feature not only protects the valve from becoming jammed shut but also greatly reduces the long-term maintenance requirements for the valve.

Fixation of body seat and wedge face rings

The fixation of the seats to the body and wedge is of paramount importance when gate valves are used in high velocity applications. The increased hydraulic forces and turbulent effects can cause the rings to separate from the casting. If this occurs, the rings obstruct the movement of the wedge resulting in damaged rings rendering the valve inoperable. The dams and reservoir specification gate valve incorporates a combination of methods used to secure the rings to the body and wedge. The standard method of securing the rings is to screw them onto the casting or to press them into place. Both methods provide suitable levels of security for standard gate valve applications. However, for our reservoir specification gate valves, all rings have additional mechanical pins which provide increased security, providing a considerable increase in product longevity.

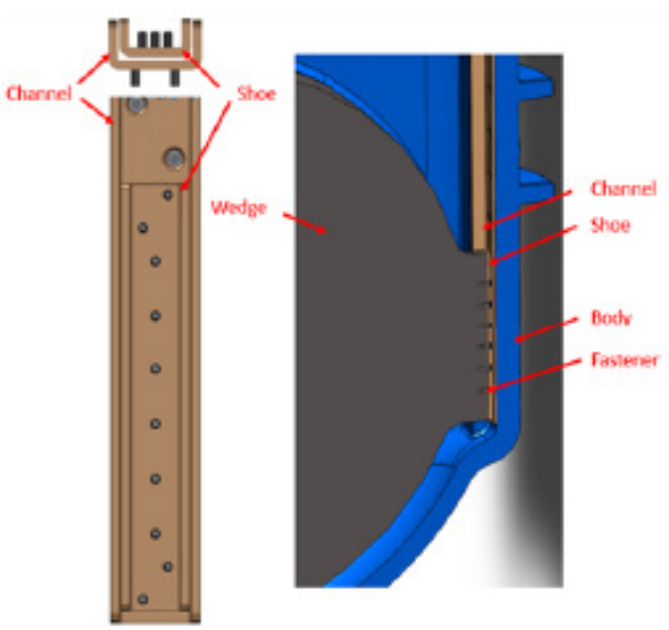


Figure 1 - Shoe & Channel feature

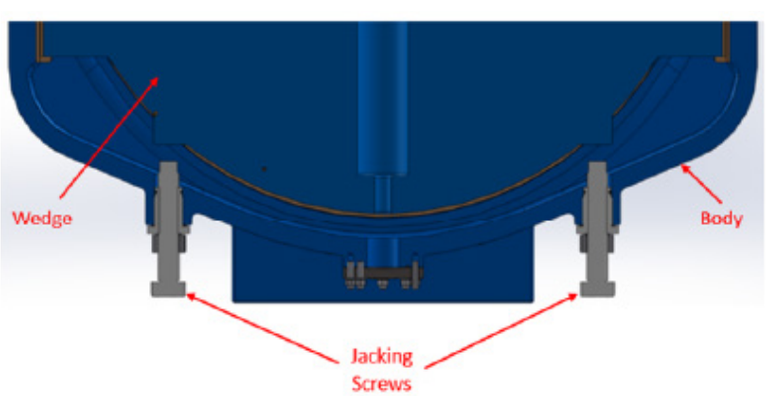


Figure 2 – Jacking screw arrangement

SERIES 54 RESERVOIR SPECIFICATION GATE VALVE OPTIONS

The Series 54 Reservoir Specification gate valve can be supplied with a range of options. The main ones are described here:

Bypass valve
All valves within this range can be supplied with an integral bypass valve. The bypass valve is used to reduce the differential pressure acting on the main gate valve (which reduces the operating effort and, when utilised, can greatly reduce the gearbox / actuator size and cost). The bypass valve also allows a more gradual release of flow from to the downstream section and also to prevent stagnation of water in the line.

Direction of operation
All valves can be supplied to operate in either a clockwise to open or clockwise to close direction.

Gearbox
It is always recommended to operate larger size valves with gearboxes to allow the user to safely operate the valve. The full range of Reservoir Specification gate valves are offered with either bevel or spur gearboxes. These gearboxes are sized to provide the most economical unit that can meet the operating conditions of the valve at a particular differential pressure. For valve sizes of DN700 and above, these must be operated using either a gearbox or actuator as the thrust is taken in the operator units and not the valve.

Electrical actuation
The Electrical actuator provides several benefits including, reduced manual input, quicker, smoother and more regular operation compared to a human operator.
Electrical actuators also allow the user to operate the valve remotely which can be hugely beneficial for more difficult installations. The electrical actuator is supplied according to the customer's specification.

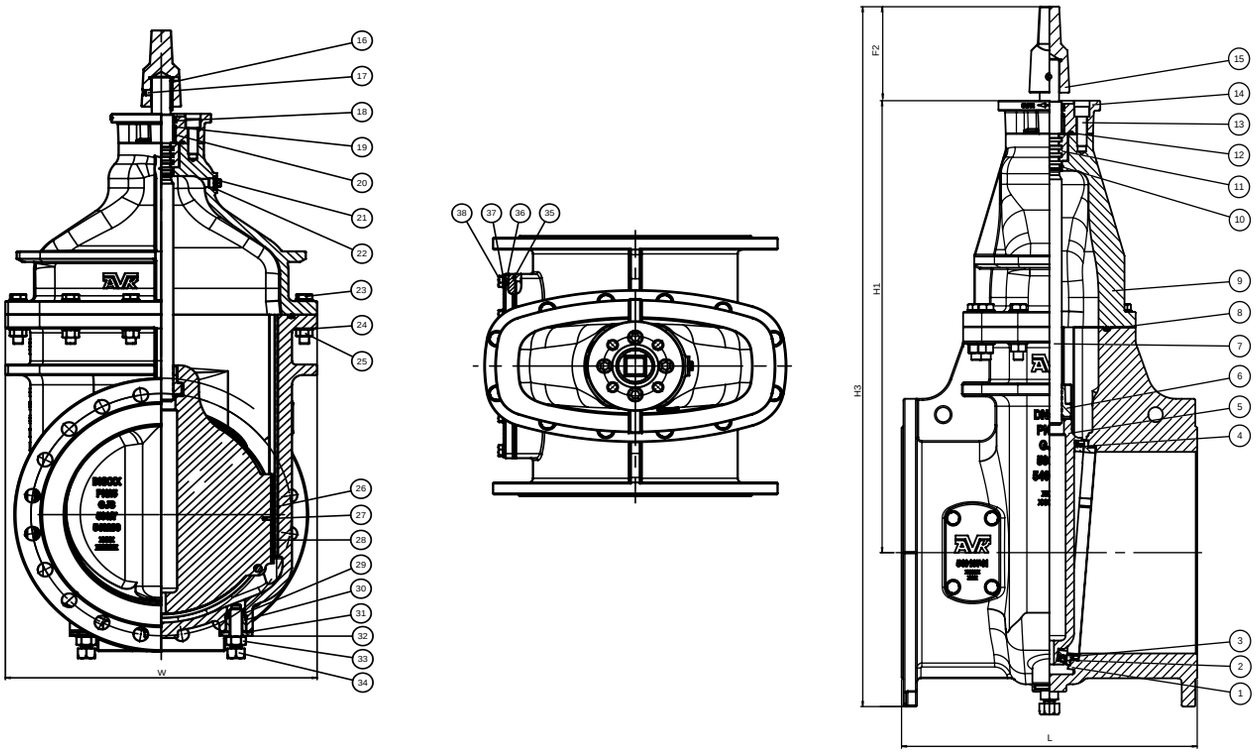
Hydraulic actuation
Where installations are extremely remote in location and where an electrical supply would prove logistically and financially prohibitive, we can supply this range of gate valves with hydraulic operation, as shown in the picture below.

Extension spindle arrangements
These valves can be supplied with bespoke extension spindle arrangements to meet any system layout. The assortment of any spindles, couplings, floor pillars, support brackets etc can be supplied with the main valve so that the full package is supplied.

Mechanical fittings
We manufacture and supply a wide range of mechanical fittings which include dismantling joints, couplings and adaptors.

Site services
We also provide site services including installation and commissioning to ensure that the products supplied are installed correctly and are performing as they should. This is particularly beneficial where electrical and hydraulic actuation is involved.

SERIES 54 RESERVOIR SPECIFICATION GATE VALVE
SIZING - **DN350-600**

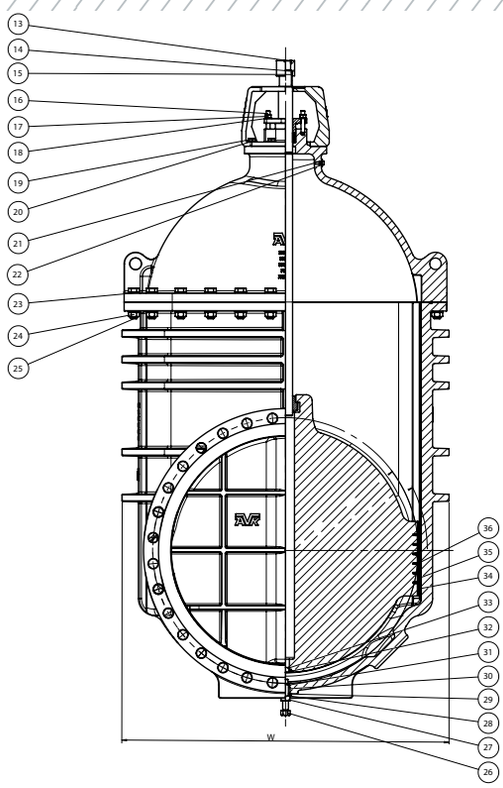


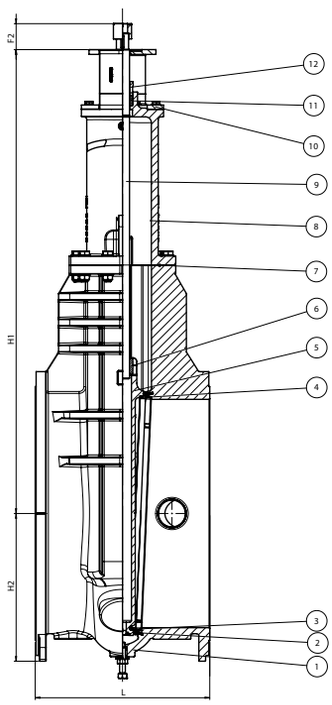
Components		Materials
1	Body	Ductile iron - EN 1563 - GJS-500-7
2	Pin	Phospher Bronze BS 2874 PB102
3	Seat Ring	Aluminium Bronze (EN1982 CC331G)(AB1)
4	Face Ring	Aluminium Bronze (EN1982 CC331G)(AB1)
5	Wedge	Ductile iron - EN 1563 - GJS-500-7
6	Wedge Nut	Al. Bronze BS EN 1982 CC333G(AB2)
7	O-Cord	EPDM
8	Bonnet	Ductile iron - EN 1563 - GJS-500-7
9	Stem	SS EN 10088-1;(W1.4057)/ASTM A276-431
10	Distance Piece	Ductile iron - EN 1563 - GJS-500-7
11	Packing	PTFE
12	Gland	Ductile iron - EN 1563 - GJS-500-7
13	Screw	SS ISO 3506; Grade A4
14	Thrust Nut	Al. Bronze; BS EN12163; CW307G
15	Key	DIN6885-A 1.0503
16	Stud Bolt	SS ISO 3506; Grade A4
17	Nut	SS ISO 3506; Grade A4
18	Washer	SS ISO 3506; Grade A4

Components		Materials
19	Bolt	SS ISO 3506; Grade A4
20	Washer	SS ISO 3506; Grade A4
21	Gasket	Nylon
22	Plug	SS EN 10088-1;(W1.4401)/ASTM A276-316
23	Washer	SS ISO 3506; Grade A4
24	Nut	SS ISO 3506; Grade A4
25	Bolt	SS ISO 3506; Grade A4
26	Jacking Screw	SS EN 10088-1;(W1.4401)/ASTM A276-316
27	Nut	SS ISO 3506; Grade A4
28	Washer	Copper alloy (CW608N)
29	Washer	Copper alloy (CW608N)
30	Plug	Dezn. res. brass EN 12165:CW602N (CZ132)
31	O-Ring	EPDM
32	Screw	SS ISO 3506; Grade A4
33	Jacking plug	SS EN 10088-1;(W1.4401)/ASTM A276-316
34	Shoe	gunmetal CC491K or al-bro AB1
35	Channel	gunmetal CC491K or al-bro AB1
36	Screw	SS ISO 3506; Grade A4

Ref	DN	Flange drilling	L	F2	H1	H3	W	ISO Flange	Theoretical weight
	mm		mm	mm	mm	mm	mm		Kg
54-0350-41-1241424	350	PN16	572	189	834	1302	616	F14	403
54-0400-41-1241424	400	PN16	610	189	910	1410	674	F14	516
54-0450-41-1241424	450	PN16	660	194	995	1525	724	F14	640
54-0500-41-1241424	500	PN16	711	194	1073	1633	794	F14	763
54-0600-41-1242424	600	PN16	787	194	1240	1857	918	F14	1140

SERIES 54 RESERVOIR SPECIFICATION GATE VALVE
SIZING - **DN700 - 12000**



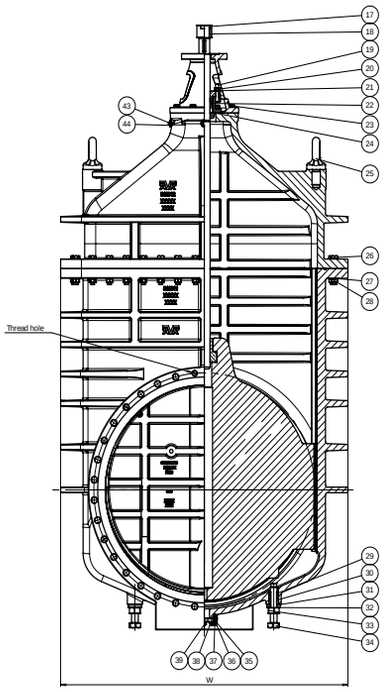


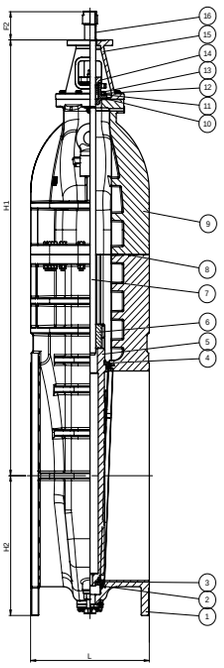
Components		Materials
1	Body	Ductile iron - EN 1563 - GJS-500-7
2	Pin	Phospher Bronze BS 2874 PB102
3	Seat Ring	Aluminium Bronze (EN1982 CC331G)(AB1)
4	Face Ring	Aluminium Bronze (EN1982 CC331G)(AB1)
5	Wedge	Ductile iron - EN 1563 - GJS-500-7
6	Wedge Nut	Al. Bronze BS EN 1982 CC333G(AB2)
7	O-Cord	EPDM
8	Bonnet	Ductile iron - EN 1563 - GJS-500-7
9	Stem	SS EN 10088-1;(W1.4057)/ASTM A276-431
10	Distance Piece	Ductile iron - EN 1563 - GJS-500-7
11	Packing	PTFE
12	Gland	Ductile iron - EN 1563 - GJS-500-7
13	Screw	SS ISO 3506; Grade A4
14	Thrust Nut	Al. Bronze; BS EN12163; CW307G
15	Key	DIN6885-A 1.0503
16	Stud Bolt	SS ISO 3506; Grade A4
17	Nut	SS ISO 3506; Grade A4
18	Washer	SS ISO 3506; Grade A4

Components		Materials
19	Bolt	SS ISO 3506; Grade A4
20	Washer	SS ISO 3506; Grade A4
21	Gasket	Nylon
22	Plug	SS EN 10088-1;(W1.4401)/ASTM A276-316
23	Washer	SS ISO 3506; Grade A4
24	Nut	SS ISO 3506; Grade A4
25	Bolt	SS ISO 3506; Grade A4
26	Jacking Screw	SS EN 10088-1;(W1.4401)/ASTM A276-316
27	Nut	SS ISO 3506; Grade A4
28	Washer	Copper alloy (CW608N)
29	Washer	Copper alloy (CW608N)
30	Plug	Dezn. res. brass EN 12165:CW602N (CZ132)
31	O-Ring	EPDM
32	Screw	SS ISO 3506; Grade A4
33	Jacking plug	SS EN 10088-1;(W1.4401)/ASTM A276-316
34	Shoe	gunmetal CC491K or al-bro AB1
35	Channel	gunmetal CC491K or al-bro AB1
36	Screw	SS ISO 3506; Grade A4

Ref	DN	Closing Direction	Flange drilling	L	H1	H2	W	F2	Actuator Flange	Theoretical weight
	mm			mm	mm	mm	mm	mm		Kg
54-0700-31-1203424	700	CTC	PN16	610	1497	450	1050	169	F25	1416
54-0800-31-1203424	800	CTC	PN16	660	1689	535	1160	169	F25	1766
54-0900-31-1203424	900	CTC	PN16	711	1844	596	1310	171	F25	2317
54-1000-31-1205424	1000	CTC	PN16	813	2007	648	1404	-	F35	3069
54-1200-31-1405424	1200	CTC	PN16	914	2427	773	1712	-	F35	4691

SERIES 54 RESERVOIR SPECIFICATION GATE VALVE
SIZING - **DN1400 - 1800**





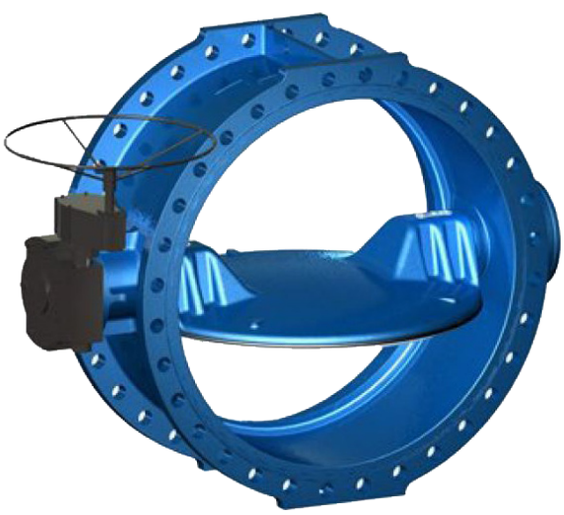
Components		Materials
1	Body	Ductile iron - EN 1563 - GJS-500-7
2	Pin Rivet	Phospher Bronze BS 2874 PB102
3	Seat Ring	Aluminium Bronze (EN1982 CC331G)(AB1)
4	Face Ring	Aluminium Bronze (EN1982 CC331G)(AB1)
5	Wedge	Ductile iron - EN 1563 - GJS-500-7
6	Stem Nut	Aluminum Bronze -EN1982- CC333G
7	Stem	SS EN 10088-3;(W1.4057)/ASTM A276-431
8	Bonnet Gasket	EPDM
9	Bonnet	Ductile iron - EN 1563 - GJS-500-7
10	Gasket	EPDM
11	Washer	SS ISO 3506; Grade A4
12	Nut	SS ISO 3506; Grade A4
13	Stud Bolt	SS ISO 3506; Grade A4
14	Gland	Ductile iron - EN 1563 - GJS-500-7
15	Stool	Ductile iron - EN 1563 - GJS-500-7
16	Key	SS ISO 3506; Grade A4
17	Bolt	SS ISO 3506; Grade A4
18	Thrust Nut	Aluminum Bronze - EN12163 - CW307G
19	Stud Bolt	SS ISO 3506; GRADE A4
20	Nut	SS ISO 3506; GRADE A4
21	Washer	SS ISO 3506; GRADE A4
22	Packing	PTFE

Components		Materials
23	Bolt	SS ISO 3506; Grade A4
24	Stuffing Box	Ductile iron - EN 1563 - GJS-500-7
25	Eyebolt	SS ISO 3506; Grade A4
26	Bolt	SS ISO 3506; Grade A4
27	Washer	SS ISO 3506; Grade A4
28	Nut	SS ISO 3506; Grade A4
29	O-Ring	EPDM
30	Bushing	Aluminum Bronze - EN12163 - CW307G
31	Washer	Copper alloy (CW608N)
32	Washer	Copper alloy (CW608N)
33	Nut	SS ISO 3506; Grade A4
34	Jacking Screw	SS EN 10088-3;(W1.4401)/ASTM A276-316
35	Washer	SS ISO 3506; Grade A4
36	Nut	SS ISO 3506; Grade A4
37	Bolt	SS ISO 3506; Grade A4
38	O-Ring	EPDM
39	Blanking Plate	Ductile iron - EN 1563 - GJS-500-7
40	Channel	gunmetal CC491K or al-bro AB1
41	Screw	SS ISO 3506; Grade A4
42	Shoe	gunmetal CC491K or al-bro AB1
43	Air Plug	SS EN 10088-1;(W1.4401)/ASTM A276-316
44	Gasket	EPDM

Ref	DN	Closing Direction	Flange drilling	L	H1	H2	W	F2	Actuator Flange	Theoretical weight
	mm			mm	mm	mm	mm	mm		Kg
54-0700-31-1203424	1400	CTC	PN16	876	2870	885	1956	-	F35	7500
54-0800-31-1203424	1600	CTC	PN16	914	3291	1060	2290	-	F35	12130
54-0900-31-1203424	1800	CTC	PN16	1067	3659	1180	2454	-	F35	14800

SERIES 756 BUTTERFLY VALVE
LARGE DIAMETER BUTTERFLY VALVES

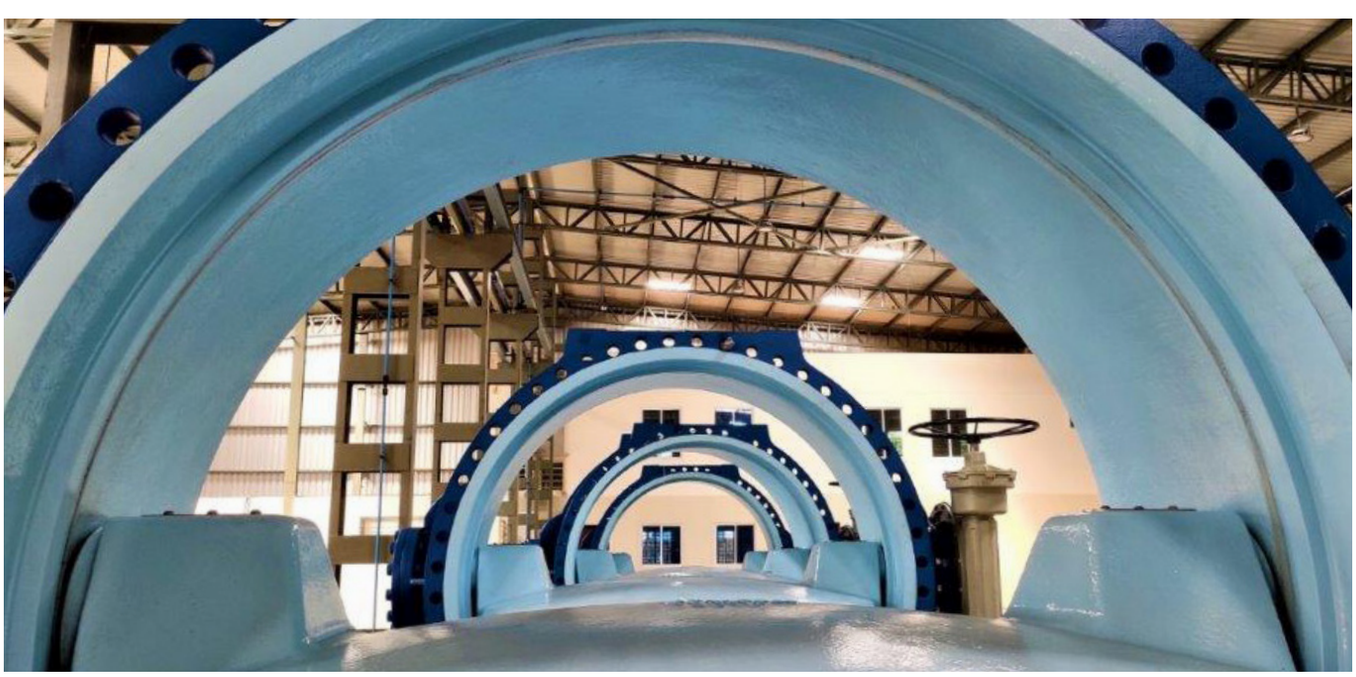
The Series 756 butterfly valve is a double eccentric, resilient seal design. These valves are used for general isolation purposes.



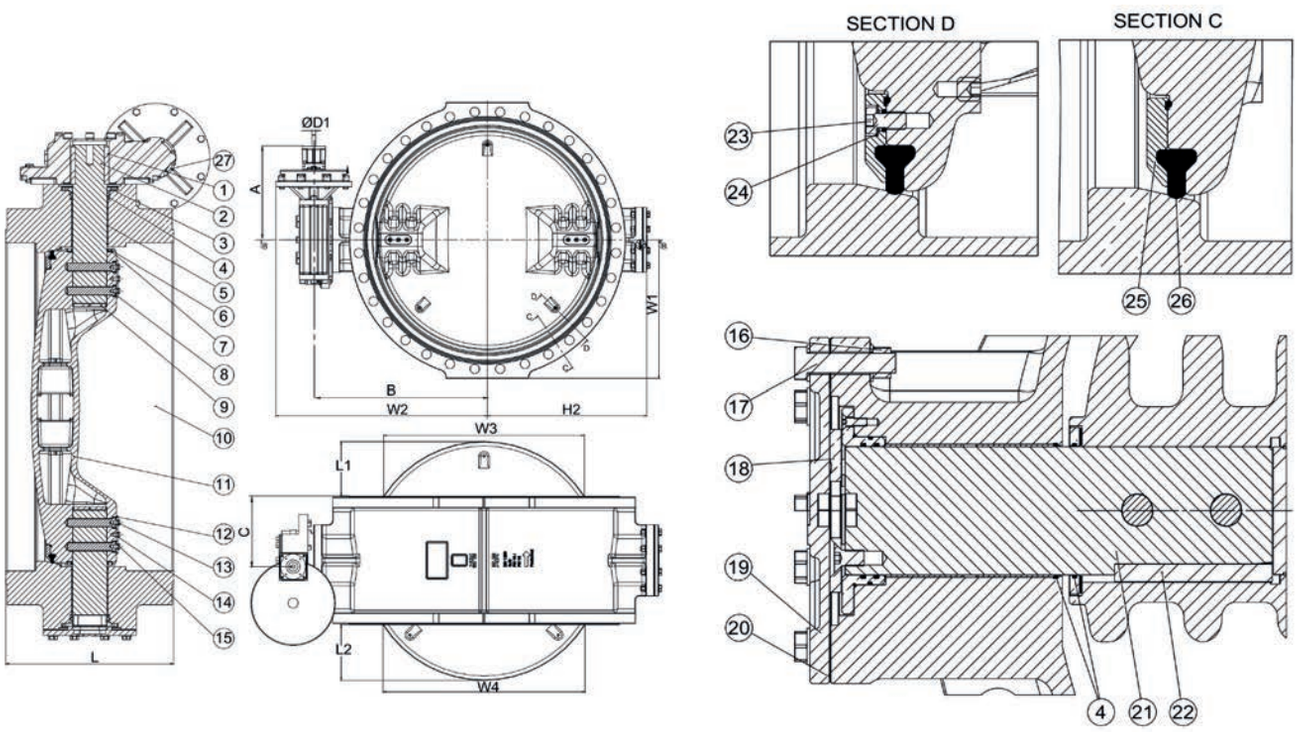
The standard valve complies with EN1074 Parts 1 & 2 and is manufactured from ductile iron with plate disc design and integral seat.

These valves have a number of key features and benefits as follows:

- Tilted disc design reduces seal wear, increases longevity and minimises operating torques.
- Pin and disc fixation ensures anti-flutter and reduction in wear. Safety key mounted as extra back-up.
- Replaceable stainless steel seat ring to increase abrasion resistance during initial opening of valve.
- Flow through disc design provides less sensitivity to cavitation at high flow velocities (available for DN700 – 1200 sizes)
- Disc seal optimization for reliable functionality due to secure fixation in the correct position.
- Protected shaft end zones for maximum corrosion protection
- Locking device providing possibility of locking the disc in the fully open or closed position
- Valves are fully bi-directional as standard
- Hydraulic opening / gravity weight closing for fast closure of valve to protect the system from emergency flow rates caused by pipe bursts etc.



SERIES 756 BUTTERFLY VALVE
SIZING



Components		Material			
1	Key	Stainless steel A2.	15	Washer	Zinc
2	Valve shaft	Stainless steel 431	16	Nut	Stainless steel A2
3	Seal housing	Bronze	17	Screw	Stainless steel A2.
4	O-ring	EPDM rubber	18	Thrust bearing	Bronze
5	Self-lubricating bearing	Steel, PTFE coated	19	End plate	Ductile iron GJS-500-7 (GGG-50)
6	Disc cover	Stainless steel	20	Gasket	EPDM rubber
7	Disc cover gasket	EPDM rubber	21	Stub shaft	Stainless steel 431
8	Dowel	Stainless steel A2	22	Safety key	Stainless steel A2
9	Plug	Steel	23	Bolt	Stainless steel A2.
10	Body	Ductile iron GJS-500-7 (GGG-50)	24	Washer	Stainless steel A2
11	Disc	Ductile iron GJS-500-7 (GGG-50)	25	Seal retainer ring	Steel
12	Security plate	Stainless steel	26	Disc seal	EPDM rubber
13	Screw	Stainless steel A2.	27	Gearbox	Cast iron
14	Spring washer	Stainless steel A2			

Ref	DN	Flange Drilling	L	L1	L2	H2	W1	W2	W3	W4	D1	A	B	C	ISO Flange	Weight
	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		Kg
756-0700-1-0400201	700	PN10	430	127	133	550	448	656	533	543	20	313	605	287	F10	469
756-0700-1-1400201	700	PN16	430	127	133	550	455	656	533	543	20	313	600	329	F10	538
756-0800-1-0400201	800	PN10	470	156	162	620	508	735	627	636	20	313	670	349	F10	632
756-0800-1-1400201	800	PN16	470	156	162	620	513	756	627	636	20	313	670	349	F10	697
756-0900-1-0400201	900	PN10	510	186	192	690	558	1057	722	730	20	313	740	369	F10	780
756-0900-1-1400201	900	PN16	510	186	192	690	563	1057	722	730	20	342	740	336	F10	885
756-1000-1-0400201	1000	PN10	550	216	222	770	615	1137	816	824	20	313	820	389	F10	996
756-1000-1-1400201	1000	PN16	550	216	222	770	628	1137	816	824	20	469	837	306	F10	1131
756-1200-1-0400201	1200	PN10	630	269	275	855	728	1222	986	993	20	469	837	346	F10	1541
756-1200-1-1400201	1200	PN16	630	269	275	855	743	1222	986	993	20	505	930	382	F10	1745

NOTE: Valves are available from DN200 - 2800. Please contact Glenfield Invicta for further information. Kilmarnock - +44(0) 1563 521150
Maidstone - +44(0) 1662 754613

ASSOCIATED PRODUCTS

bsi.

By Royal Charter

Certificate of Registration

QUALITY MANAGEMENT SYSTEM - ISO 9001:2015

This is to certify that:

Glenfield Valves Ltd
22 Shore Road
Prestwick
KA9 2LP
United Kingdom

Holds Certificate Number: FM 20942

and operates a Quality Management System which complies with the requirements of ISO 9001:2015 for the following scope:

The marketing and sales of valves and associated products for water, sewerage, hydropower, fire fighting, gas, coal and nuclear power industries.

For and on behalf of BSI:

Andrew Launn, EMEA Syst Cert Ops & Compliance Director

Original Registration Date: 1992-07-08
Latest Revision Date: 2017-12-15

Effective Date: 2017-12-23
Expiry Date: 2020-12-22

Page: 1 of 1

...making excellence a habit.

Glenfield Invicta's design quality is based on exceptional historic engineering detail and thorough research of the customers' needs. Glenfield Invicta products have been manufactured in Scotland for over 100 years using experienced personnel and equipment to ensure high precision and uniformity.

The overall framework for quality from development to distribution is our extensive quality assurance system.

METAL SEATED GATE VALVE

- Standard size range: DN350-2400
- Designed to operate under high flow and considerable unbalanced pressures.
- Operates from fully open position to closed under high velocity.
- Valve operates in bidirectional flow conditions.
- Body and gate are single piece castings
- Optional accessories include bypasses, clean-outs, indicators, shoe and channels, scrapers, extension stems, and floor-stands.
- Available with outside stem and yoke to facilitate limit switches.
- Available with manual or electrical actuation.
- Reservoir specification version gate valve available for high velocity application such as scour valve and terminal discharge guard valve.

3 AND 4 SIDED HIGH PRESSURE PENSTOCK

- Standard size range: up to 4000x4000, larger sizes available.
- Three and four side sealing.
- 4-sided closed frame design.
- Suitable for wall mounting with a square or rectangular opening.
- Fabricated stainless steel frame and slide, resilient rubber sealing with either non-rising spindle or rising spindle.
- Flush invert available.
- Bi-directional up to and including 1200 x 1200mm.
- Uni-directional and bi-directional available on larger sizes.
- Designed according to DIN 19569-4
- Leakage allowance – lower than allowable in DIN 19569-4 (class 5).
- Replaceable seals.

BONNETED GATE VALVE

- Standard size range: DN200-1800
- Completely enclosed rectangular port sliding gate for the isolation of flow through the outlet works of dams.
- Robust, fabricated construction of carbon steel, with high-performance bronze or stainless steel seats.
- May be equipped with air vent piping system to avoid cavitation and with bypass for pressure balancing.
- Wide range of sizes and special materials to match specific requirements and head conditions under which the gate will operate.
- Available with hydraulic, electric or manual actuator.

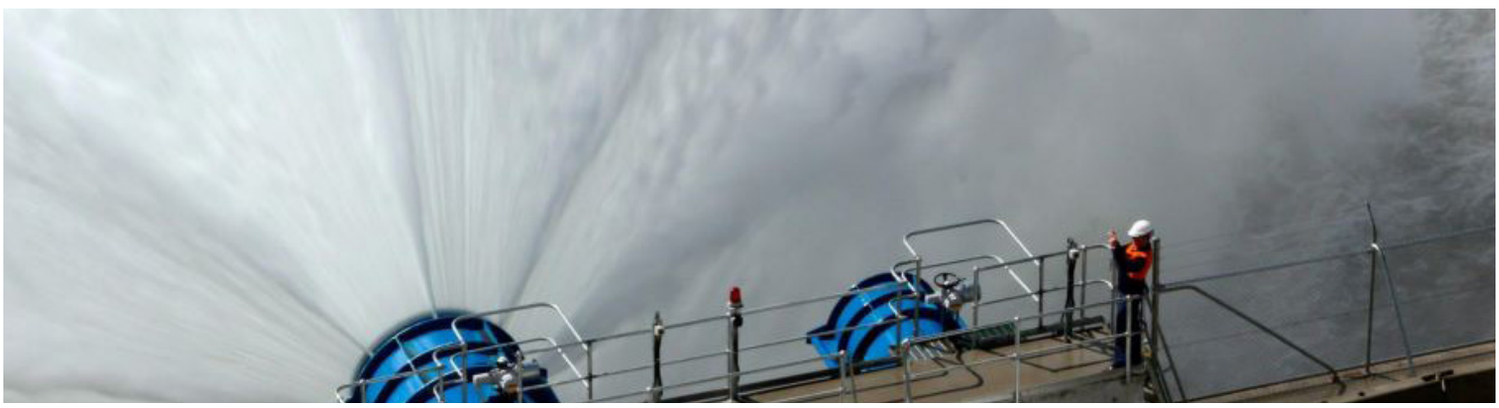
HIGH PRESSURE KNIFE GATE VALVE

- Standard size range: up to DN3500
- Fabricated body and bonnet with robust design. Gate guiding and closure design incorporates half-wedges on the body and gate.
- Can be manufactured with flanges of any size and to any standard.
- Wide range of sizes and special materials to match specific requirements and head conditions under which the gate will operate.
- Available with hydraulic, pneumatic, electric or manual actuator.

TILTING DISC CHECK VALVE

- Standard size range: up to DN2000
- Fabricated tilting disc non return valve designed to prevent back flow on the pressure sides of pumping systems.
- Available with counterweight and adjustable hydraulic damping systems to prevent water slamming.
- Available with integrated HPU to operate as a butterfly valve while opening and as a check valve while closing.
- Wide range of sizes and special materials (including duplex materials for sea water) to match specific requirements and head conditions under which the valve will operate.

PRODUCT CHECKLISTS



In order to ensure that your enquiry can be processed as quickly and accurately as possible, it is important that the following information is provided to allow us to correctly select the optimum valve type and size for your specific application:

Alternatively use the documents below for the chosen product, these are available to download from our website.

EXPECT... SOLUTIONS NOT ONLY PRODUCTS

LARGE DIAMETER GATE VALVE SPECIFICATION

FOR USE WHEN ORDERING

Valve series no		**LNS No** (if known)	
Size (DN)			

Wedge Type (Click Box)		**Closure** (Click Box)	
Metal	**Resilient**	**CWC**	**CWO**

Pressure Rating (Click Box)			
PN10	**PN16**	**PN25**	**Other:**

Upstream pressure (bar)		**Downstream pressure (bar)**	
Maximum flow rate (l/s)		**Minimum flow rate (l/s)**	

Orientation - Direction of Spindle (Click Box)		
Vertical	**Horizontal, Flanges** **Vertical** (Wedge Guides Required)	**Horizontal, Flanges** **Horizontal**

Valve to be Operated by (Click Box)			
Bare Shaft	**Cap Top**	**Handwheel** (May Require Gearbox)	**Bevel Gearbox** (Essential above DN600)
Spur Gearbox (Essential above DN600)	**Actuator** (Please complete actuation specification sheet)		

Other Requirements - Additional Options: e.g Non-rising Stem / Outside Screw & Yoke / Pinned Seats

Documentation (Standard, Special O&M's, Drawing, Test Certification)

Note:
1. For metal seat: When valve stem is horizontal (350mm and above) Shoes and Channels should be used
1. Flow Rate m/sec: If over 4m/s another valve should be considered, please refer to technical support
2. Actuator or gearbox must be used on all manually operated valves above 600mm Dia.

Kilmarnock T: +44(0) 1563 521150
Maidstone T: +44(0) 1662 754613
E: enquiries@glenfieldinvicta.co.uk

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FREE DISCHARGE VALVE SPECIFICATION

FOR USE WHEN ORDERING

Also known as: Fixed Cone Valve, Energy Dissipation Valve, Terminal Discharge Valve, Howell Bunger Type Valve

Valve series no		**LNS No** (if known)	
Size (DN)			

Pressure Rating (Circle)			
PN10	**PN16**	**PN25**	**Other:**

Maximum Unbalanced Operating Pressure (difference between the upstream and downstream pressures)

Flow Details			
Minimum Flow:		**Minimum Net Head:**	
Maximum Flow:		**Maximum Static Head:**	

Closure (Circle)	**Clockwise to Close (CWC)**	**Clockwise to Open (CWO)**

Flange Drilling (Circle)			
PN10	**PN16**	**ANSI**	**Other:**

Coating - Preferred Thickness (Circle)			
250 Microns	**300 Microns**	**Other:**	

Fluid Details		**Max Temperature**	

Method of Operation ((Circle)			
Manual	**Electric**	**Hydraulic**	**Other:**

Mounted Operation (Circle)	**Direct Mounted**	**Floor Mounted**	**Other:**

Datum Levels	
Inlet Valve Bore Centreline	
Operating Platform Level	
Supply levels Minimum:	**Maximum:**

Power Supply	**Electric (V / Ph / H_2)**	**Pressure Supply**	**Hydraulic**
Time to Open:		**Close:**	

Operation (Circle)	**Standard**	**Modulating**	**Other:**
Discharge (Circle)	**Atmospheric**	**With Hood**	**Submerged**
Method of Construction (Circle)	**Cast**	**Fabricated**	

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Maidstone T: +44(0) 1662 754613
E: enquiries@glenfieldinvicta.co.uk

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1. Maximum flow rate = _____m^3/s
2. Minimum flow rate = _____m^3/s
3. Maximum pressure head at valve = _____m
4. Minimum net pressure head at valve* = _____m
5. Method of operation = manual or electrical
6. Any other information that is relevant to the enquiry

*Net pressure head is the height difference between the minimum upstream water surface and the centerline level of the valve bore minus any system headlosses.

SUBMERGED DISCHARGE VALVE SPEC

FOR USE WHEN ORDERING

Valve series no		**LNS No** (if known)	
Size (DN)			

Pressure Rating (Circle Box)		
PN16	**PN25**	**Other:**

Maximum Unbalanced Operating Pressure (difference between the upstream and downstream pressures)

Flow Details			
Minimum Flow:		**Minimum Net Head:**	
Maximum Flow:		**Maximum Static Head:**	

Direction of Operation (Circle one)	
Clockwise to open (CWO)	**Clockwise to Close (CWC)**

Flange Drilling (Circle one)			
PN16	**PN25**	**ANSI**	**Other:**

Coating - Preferred Thickness (Circle one)		
250 Microns	**300 Microns**	**Other:**

Fluid Details

Maximum Temperature

Method of Operation (Circle one)			
Manual	**Electric**	**Hydraulic**	**Other:**

Power Supply	**Pressure Supply**
Electric (V / Ph / Hz)	**Hydraulic (bar)**

Time to Open:		**Close:**	

Datum Levels			
Inlet Valve Bore Centreline			
Operating Platform Level			
Sump Base (if known)			
Supply levels Minimum:		**Maximum:**	

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EXPECT... SOLUTIONS NOT ONLY PRODUCTS

NEEDLE VALVE SPECIFICATION

FOR USE WHEN ORDERING

Valve series no		**LNS No** (if known)	
Size (DN)			

NECESSARY HYDRAULIC DATA (please specify the value of data)		
Max Flow (Qmax)	**Min Flow (Qmin)**	**Static Pressure (Pst)**

Upstream Pressure at Max Flow (Pmqmax)	**Upstream Pressure at Min Flow (Pmqmin)**	**Downstream Pressure (backpressure) at Max Flow (Pvqmax)**	**Downstream Pressure (backpressure) at Min Flow (Pvqmin)**

INSTALLATION DETAILS (please specify the characteristics) (Circle)			
Valve Installed		**If end-line, the discharge is**	
In-line	**End of line**	**In the atmosphere**	**Intubated**

Type of Operation	**Hydraulic Right (std)**	**Hydraulic Left**

ACCESSORIES REQUESTED BY THE CLIENT (Circle)					
Manual (with handwheel)	**Yes**	**No**			
With Electric Actuator	**Yes**	**No**	**Opening / Closing Time**		
With Pneumatic Actuator	**Yes**	**No**	**Double Acting**	**Yes**	**No**
Single Acting	**Spring closing**	**Spring opening**	**Air Pressure**		
With Hydraulic Actuator	**Yes**	**No**	**Double Acting**	**Yes**	**No**
Single Acting	**Spring closing**	**Spring opening**	**Air Pressure**		
With Lever, Counterweight and Hydraulic Piston	**Yes**	**No**	**Type of Counterweight and Hydraulic Piston**		
Oil Pressure			**Counterweight opening**	**Counterweight closing**	

Other Requirements - Additional Options

Documentation (Standard, Special O&M's, Drawing, Test Certification)

Note: It is mandatory to know the sizes of the chamber where the valve will be installed. Please provide .dwg or .dxf drawing of the chamber

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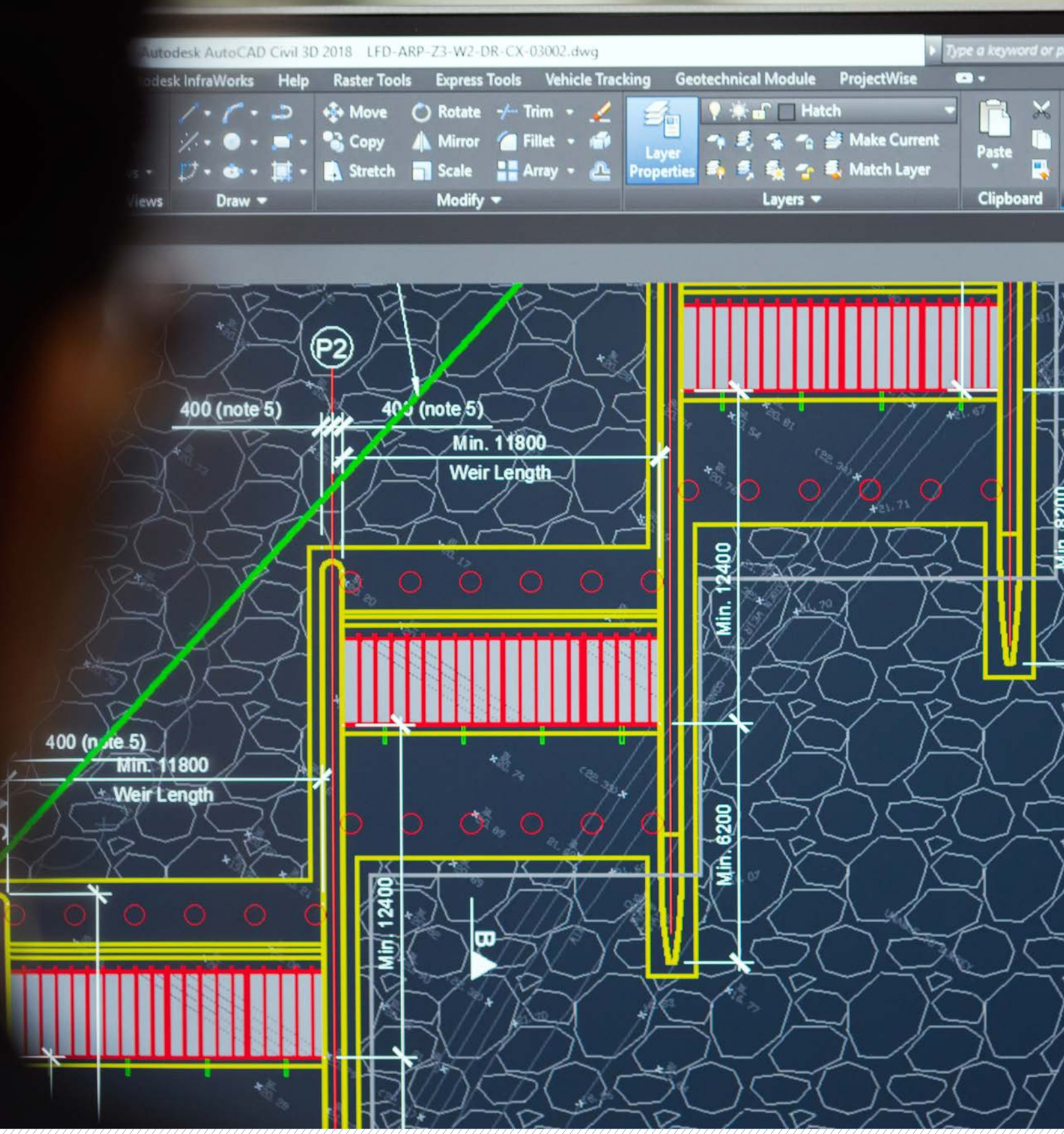

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