

Product guide

VIC - Issue 6



About Humes

Humes has a long history of engineering precast and prestressed concrete solutions and, after 100 years of manufacture, our product range has never been more diverse, more competitive, or more in-tune with our clients' needs than it is today.

Humes offers a range of solutions for bridges and platforms, road and rail infrastructure, tunnels and shafts, stormwater management, pipeline systems, sewage transfer and storage, and retaining walls. We can customise our solutions to ensure they create maximum value for your project, accommodating your site conditions, design requirements and construction factors.

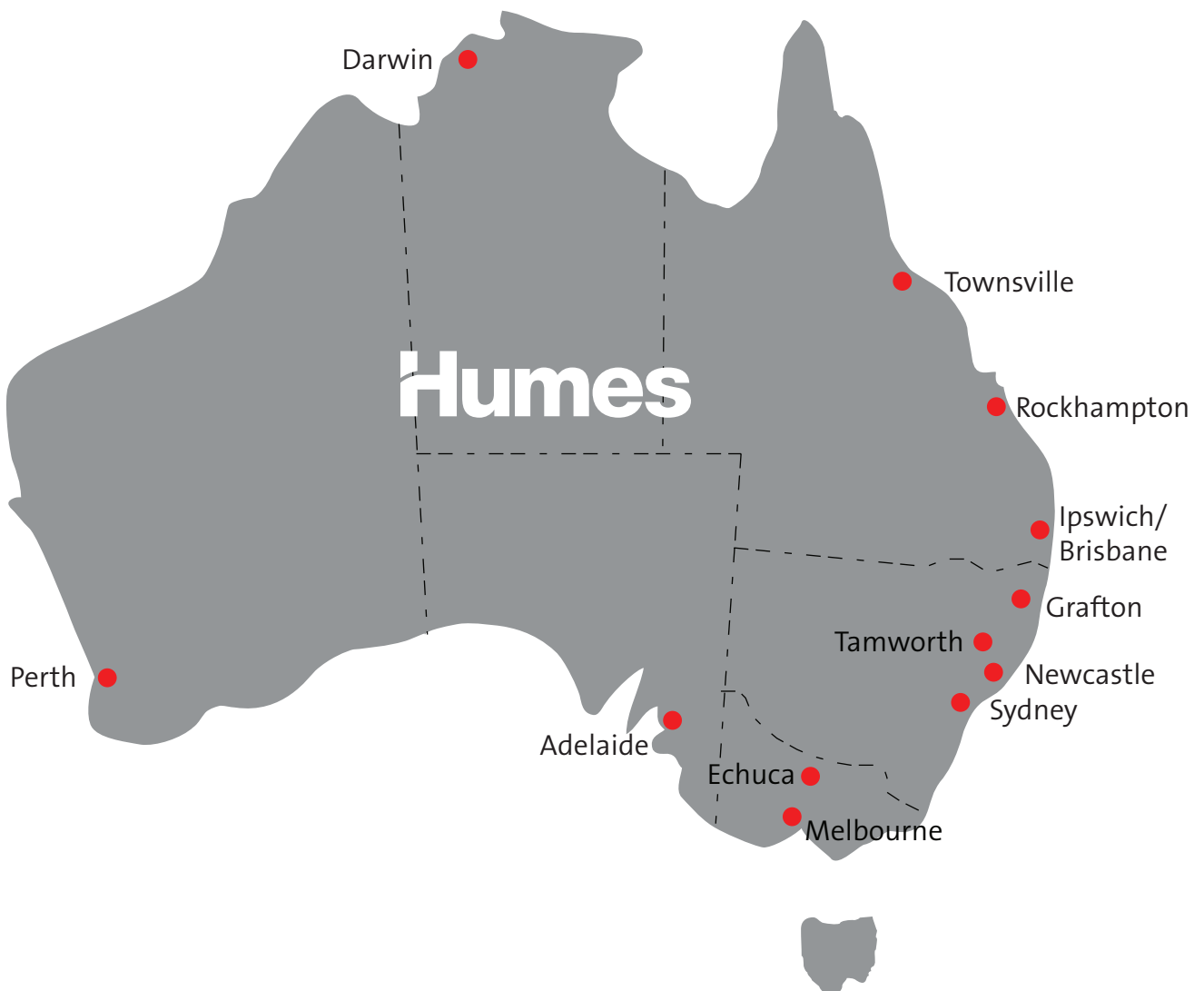
The quality and reliability of Humes' products and services are the foundation of our success. We are constantly developing and improving our solutions, whilst striving to exceed customer expectations.

Our ability to deliver to client specifications on major projects across Australia has established Humes as a valuable and reliable partner.

Humes is a division of Holcim, one of the world's leading suppliers of cement and aggregates.

Today Humes employs more than 1,000 people and is the largest civil precast concrete manufacturer in Australia.

Factory locations



Our commitment to safety

Safety is a value that cannot be compromised at Humes. As our operational priorities adjust to ensure that we meet market and customer demands we know that all activities and decisions are made with no compromise on the management of safety and the ultimate goal of Zero Harm.

We do this by maintaining focus on four key drivers as part of the overall Holcim Australia strategic safety framework.

The four key drivers which form the strategy framework to achieve short and long-term improvements in safety and health as well as nurture the longer-term achievement of a Zero Harm culture are:

- **Leadership and culture**
Relentless focus by Leadership in shaping and motivating our Zero Harm culture
- **Organisational competence**
Increase our capability and capacity to fulfill our SHE responsibilities at all levels
- **Guiding and managing SHE risks**
Refine and enhance our safety and environmental management processes to effectively manage our risk profile
- **Compliance and close out**
Strengthen our ability to challenge and validate our progress in order to effect further improvements towards Zero Harm.



Design services and custom solutions

At every opportunity we endeavour to create value for our customers; we look for ways to adapt our designs or create new solutions to best meet the needs of their projects.

Our in-house design team of professional civil, structural, and hydraulic engineers, and drafters work closely with our customers to ensure we understand their requirements, and can provide a cost effective solution that meets the necessary specifications. We can often convert in-situ designs into a more cost effective precast option.

Custom solutions can deliver significant advantages to a project by reducing installation risks, time and cost, and the need for on-site skilled labour. Our quality controlled manufacturing processes ensures a high quality finished product.

We are a business committed to research and development, continually sourcing and innovating smarter technologies and designs to bring world class solutions to our customers.

Contact your Humes representative today to find out how we can design a solution for your project.



HumeSlab® bridge deck unit



Pipeline footings



Seawall units



Tunnel invert units



Box culverts with post-tensioning ducts



Pipeline anchor blocks



Precast units for LNG processing train



Overflow chamber



HDPE lined access chamber



Skewed arch units

Disclaimer

This publication supersedes all previous literature on this subject. As the specifications and details contained in this publication may change please check with your Humes representative for confirmation of current issue.

This publication provides general information only and is no substitute for professional engineering advice. Actual product designs, dimensions and masses may vary.

No representations or warranties are made regarding the accuracy, completeness or relevance of the information provided. Users must make their own determination as to the suitability of this information or any Humes' product for their specific circumstances.

Humes accepts no liability for any loss or damage resulting from any reliance on the information provided in this publication.

Not all products are available nationwide; please check with your Humes representative as to the availability of any particular product.

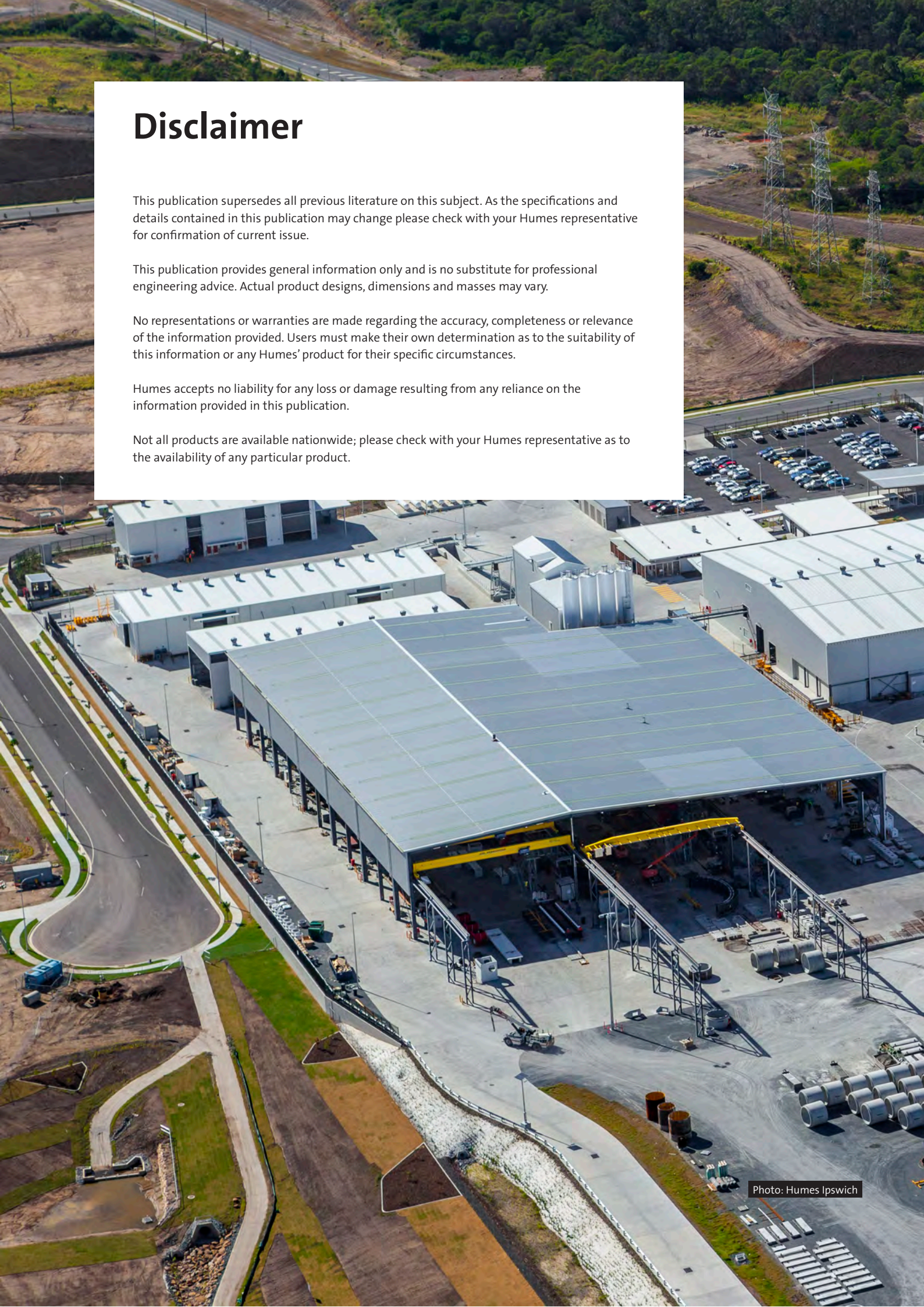


Photo: Humes Ipswich

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Photo: StormTrap® detention and infiltration system – DoubleTrap model

1. Stormwater solutions



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HumeGard® GPT 19



HumeCeptor® system 20



HumeFilter® UPT 23



StormTrap® system 24



RainVault® system 25



Our standard concrete pipes are manufactured to AS/NZS 4058:2007 and are available:

- in DN300 to DN3600
- in standard strength (class 2-4) and super strength (class 6-10) load classes
- usually in 2.4 m effective lengths, although other lengths can be manufactured on request
- with either a flush joint or rubber ring joint.

Joint types

Humes concrete pipes are manufactured with two basic joint types, Flush Joint (FJ) and Rubber Ring Joint (RRJ).

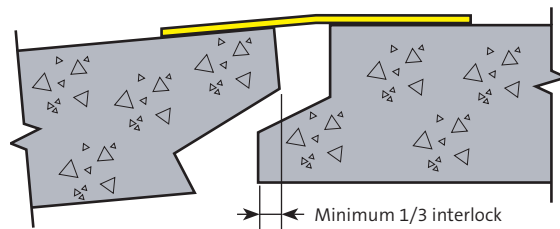
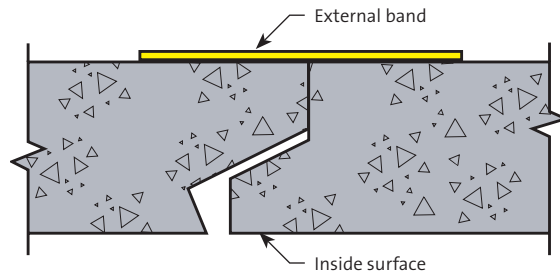
Flush joints provide a small degree of flexibility to accommodate ground settlement or alignment adjustments. When external bands are used in conjunction with FJ pipes, they provide a soil-tight joint along the pipeline and prevent loss of bedding material into the pipe. Groundwater infiltration may occur however, when the groundwater level is significantly above the pipeline obvert.

Rubber ring joints provide a high degree of flexibility to accommodate ground settlement or alignment adjustments. The RRJ profile is designed for ease of installation, and allows curved alignment adjustments while maintaining a watertight joint capable of withstanding the common levels of hydraulic head occurring in stormwater pipelines. RRJ pipes up to DN1800 are supplied with a belled-socket joint, while those larger than DN1800 are supplied with an in-wall (skid) joint.

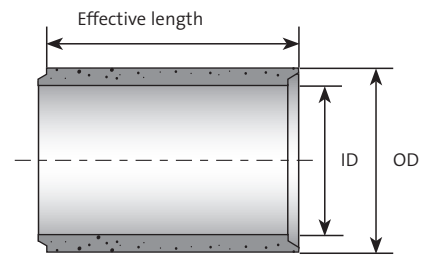
Salt water cover

Humes can add an internal surface layer of concrete over the standard 10 mm cover to reinforcement in concrete pipe. This sacrificial layer is designed to ensure the pipe is structurally sound at the end of its design life.

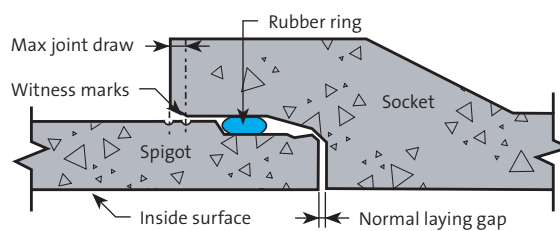
Flush joint profile



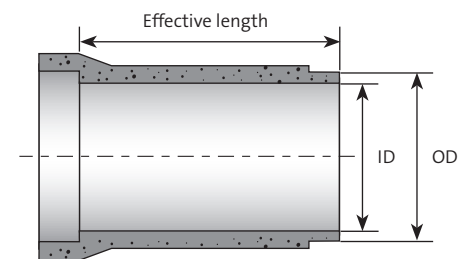
Flush Joint pipe



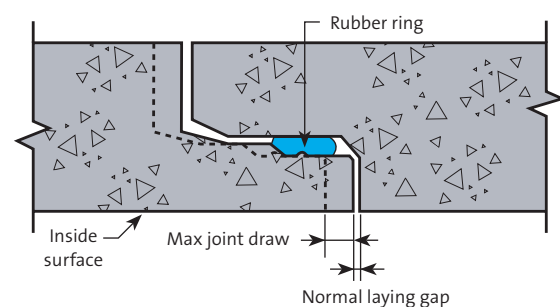
RRJ pipe with belled socket joint



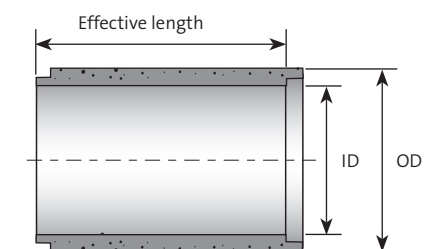
RRJ pipe (belled socket)



RRJ pipe with in-wall (skid) joint



RRJ pipe (in-wall)





Flush joint (FJ) pipes

Size class (DN)	Standard strength load classes						Super strength load classes						OD (mm)
	Class 2		Class 3		Class 4		Class 6		Class 8		Class 10		
	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	
300	300	205	300	205	300	210	290	235	280	260	268	295	362
375	375	280	375	285	375	290	363	330	355	360	343	395	445
450	450	400	450	405	450	415	444	445	438	465	418	545	534
525	534	465	518	545	502	625	502	625	502	630	486	705	616
600	610	565	600	625	586	705	586	710	570	800	554	885	698
675	685	690	679	735	661	850	661	860	637	1,005	615	1,135	781
750	762	815	756	865	730	1,045	730	1,055	714	1,170	682	1,385	864
825	838	945	832	1,000	806	1,205	806	1,215	782	1,400	754	1,605	946
900	915	1,090	903	1,200	883	1,370	883	1,390	851	1,655	795	2,085	1,029
1,050	1,066	1,420	1,054	1,550	1,026	1,830	1,026	1,855	966	2,430	926	2,775	1,194
1,200	1,219	1,775	1,207	1,925	1,179	2,245	1,171	2,355	1,109	3,045	1,059	3,580	1,359
1,350	1,372	2,165	1,360	2,340	1,332	2,700	1,292	3,230	1,242	3,830	1,202	4,335	1,524
1,500	1,524	2,405	1,504	2,710	1,468	3,245	1,424	3,860	1,374	4,590	1,324	5,230	1,676
1,650	1,676	2,885	1,656	3,220	1,620	3,820	1,576	4,495	1,516	5,450	1,476	6,065	1,842
1,800	1,828	3,375	1,808	3,745	1,772	4,400	1,718	5,295	1,668	6,200	1,628	6,855	2,006
1,950	1,994	4,200	1,982	4,515	1,944	5,225	1,904	5,980	1,834	7,340	1,794	8,040	2,198
2,100	2,160	5,215	2,136	5,655	2,110	6,205	2,050	7,535	1,990	8,715	1,960	9,335	2,388
2,250	2,250	8,140					Project specific production only						2,530
			2,250	8,775	2,250	9,165							2,550
							2,250	14,195					2,718
									2,250	15,050			2,742
2,400	2,438	8,795											2,850
			2,438	9,640									2,718
					2,438	10,850							
						2,438	20,620	2,438	20,715	2,438	20,855	3,060	
2,700	2,700	11,460	2,700	11,585									3,030
					2,700	13,115							3,060
							2,700	21,250	2,700	21,340	2,700	21,490	3,410
3,000	3,060	13,750											3,410
			3,060	15,835	3,060	16,510							3,460
							3,060	32,700	3,060	32,800	3,060	32,950	4,010
3,300	3,300	21,110	3,300	21,240	3,300	21,350							3,900
3,600	3,600	24,535	3,600	24,700	3,600	24,820							4,240

Note: Refer to CPAA's Pipeclass software for assistance with class selection.



Rubber Ring Joint pipes (RRJ) – Belled socket – VIC

Size class (DN)	Standard strength load classes						Super strength load classes						Socket dimensions			Pipe OD (mm)
	Class 2		Class 3		Class 4		Class 6		Class 8		Class 10					
	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	A (mm)	G (mm)	H (mm)	
300	300	220	300	220	300	240	288	250	280	280	268	310	451	76	89	362
375	375	305	375	310	375	315	355	345	351	395	343	420	540	80	95	445
450	450	435	450	440	450	450	438	480	438	500	418	580	622	114	114	534
525	534	515	518	595	518	675	502	680	502	685	486	755	711	133	133	616
600	610	625	598	685	598	765	586	770	570	860	554	945	797	133	133	698
675	685	760	673	805	673	920	653	930	645	1,030	615	1,205	886	133	133	781
750	760	940	744	985	744	1,170	728	1,125	712	1,290	680	1,500	997	143	152	864
825	838	1,050	818	1,105	818	1,305	798	1,320	782	1,500	748	1,745	1,064	146	146	946
900	910	1,415	910	1,425	910	1,535	878	1,555	862	1,850	800	2,335	1,197	152	152	1,042
1,050	1,070	1,895	1,070	1,910	1,058	2,115	1,022	2,250	990	2,725	950	3,075	1,391	171	149	1,220
1,200	1,220	2,175	1,220	2,195	1,200	2,555	1,156	2,695	1,120	3,360	1,070	3,905	1,543	171	149	1,372
1,350	1,370	2,460	1,370	2,610	1,330	2,995	1,294	3,400	1,240	4,115	1,200	4,630	1,695	171	149	1,524
1,500	1,524	3,550	1,524	3,575	1,504	3,905	1,460	4,515	1,404	5,335	1,354	5,990	1,937	194	292	1,714
1,650	1,676	3,890	1,676	3,925	1,636	4,470	1,596	5,065	1,546	6,045	1,486	6,915	2,089	194	292	1,866
1,800	1,828	4,450	1,828	4,495	1,788	5,085	1,744	5,900	1,668	7,285	1,608	8,220	2,267	194	203	2,032

Note: Refer to CPAA's Pipeclass software for assistance with class selection.



Rubber Ring Joint pipes (RRJ) – In-wall – VIC

Size class (DN)	Standard strength load classes						Super strength load classes						OD (mm)	Nom. length (m)
	Class 2		Class 3		Class 4		Class 6		Class 8		Class 10			
	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)	ID (mm)	Mass (kg)		
1,950	1,950	5,515	1,950	5,540	1,950	5,580	1,894	6,715	1,830	7,850	1,780	8,760	2,220	2.44
2,100	2,100	6,340	2,100	6,370	2,100	6,415	2,068	7,265	2,000	8,585	1,920	10,055	2,388	2.44
2,250	2,250	8,795	2,250	8,880			2,250	12,120					2,550	3.00
					2,250	11,925							2,650	
									2,250	15,050			2,742	
											2,250	18,640	2,850	
2,400	2,438	9,575	2,438	9,660									2,742	3.00
					2,438	10,895							2,768	
							2,438	20,620	2,438	20,715	2,438	20,855	3,060	
2,700	2,700	11,505	2,700	11,590									3,030	3.00
					2,700	13,175							3,060	
							2,700	21,250	2,700	21,340	2,700	21,490	3,410	
3,000	3,060	13,795	3,060	15,875									3,410	3.00
					3,060	16,585							3,460	
							3,060	32,700	3,060	32,800	3,060	32,950	4,010	
3,300	3,300	21,110	3,300	21,240	3,300	21,350							3,900	2.44
3,600	3,600	20,165	3,600	20,220	3,600	20,320							4,130	2.44

Note: Refer to CPAA's Pipeclass software for assistance with class selection.



Butt joint jacking pipes

Humes offer butt joint jacking pipes from DN300 to DN3000 (standard range DN300 to DN2100).

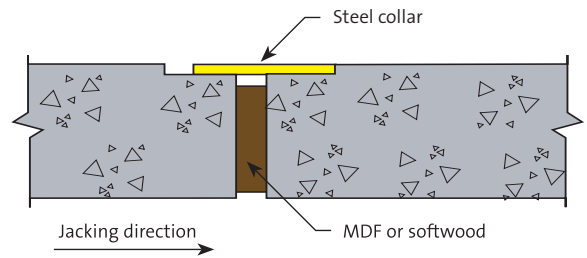
The steel collar is not attached to the pipe (cast with) but rather is fitted onto the pipe before installation. The collars can be supplied by either Humes or the contractor.

Jacking pipes – Butt joint

Size class (DN)	ID (mm)	OD (mm)	Mass (kg)
300	280	362	263
375	363	445	333
450	438	534	467
525	518	616	560
600	586	698	718
675	653	781	919
750	730	864	1,067
825	790	946	1,348
900	875	1,029	1,471
975	951	1,111	1,657
1,050	1,026	1,194	1,873
1,200	1,163	1,359	2,461
1,350	1,324	1,524	2,850
1,500	1,452	1,676	3,493
1,650	1,596	1,842	4,186
1,800	1,756	2,006	4,680
1,950	1,930	2,198	5,507
2,100	2,096	2,388	6,445

Note: Standard range is manufactured to load class 4.

Butt joint profile





Steel reinforced concrete pipes - jacking

S and J series jacking pipes

A wide robust range is available from DN300 to DN3000 inclusive. They are a custom designed reinforced concrete jacking pipe incorporating a single wide jacking face including timber packers, a secure steel collar cast onto the pipe and a flexible watertight joint. All these being essential for longer pipe jacks and unstable ground conditions.

Features and benefits

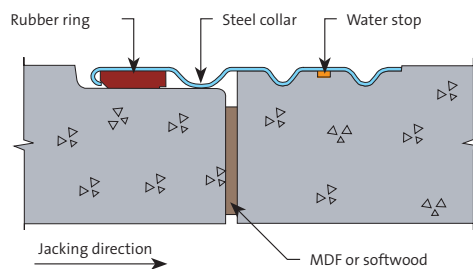
- Elastomeric seal – Prevents ingress or egress of water and soil surrounding the pipes and allows pressure grouting of the excavated annulus at the completion of jacking (if required).
- Fixed collar – The designer has many options for the grade of steel to suit the intended design life in the installed environment of the pipe. Generally, mild steel is considered suitable for in-ground conditions and a non-aggressive environment.
- Permanent seal location – The seal remains in place throughout the design life of the pipeline providing a long-term watertight structure under external groundwater pressures or ground movement.
- Single wide jacking face – Long drives, lower construction costs and less disturbance to above-ground activities.
- Muck ring (J series) – After installation the muck ring protects the rubber ring and the steel collar to maintain watertightness.
- Internal joint recess – The recess is shaped to allow retention of a flexible sealant if secondary joint sealing is required.

Jacking pipes – S and J series

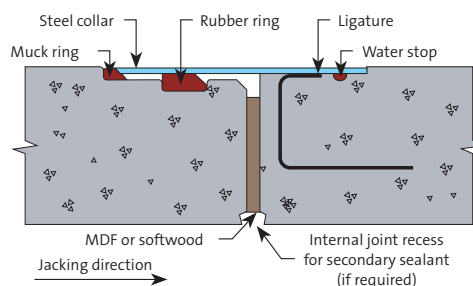
Size class (DN)	S series			J series		
	ID (mm)	OD (mm)	Mass (kg)	ID (mm)	OD (mm)	Mass (kg)
300	300	430	500			
350	350	480	550			
400	400	540	660			
450	450	606	725			
500	500	672	1,000			
600	600	774	1,190			
700	700	876	1,380			
800				800	1,000	1,800
900				900	1,110	2,100
1,000				1,000	1,220	2,400
1,100				1,100	1,332	2,800
1,200				1,200	1,450	3,300
1,350				1,350	1,626	4,000
1,500				1,500	1,800	4,800
1,650				1,650	1,974	5,700
1,800				1,800	2,150	6,700
2,100				2,100	2,500	12,050
2,400				2,374	2,783	12,950
2,500				2,500	3,000	16,650
2,700				2,636	3,096	16,150
3,000				2,972	3,472	19,700

Note: Standard range is manufactured to load class 4.

S series joint profile



J series joint profile





Bends

Humes offers two styles of bends. Elbow bends for angles up to 45 degrees and lobster back bends for angles between 45 and 90 degrees.

Junctions

Humes can manufacture junctions for individual job requirements. The off-take pipe diameter must be at least 1/6 less than the diameter of the mainline pipe, e.g. for a DN1050 the off-take pipe diameter must be smaller than DN875.

Reducers

Humes is able to supply reducers, made up from pipe sizes in our standard range, generally the size difference should be no greater than two size classes, e.g. a DN1050 pipe should not be reduced to a pipe which is smaller than DN825.

Handling pipes

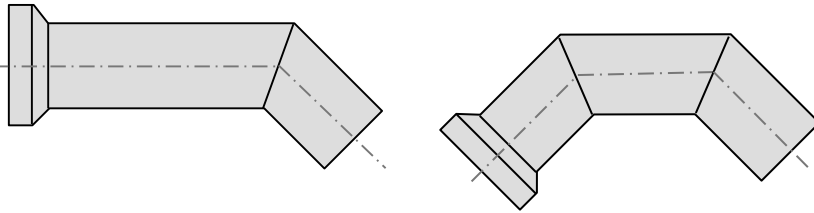
RRJ pipes can be supplied with lifting anchors if requested, however suitable lifting straps or chains are most commonly used. When using chains take care to minimise damage to the pipe and bedding when removing the chains after placing the pipe.

When stacking on site, pipes should always be placed with the "TOP" mark facing upwards.

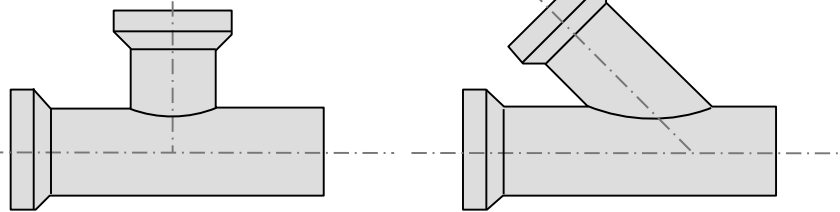
It's a good idea to stack pipes on timber bearers at one-third points along the barrel for easy access when fitting lifting equipment.

All pipes should be chocked to prevent movement when stacked. Take extra care when pipes are double stacked.

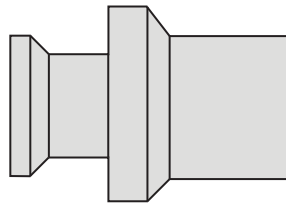
Bends



Junctions



Reducer



Maximum joint deflection for RRJ pipes* – Drainage applications

Size class (DN)	Max CL deviation per pipe (mm)	Max deflection angle at joint (degrees)	Min CL radius** (m)
300	81	1.9	70
375	81	1.9	70
450	55	1.3	105
525	43	1.0	135
600	38	0.9	155
675	34	0.8	170
750	26	0.6	230
825	21	0.5	275
900	34	0.8	170
1,050	26	0.6	230
1,200	21	0.5	275
1,350	21	0.5	275
1,500	26	0.6	230
1,650	21	0.5	275
1,800	68	1.6	85
1,950	26	0.6	230
2,100	34	0.8	170

Notes

* These figures do not apply to pipes manufactured at Humes Ipswich, please contact your Humes representative if required.

** Minimum radius is measured to the pipe mid point.



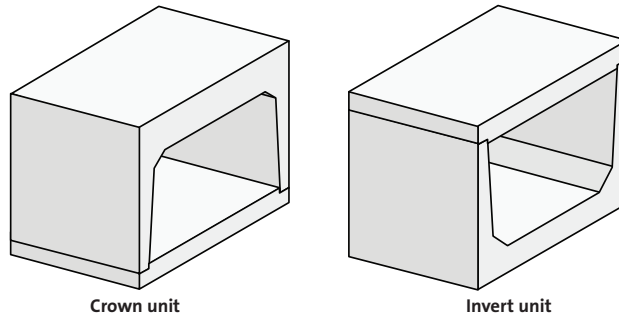
Box culverts - small

Humes manufactures a full range of small box culverts from 300 mm to 1,200 mm span available in standard lengths of 1.2 m and 2.4 m. Custom designs such as splayed units can be manufactured as required. Penetrations, post tensioning ducts, openings and cast-in items such as ferrules can be easily accommodated.

The box culvert is available either as an inverted U on a concrete base foundation (crown type) or as a U shaped trough with a lid (invert type). Humes can supply precast bases and lids to suit.

Unless specified otherwise, box culverts are typically designed for 0-2 m fill with concrete exposure class B2. Other specifications can be accommodated on request.

Box culverts details



Small RCBC size range

Leg height (mm)	Span (mm)					
	300	450	600	750	900	1,200
300	■	■	■	■	■	■
450		■	■	■	■	■
600			■	■	■	■
750				■	■	■
900					■	■
1,200						■

Note: Other sizes may be available on request

For information on large box culverts see page 51.

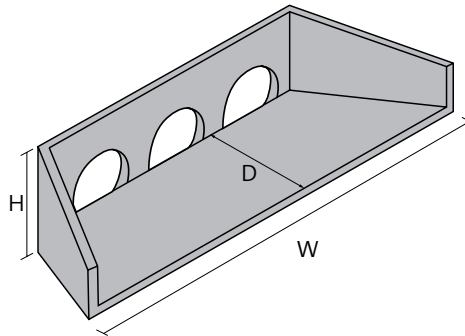
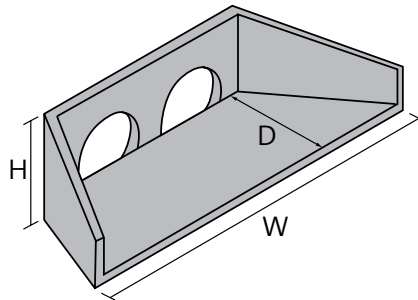
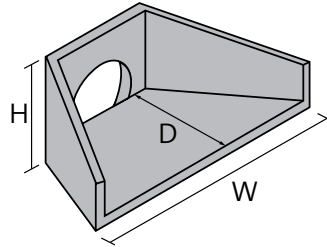


Headwalls

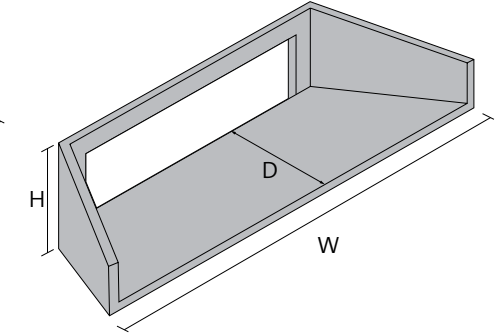
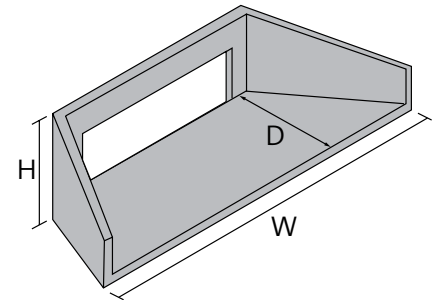
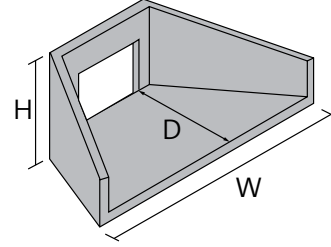
Humes manufactures an extensive range of headwalls which vary to accommodate:

- Pipes DN300 - DN3600
- Box culverts up to 1.2 m leg height
- Number of outlets (single, double, triple etc.)
- VicRoads, local or other specifications

Headwalls for pipes



Headwalls for box culverts



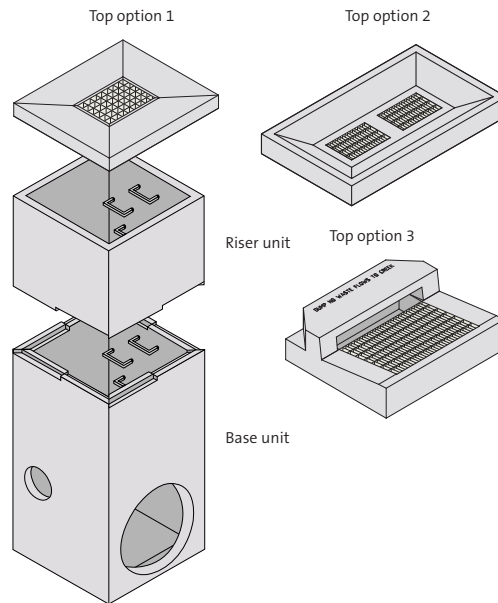


There are two types of stormwater pits available; custom and knock-out. Custom pits come in a range of common footprints, to suit requirements of different authorities and are made to the exact height to suit project requirements. Knock-out (also known as standard, modular or church door) pits come in a range of sizes and have knockouts on all four sides to provide easy installation of pipes.

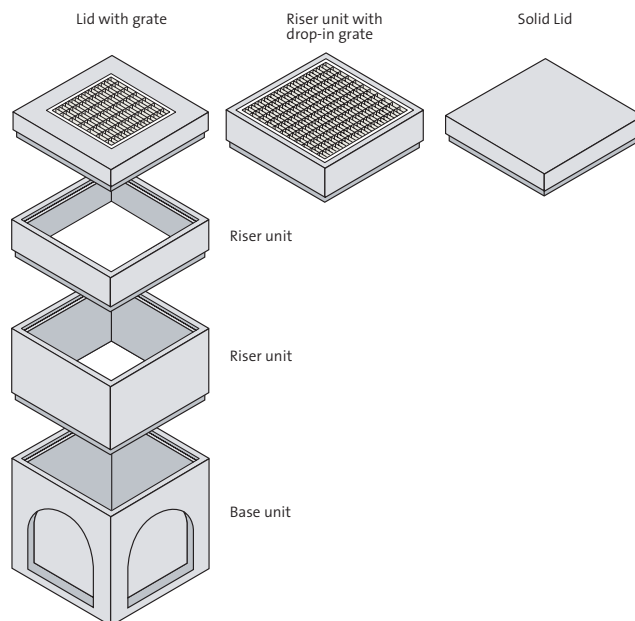
Features and benefits – Custom pits

- Customisable – Custom pits can be manufactured to meet your design requirements of your stormwater network with exact heights and pipe penetrations.
- Trafficable – Designed in accordance with the Australian Standard for Bridge Design AS 5100.5 and SM 1600 traffic loading (other load classes available).
- Extensive range of sizes – Meeting local authorities’ stormwater network specifications.
- In-house design capability – Our built-for-purpose software generates detailed drawings for manufacturing and installation purposes.
- Comprehensive support – A detailed installation guide is available together with a team of experts who can assist with site support if required.
- Highly versatile – Fully adaptable with Humes extensive range of stormwater pipes, kerb inlet systems and other stormwater drainage products. Custom pits can also be used as junction pits for electricity, gas and communication networks.

Custom pit components



Knock-out pit components



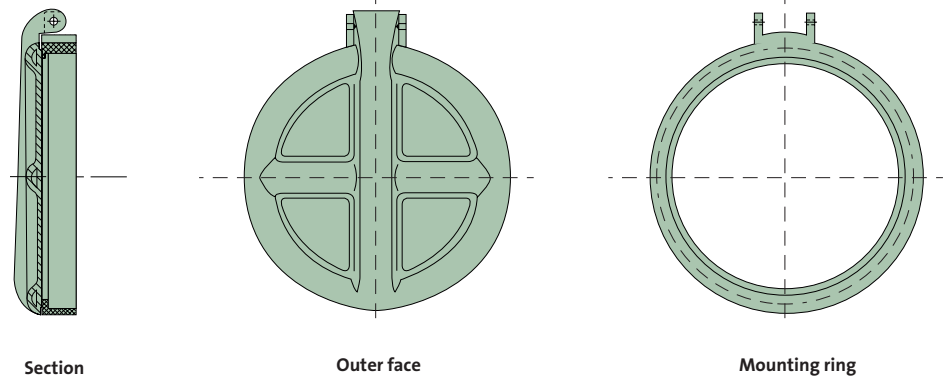


Floodgates

Hume-King floodgates are moulded from fibreglass reinforced polyester, with high tensile 316 stainless steel built-in hinges, and replaceable neoprene sealing rings. They are available to suit Humes standard pipe diameters, in a mounting-ring style for smaller diameter pipes, and a bolt-on style for DN1050 to DN1800 pipes.

Humes can develop and manufacture customised floodgates for box culverts and other non-standard applications.

Mounting ring style floodgate



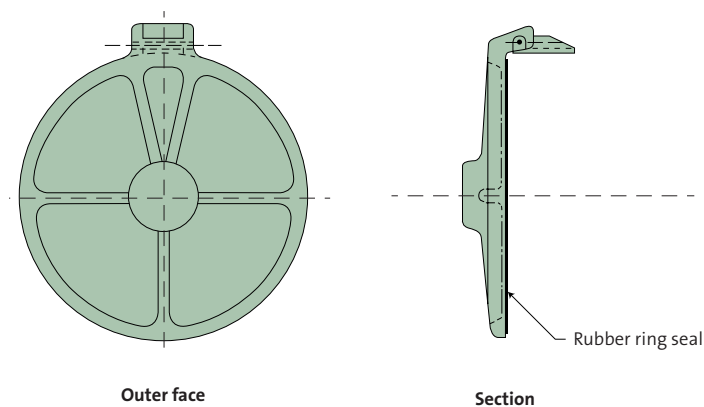
Mounting ring style floodgates

Nominal pipe dia. (mm)	Mass (kg)	Overall diameter (mm)	Overall thickness (mm)
100	2	154	64
150	3	211	76
225	4	298	92
300	11	387	133
375	16	473	133
450	17	562	133
525	22	651	133
600	30	730	133
675	36	816	133
750	50	905	133
900	65	1,064	133

Bolt-on style floodgates

Nominal pipe dia. (mm)	Mass (kg)	Overall diameter (mm)	Overall thickness (mm)
1,050	115	1,185	276
1,200	124	1,365	317
1,350	160	1,518	349
1,500	191	1,689	445
1,800	260	2,019	432

Bolt-on style floodgate





Stormwater treatment introduction

Improving stormwater quality

Stormwater runoff from urban areas has been shown to contain a wide variety of pollutants from both natural and man-made sources, with key contaminants including:

- sediment/suspended solids
- litter
- nutrients (nitrogen and phosphorous)
- heavy metals
- pesticides
- hydrocarbons (oil and grease)
- micro-biological organisms.

To minimise the impact of pollutants on receiving waterways many authorities have now set specific Water Quality Objectives (WQO) for the treatment of stormwater runoff from new developments. Due to the complexity and variability of stormwater runoff, and climatic changes, many authorities have different WQO; refer to the current QLD State Planning Policy and other local, state and federal guidelines for their specific WQO.

Model for Urban Stormwater Improvement Conceptualisation (MUSIC)

MUSIC software was developed as an assessment tool for designers and authorities to identify appropriate stormwater treatment measures to achieve the above WQO for new urban development proposals.

Contact your local Humes representative for assistance with modelling our stormwater treatment solutions in MUSIC for your project.

Pollutant removal – Treatment trains

To effectively treat stormwater runoff, it is necessary to utilise different treatment processes to target different pollutants; the combination of which is typically referred to as a 'treatment train'.

The figure below demonstrates how specific pollutants must be targeted by higher level treatment measures and how it is helpful to separate them into primary, secondary, and tertiary categories.

Treatment measure selection guide (adapted from Ecological Engineering 2003)

Particle size grading	Treatment measures	Hydraulic loading ($Q_{des}/A_{facility}$)
Gross solids >5,000 μm		1,000,000 m/yr 100,000 m/yr
Coarse to medium sized particulates 5,000 μm - 125 μm		50,000 m/yr 5,000 m/yr
Fine particulates 125 μm - 10 μm		2,500 m/yr 1,000 m/yr
Very fine/colloidal particulates 10 μm - 0.45 μm		500 m/yr 50 m/yr
Dissolved particles < 0.45 μm		10 m/yr
	Primary Secondary Tertiary	



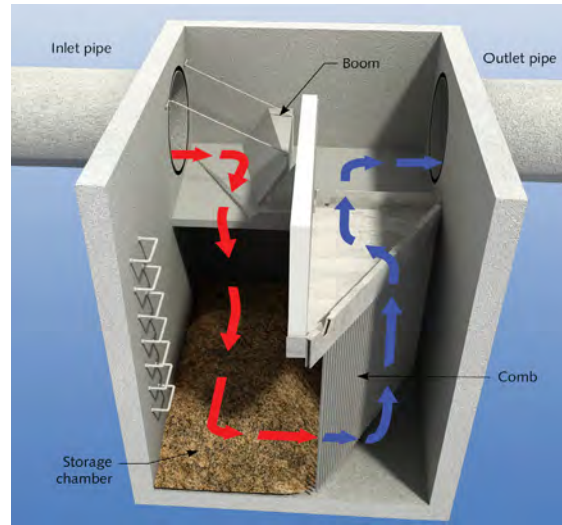
HumeGard® Gross Pollutant Trap (GPT)

The HumeGard® GPT is a pollution control device that is specifically designed to remove gross pollutants and coarse sediments ≥ 150 micron from stormwater runoff. This system is designed for residential and commercial developments where litter and sediment are the main pollutants. It is particularly useful in retrofit applications or drainage systems on flat grades where low head loss requirements are critical.

Features and benefits

- High performance with negligible head loss – HumeGard® GPT has a **head loss 'k' factor of 0.2**, important for retrofit and surcharging systems.
- Captures and stores a large volume of pollutants – For pollutant export rates reported by Australia Runoff Quality (1 m³/hectare/year), the HumeGard® GPT is sized for maintenance intervals up to annual durations.
- Low operational velocities – Flow velocity in the storage chamber is <0.2 m/s to ensure the comb self-cleans and improves settling of coarse sediment.
- Retains floating material even in bypass – All GPTs bypass at high flows. The patented floating boom will capture and retain floating materials even when bypass occurs.
- Maximises above ground land use – The HumeGard® GPT is a fully trafficable solution, so it can be installed under pavements and hardstands to maximise land use on constrained sites.

HumeGard® operation (design flow conditions)



HumeGard® dimensions and specifications

HumeGard® model	Nominal pipe dia. (mm)	Treatment flow rate (l/s)	Storage capacity (m ³)	Length (mm)	Width (mm)	Height (mm)
HG12	300	85	3	2,000	1,758	2,500
HG12A	375	100	3	2,000	1,758	2,500
HG15	450	130	3	2,000	1,758	2,500
HG15A	525	150	3	2,000	1,758	2,500
HG18	600	600	3	2,100	2,100	2,115
HG24	600	1,050	8	2,500	2,700	2,740
HG27	750	1,110	7	2,500	3,000	2,715
HG30	750	1,330	12	2,500	3,350	3,365
HG30A	900	1,160	11	2,500	3,350	3,365
HG35	900	1,540	12	2,500	3,850	3,390
HG35A	1,050	1,370	11	2,500	3,850	3,390
HG40	900	1,910	16	2,850	4,350	3,390
HG40A	1,050	1,750	14	2,850	4,350	3,390
HG40B	1,200	1,580	12	2,850	4,350	3,390
HG45	1,200	1,960	19	2,900	4,900	3,915
HG45A	1,350	1,780	19	3,200	4,900	3,915

Notes

1. Custom solutions also available
2. HumeGard® should be sized for the critical of either pipe diameter or treatment flow rate.
3. Units listed are standard configurations. Custom units can be provided to meet specific project requirements.

HumeGard® GPT performance summary

Pollutant	Removal efficiency	Details
Gross pollutants (litter, vegetation)	90%	Annually
TSS	41%	Annually (including bypass)
Hydrocarbons	90%	In an emergency spill event
TP	34%	Particulate-bound
TN	24%	Particulate-bound

Notes:

1. Nutrient removal is influenced by catchment characteristics and partitioning between dissolved and particulate nitrogen.
2. For further details on performance testing contact Humes Water Solutions.
3. Gross pollutant traps are not specifically designed to capture hydrocarbons, though may do so during emergency spill events. When this occurs, maintenance is required immediately.
4. The unique design of the HumeGard® floating boom allows it to be modified to treat higher flows and capture more gross pollutants and sediment on request.



HumeCeptor® hydrodynamic separator - Class II

The HumeCeptor® system is an underground, precast concrete stormwater treatment solution that utilises hydrodynamic and gravitational separation to efficiently remove Total Suspended Solids (TSS) and entrained hydrocarbons from runoff. First designed as an 'at source' solution for constrained, commercial and industrial sites it has been improved and expanded to service large catchments, mine and quarry sites, inundated drainage systems, and capture large volume emergency spill events.

HumeCeptor® STC 2 (inlet) model

This model features a grated inlet to directly capture runoff from hardstand areas, replacing the need for a stormwater pit.

MultiCeptor™ model

The MultiCeptor™ model was developed to facilitate the replacement of junction pits while still providing the treatment abilities of the original HumeCeptor® system. Available in the same sizes as the standard HumeCeptor® units (refer Table 6 below) with the addition of a 2,440 mm diameter unit to accommodate drainage networks up to 1,800 mm diameter.

HumeCeptor® operation (design flow conditions)



HumeCeptor® STC 2 (inlet) model



HumeCeptor® model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert* (m)	Sediment capacity (m³)	Oil capacity (l)	Total storage capacity (l)
STC 2 (inlet)	100 - 600	1,200	1.70	1	350	1,740
STC 3	100 - 1,200	1,800	1.68	2	1,020	3,410
STC 5			2.13	3		4,550
STC 7			3.03	5		6,820
STC 9			2.69	6		9,090
STC 14			3.69	10		13,640
STC 18	3,060	3,060	3.44	14	2,980	18,180
STC 23			4.04	18		22,730
STC 27			3,600	3.84		20

Notes

- *Depths are approximate.
- Larger inlet pipe diameters can be accommodated - contact Humes for further information.

HumeCeptor® system performance summary

Pollutant	Average removal efficiency	Details
TSS	80%	Laboratory and field results, stable, hardstand, roads, commercial and industrial sites
TN	37%	Field results
TP	53%	Field results
Chromium	44%	Field results
Copper	29%	Field results
TPH	65%	<10 ppm inflow concentration
	95%	10 ppm - 50 ppm inflow concentration (typical stormwater)
	99%	>500 ppm inflow concentration (emergency spills)

Note: Detailed reports are presented in the HumeCeptor® system technical manual.



HumeCeptor® hydrodynamic separator

DuoCeptor™ model

Developed to treat larger catchments (2 Ha - 6 Ha) because some constrained developments can only accommodate a single, large device instead of several smaller devices.

The unit operates by splitting the flow and treating half of the design flow through the first chamber. The untreated half of the design flow then bypasses from the first chamber then passes through the split connection pipe into the second chamber for treatment. Treated flow from the first chamber exits and flows through the other side of the split connection pipe, and bypasses the second chamber to join the treated flow from the second chamber at the outlet of the DuoCeptor™ model.

DuoCeptor™ model



DuoCeptor™ model range and details

DuoCeptor™ model	Pipe diameter (mm)	Device footprint (L x W)	Depth from pipe invert (m)	Sediment capacity (m ³)	Oil capacity (l)	Total storage capacity (l)
STC 40	600 - 1,500	7,750 x 3,500	3.41	27	10,585	42,370
STC 50			4.01	35	10,585	50,525
STC 60		9,150 x 4,200	3.89	42	11,560	60,255



Stormwater solutions

HumeCeptor® hydrodynamic separator - Class I

The HumeCeptor® Class I system is an underground, modular, precast concrete stormwater treatment train that utilises hydrodynamic and gravitational separation to efficiently remove Total Suspended Solids (TSS) and entrained hydrocarbons from stormwater runoff.

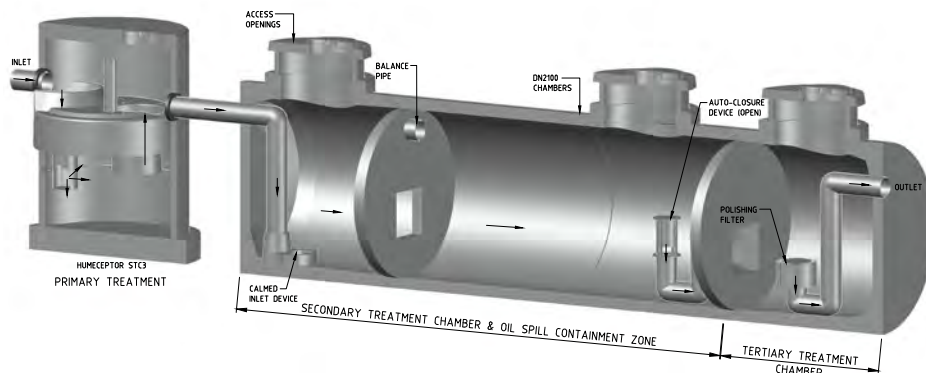
The HumeCeptor® Class I system is installed on sites where there is a higher risk of environmental contamination from stormwater runoff, or where a spill might occur. It is sized for a specific treatment flow rate, and installed on line at sites such as; refuelling stations, fuel distribution stations, car servicing workshops, electrical transformer pads and substations, etc.

The HumeCeptor® Class I system is an evolution of the original HumeCeptor® (Class II) hydrodynamic separator, with this version specifically modified to remove hydrocarbons to less than 5ppm in line with EN/BS858.

The HumeCeptor® Class I separators are full retention two chamber systems that incorporate primary treatment utilising a HumeCeptor® Class II, an automatic closure valve for emergency oil spill containment, an oil level monitoring unit and alarm, and a coalescing filter for final polishing of the discharge water.

The HumeCeptor® Class I is designed and tested to meet the stringent European Standard EN/BS 858-1 for installations for separators of light liquids. They ensure a maximum hydrocarbon concentration in the outlet of 5mg/litre (5ppm), which is suitable for discharging into a surface water drain. Laboratory testing in strict accordance with EN/BS 858-1 showed that the HumeCeptor® Class I achieved an average effluent oil concentration of less than 1mg/L (<1ppm), (Drapper, D. D., 2020, EN/BS858 and Stormwater Quality Lab Testing Final Report).

HumeCeptor® - Class I



HumeCeptor® Class I performance summary

Humeceptor Class 1 Model	Treatment Flow Rate (TFR L/s)	Oil Storage Volume (Minimum L) TBC	Additional Oil Spill Volume per Module (L)	Sediment Volume (m ³)
HC2 - NS7 - 4k	7	4,000	1,800	TBC
HC3 - NS13 - 7k	13	7,000	3,100	TBC
HC3 - NS17 - 12k	17	12,000	3,600	TBC
HC9 - NS25 - 16k	25	16,000	4,700	TBC
HC18 - NS35 - 25k	35	25,000	7,400	TBC
HC18 - NS45 - 32k	45	32,000	7,400	TBC
HC27 - NS55 - 47k	55	47,000	10,700	TBC
HC27 - NS65 - 58k	65	58,000	10,700	TBC



HumeFilter® UPT

The HumeFilter® is a tertiary stormwater treatment device featuring a multistage treatment method, including primary screening, media filtration, and membrane filtration. The multistage treatment approach provides exceptional pollutant removal rates at high treatment flow rates with minimal head loss and relatively low maintenance costs.

The HumeFilter® uses hydrodynamic separation, and physical media and membrane filtration to provide tertiary treatment to stormwater run-off in an underground precast concrete structure. Using the media and filtration cartridges provides an extremely large contact surface area, resulting in high flow rates and pollutant removal capability for many types of contaminants.

The HumeFilter® efficiently captures a high level of stormwater pollutants, including:

- Total Suspended Solids (TSS), mean removal efficiency of 97%
- Total Nitrogen (TN), mean removal efficiency of 42%
- Total Phosphorous (TP), mean removal efficiency of 55%
- Gross Pollutants (GP), mean removal efficiency of 100%

Designed as a polishing device for constrained sites, the HumeFilter® is available in a range of sizes to cater for both at-source and end-of-pipe solutions. It's also very effective at capturing heavy metals, including lead, zinc and copper, as well as residual hydrocarbons from roads and car park stormwater run-off.

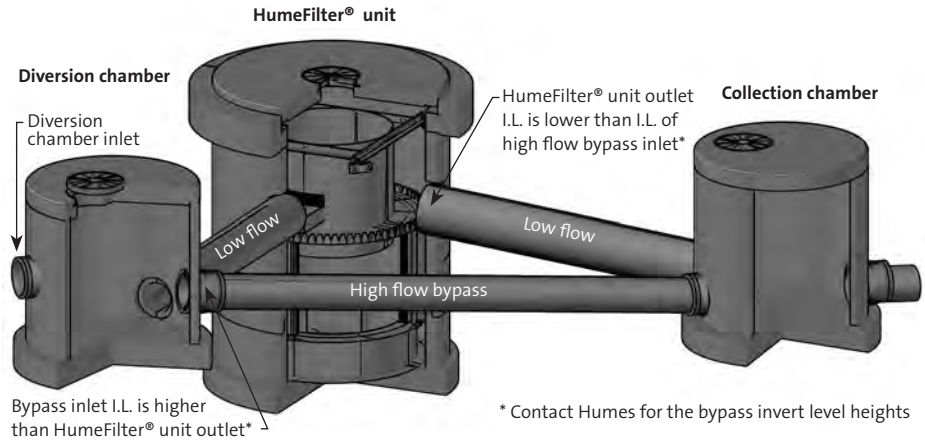
HumeFilter® treats higher flow rates than most filters. There are 5 models currently available with Treatment Flow Rates as follows:

- UPT1200 – 12L/s TFR
- UPT1800 – 30L/s TFR
- UPT2400 – 55L/s TFR
- UPT3000 – 100L/s TFR
- UPT3600* – 160L/s TFR**

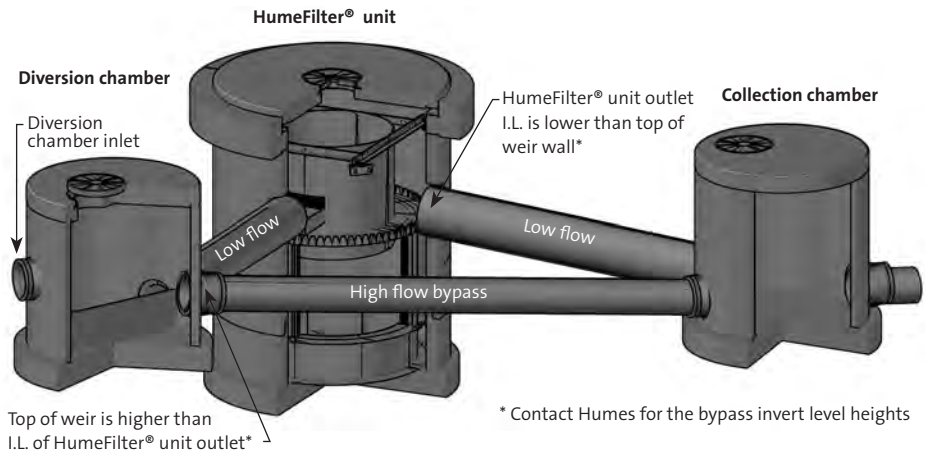
* Internal Diameter of the Concrete Chamber

** TFR – Treatment Flow Rate

HumeFilter® UPT offline arrangement without diversion weir



HumeFilter® UPT offline arrangement with diversion weir





StormTrap® system

The StormTrap® system is a purpose-built stormwater detention and infiltration solution that meets regulatory requirements while minimising the impact on land usability. It is the most cost effective, fully trafficable, below ground detention system on the Australian market today.

Features and benefits

- Flexible footprint and design
- Reduced design time
- Maximum detention volume for the smallest footprint
- High infiltration capacity
- Full trafficability to SM 1600
- Minimum 50 year design life
- Full access and maintainability

Geotechnical considerations

Minimum bearing capacity of 150 kPa.

Australian standards

The StormTrap® system is designed in accordance with the following Australian standards:

- AS 3600 – Concrete Structures Code
- AS 5100 – Bridge Design Code
- AS 5100.2 – Bridge Design – Design Loads
- AS 1597.2 – Precast Reinforced Concrete Box Culverts – Large Culverts
- AS/NZS 1170.1 – Structural design actions – Part 1: Permanent, imposed and other actions.

Standard module types and sample layout

Standard type I



Standard type II



Standard type III



Standard type IV



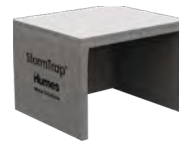
Standard type V



Standard type VI



Standard type VII



V	III	III	IV
II	I	I	II
II	I	I	II
IV	III	III	V

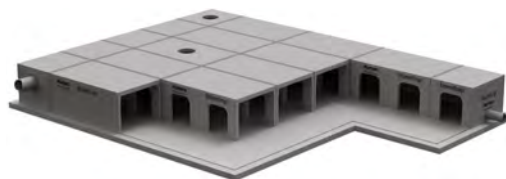
StormTrap® system footprints

Module type	Dimensions	Comment
I, III and VI	2,350 mm wide x 4,000 mm long	Multiples of 2,350 mm wide and 4,000 mm long are the most cost effective.
II, IV, V and VII	2,350 mm wide x 2,000 mm long	

StormTrap® system heights

System type	Leg height	Comment
SingleTrap™ module	600 - 1,500 mm max	Internal depths closer to the maximum are the most cost effective.
DoubleTrap™ module	1,200 - 3,000 mm max	

SingleTrap™ system example



DoubleTrap™ system example



Features a patented key joint and low flow ports to balance detained water across the system.



RainVault® system

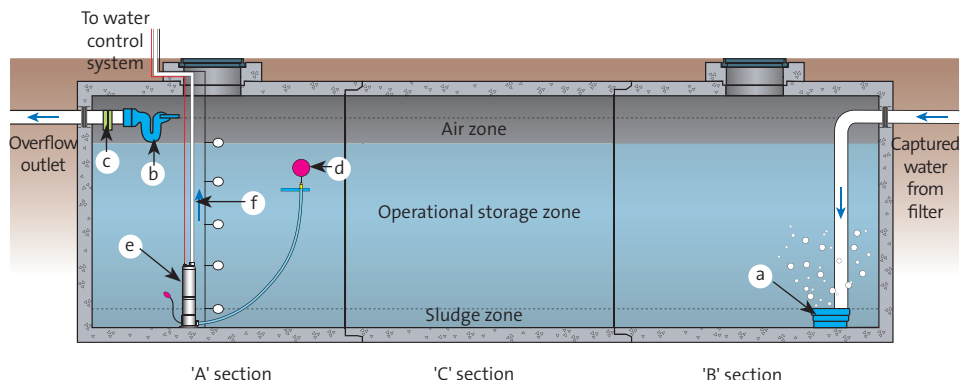
The RainVault® system is specifically designed to capture, treat, store and supply rainwater as an alternative to potable water for non-potable applications. The underground system consists of treatment devices, water quality measures, storage components and a pumping system. It can be customised to suit each project's requirements.

Features and benefits

- Fully integrated harvesting and reuse solution, including a pre-treatment filter, components to maintain the stored water quality, flexible storage volume, and a pumping solution.
- Fully trafficable – designed for the SM 1600 road traffic load as detailed in AS 5100. This makes it an ideal solution for installation under car parks, driveways, hardstands and open space areas.
- Minimum 50 year design life.
- Can be custom designed to suit your project – the modular design can be configured to suit most footprints through interconnecting the storage components in multiple barrels.
- Easy to install – The precast concrete components means large systems are fast and simple to install.
- Accessible and maintainable – When required, it is possible to safely enter the RainVault® system for maintenance without completely excavating it.

ReserVault® system

The ReserVault® system is an ideal solution where a high quality of water is not required, (e.g. irrigation applications). This 'no frills' model is similar to the RainVault® system, using the same seals and storage components, but excludes the treatment devices, water quality measures and pumping system.



Legend

a	Calmed inlet
b	Overflow siphon
c	Backflow prevention valve
d	Floating pump intake
e	Pump
f	Water level gauge

RainVault® system configuration guide

RainVault® model	Inside diameter (mm)	Outside diameter (mm)	Storage volume combined 'A' + 'B' sections* (L)	Additional 'C' section volume each (L)	Combined 'A' + 'B' sections mass† (kg)	Additional 'C' section mass each‡ (kg)
RV1200 - 01 - 00	1,280	1,500	5,000	2,500	8,200	3,300
RV1950 - 01 - 00	1,950	2,220	10,000	6,300	16,000	6,000
RV2100 - 01 - 00	2,100	2,388	12,000	7,500	17,700	6,800
RV2250 - 01 - 00§	2,250	2,550	14,000	8,700	20,200	7,500
RV2400 - 01 - 00	2,438	2,742	19,000	10,000	21,200	8,000
RV2700 - 01 - 00	2,700	3,030	23,000	12,000	25,500	9,500
RV3000 - 01 - 00	3,060	3,410	30,000	16,000	32,000	12,000

Notes:

* Volume excludes sludge zone and air zone.

† Mass comprises both end sections plus saddle for risers, but excludes risers.

‡ Mass is for class 2 'C' sections - contact Humes for masses of heavier class sections.

§ RV2250 currently available in Western Australia only.

2. Sewage transfer and storage solutions



SRC pipes with corrosion protection 25



Access chambers/Manholes 27



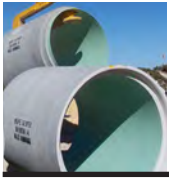
QuickTee® maintenance shafts 32



Storage tanks 33



Pump stations 34



Steel reinforced concrete pipe with corrosion protection

Sewerage pipes

Humes rubber ring joint (RRJ) pipes manufactured with one of the corrosion protection options below are ideal for sewerage applications. See pages 7-14 for details on our range of RRJ pipes.

Extra cover to reinforcement

Adding extra cover increases protection when the system's designer has little or no information to carry out a detailed pipe system analysis. The cover can be increased from a nominal standard to lengthen the life of the pipe by up to two times.

Calcareous aggregate

Manufacturing concrete pipes from calcium rich aggregate such as limestone, increases resistance to acidic corrosion, by inhibiting the progress of the chemical attack. It is most effective when incorporated as a sacrificial layer and can lengthen the pipe life by up to two times.

HDPE lining

Lining systems are able to bridge any discontinuities in the pipe/structure wall, which is a distinct advantage over coating systems which depend on the integrity of the surface for functionality.

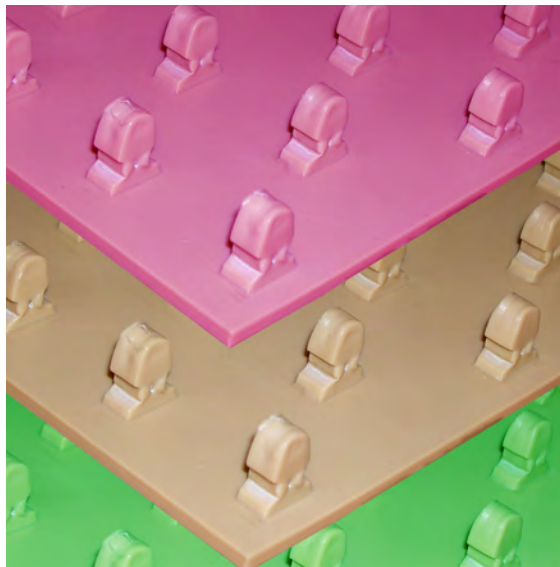
High density polyethylene (HDPE) lining suits both precast and in-situ applications. Firmly anchored to the pipe, the lining forms a superior protective layer able to withstand both abrasion and harsh chemical environments.

This material is available in a variety of colours, including pale colours which allow easy visual inspection. HDPE lining is available in 2 mm to 5 mm thicknesses in sheets up to 3 m wide.

HDPE lined pipes



HDPE sheets



HDPE weld types



Extrusion weld - overlapped



Extrusion weld - butted



Double wedge weld



Electronic butt weld



Access chambers

Humes offer a modular access chamber system for quick and safe construction of leak-tight and zero-infiltration structures. Standard components are designed for up to 9m depth, in accordance with AS 4198 - Precast Access Chambers for Sewerage Applications.

Various jointing options are available to meet local requirements:

Self-slip joint

- Superior joint – best-in-class sealing performance - tested at pressures in excess of 120kPa
- Recommended for leak-tight and zero-infiltration specifications
- Safer installation - no reaching under suspended loads to lubricate sockets
- Easier installation - low closing force to join components
- EPDM material meets requirements of AS 4198 with joint deflection up to 6 mm

Wedge joint

- Popular water-tight joint, successfully used for many years
- Withstands groundwater pressures of up to 90 kPa, and joint deflection of up to 6 mm
- manhole sections typically close under own weight
- meets requirements of AS 4198

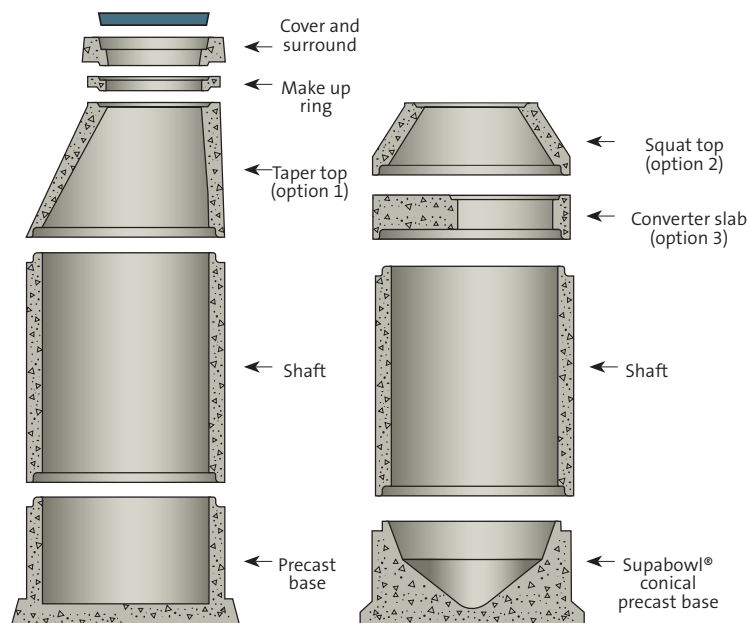
Mastic joint

- Rated as water-resistant
- Suitable in homogeneous sandy soils of uniform moisture
- Not recommended for differential soil movements e.g. clay soils

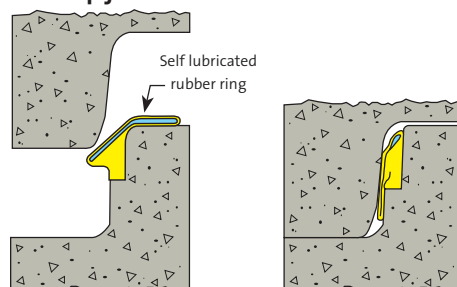
Epoxy joint

- Specialist epoxy resins applied to both spigot and socket
- Creates a monolithic structure - suits some ground conditions and applications
- Water-tightness depends upon controlled application of epoxy (360 degrees) and low lateral pressures on manhole structure throughout service life

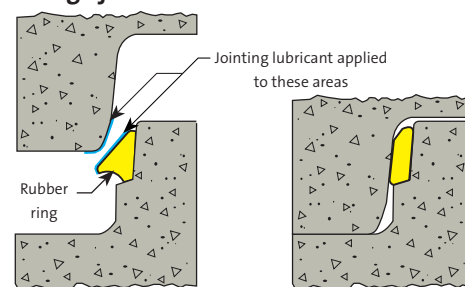
Access chamber components



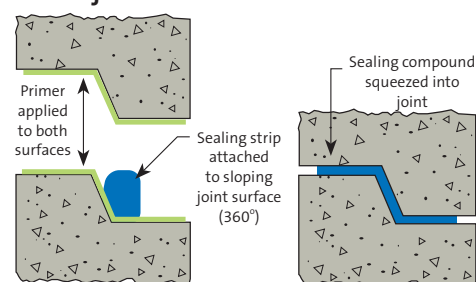
Self-slip joint



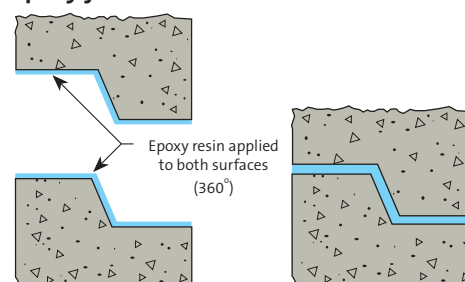
Wedge joint



Mastic joint



Epoxy joint





Sewage transfer and storage solutions

Access chambers – Bases

Precast bases are available to regional requirements, with most regions offering a combination of plain and factory benched bases

Supabowl® conical base

The Supabowl® is a patented replacement for traditionally benched bases. The unique design eliminates the need for a separate benching process and greatly improves supply lead times.

It has an internal surface in the shape of an inverted cone. The point of the cone is semi-spherical and acts as a node where incoming flows are concentrated prior to draining through a preformed outlet. Inlets are cored in the factory to suit site line and levels.

Extensive laboratory testing has shown that this type of base has the same hydraulic efficiency as traditional channel benched bases while displaying superior self-cleansing under surcharge conditions.

HumeSeal® watertight coupling

Designed for fast, efficient and watertight joining of standard UPVC pipe, DN100 - DN225, into precast concrete or in-situ structures. (Larger HumeSeal® couplings are available on request)

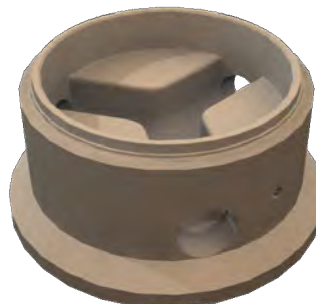
HumeSeal® has been extensively tested and performs well above specification requirements for pressure, angular deflection and lateral loads. The HumeSeal® coupling will accommodate a 90 kPa pressure differential and remain watertight with up to 17 degrees of angular deflection.

It is constructed to AS 1646 from natural rubber, glass filled nylon, and 316 stainless steel bolts and nuts, for compression of the coupling.

Plain base



Benched base



Supabowl®



HumeSeal®





Access chambers – Shafts

Shafts come in increments that, when combined with make-up rings, provide the required depth of access chamber.

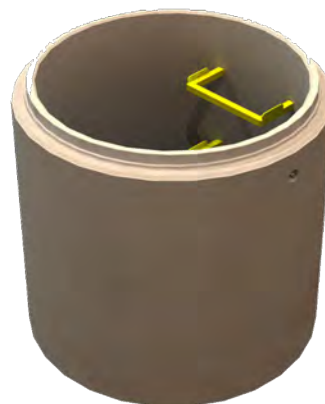
Step irons

The requirement for step irons depends upon local specifications and are offered accordingly.

Plain shaft



Shaft with step irons



Shafts

DN (mm)	1,100
ID (mm)	1,100
Wall thickness (mm)	90
Available nominal lengths (mm)	300
	600
	900
	1,200



Access chambers – Reducer options

Converter slab

Provide maximum head room in the chamber for shallow access chambers. Thickness varies according to load specification.

Taper top

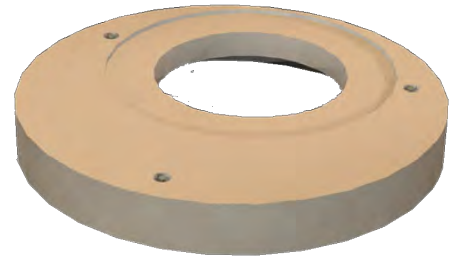
Taper tops are suited to deeper installations, usually >1200 mm depth. The vertical side aligns with the shaft, providing a face down the depth of the chamber for mounting of ladders or step irons.

Squat top

Squat tops are usually used for shallow installations <1200 mm deep.

Converter slab

OD (mm)	1,290
Height (mm)	210
Opening dia. nominal (mm)	600



Taper Top

Height (mm)	600
Opening dia. nominal (mm)	600



Squat Top

Height (mm)	300
Opening dia. nominal (mm)	600





Access chambers - Cover options

Make-up rings

Added to bring the chamber cover to the required surface level.

Cover and surround

Ductile cast iron covers sit within frames that are cast directly into the concrete surround.

Covers and surrounds are offered to class B or D loadings per AS 3996 and to reflect local authority requirements.

Humes also supply innovative cover solutions to overcome handling hazards presented by 40 - 60 kg cast iron covers. Mechanical lifting struts for cast-iron covers and lighter polymer based covers such as HDPE are available upon request.

Make-up rings

Heights (mm)	100 150
Opening dia. nominal (mm)	600

Make-up rings



Cast iron cover and surround



Cast iron cover and frame



Covers and surrounds

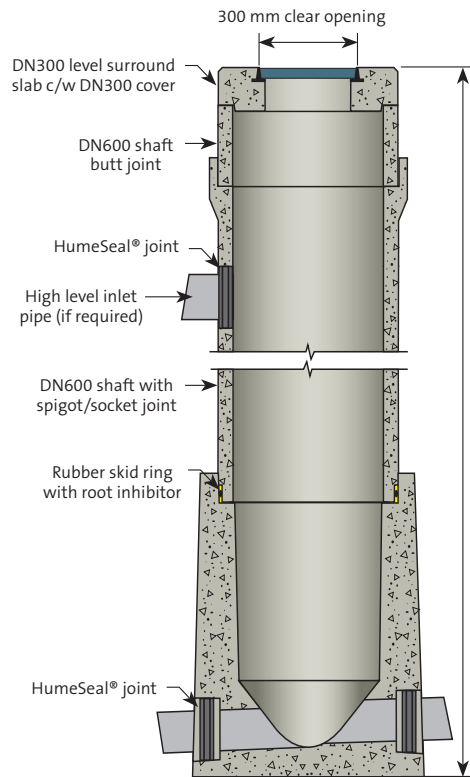
Surround and lid type	Surround, cast iron collar and cover - Light duty	Surround, cast iron collar and cover - Heavy duty
Lid secured	Bolt down or conventional	Bolt down or conventional
Load Class (ref. AS 3996)	Class B (light)	Class D (heavy)
Lid diameter (mm)	600	600
Height (mm)	150	200



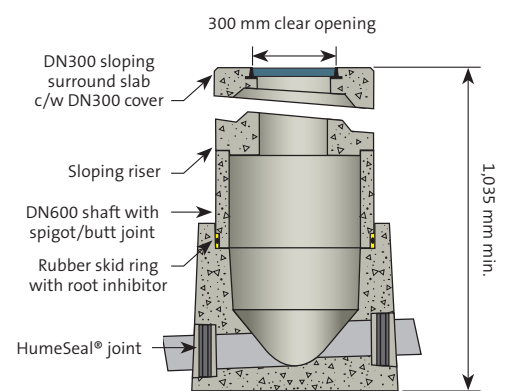
QuickTee® maintenance shafts

The QuickTee® maintenance shaft is a DN600 vertical shaft for non-worker entry to sewerage systems to introduce inspection (CCTV) and maintenance equipment. The system features rigid precast construction and a conically benched base, ensuring trafficable installation and efficient hydraulic performance.

Deep installation - 900 mm base



Shallow installation - 500 mm base

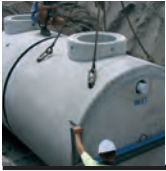


QuickTee® system dimensions

System	500 mm base	900 mm base	DN600 spigot/butt shaft	DN600 spigot/socket shaft	DN300 level surround	DN300 sloping surround and riser ²	Min. depth ³ (mm)	Max. depth ³ (mm)
A	✓	-	✓	-	✓	✓	875	2,875
B	-	✓	✓	-	✓	✓	1,275	3,275
C	✓	-	✓	✓	✓	✓	3,267	5,267
D	-	✓	✓	✓	✓	✓	3,667	5,667
Effective height (mm)	500	900	Varies ¹ Min. 250 Max. 2,250	2,392	125	125	-	-

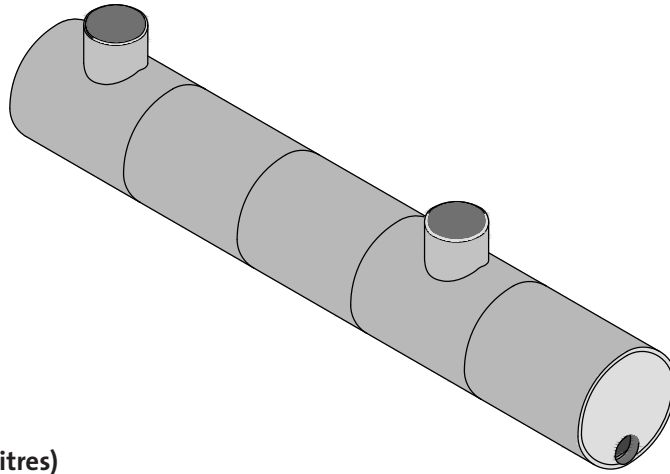
Notes:

1. Components cut to required length by Humes
2. For sloping sites use DN300 sloping surround and riser
3. When using DN300 sloping surround and riser and add 125 mm to depths shown



Storage tanks

Humes can design sewage storage tanks using our range of steel reinforced concrete pipes, which is an ideal solution where unique footprints or depths are required. These storage tanks are available from DN1200 to DN3600 in a variety of storage capacities, and are configured with end walls and fittings to meet project specific needs. The entire precast concrete solution can be provided with corrosion protection lining to meet specific durability requirements.



Storage tank indicative capacities (litres)

DN (mm)	Length of pipe (m)														
	0.2	0.4	0.6	0.8	1.0	1.2	1.22	1.4	1.6	1.8	1.83	2.0	2.2	2.4	2.44
1,200	234	467	701	934	1,168	1,401	1,425	1,635	1,869	2,102	2,137	2,336	2,569	2,802	2,849
1,350	295	591	887	1,182	1,478	1,773	1,803	2,069	2,364	2,660	2,704	2,955	3,251	3,546	3,605
1,500	365	730	1,094	1,459	1,824	2,189	2,225	2,554	2,919	3,283	3,338	3,648	4,013	4,378	4,451
1,650	441	883	1,324	1,766	2,207	2,649	2,693	3,090	3,532	3,973	4,039	4,414	4,856	5,297	5,386
1,800	525	1,051	1,576	2,101	2,627	3,152	3,205	3,677	4,203	4,728	4,807	5,254	5,779	6,304	6,409
1,950	617	1,233	1,850	2,466	3,083	3,699	3,761	4,317	4,933	5,549	5,632	6,166	6,782	7,399	7,522
2,100	715	1,430	2,145	2,860	3,575	4,290	4,362	5,005	5,721	6,436	6,543	7,151	7,866	8,581	8,724
2,250	795	1,590	2,386	3,181	3,976	4,771	4,851	5,567	6,362	7,157	7,276	7,952	8,747	9,940	9,702
2,400	934	1,867	2,801	3,735	4,668	5,602	5,695	6,536	7,469	8,403	8,543	9,337	10,270	11,671	11,391
2,700	1,145	2,290	3,435	4,580	5,726	6,871	6,985	8,016	9,161	10,306	10,478	11,451	12,596	14,314	13,970
3,000	1,471	2,942	4,412	5,883	7,354	8,825	8,972	10,296	11,767	13,237	13,458	14,708	16,179	18,385	17,944



Pump stations

Pump stations (pump wells) are used for a variety of infrastructure systems including the transfer of sewage to treatment plants.

Humes supplies pump station sections up to DN3600, which can be designed to meet customer requirements.

Precast converter slabs are available on request.

In-situ bases are commonly used with pump stations however Humes can also supply precast bases on request.

For diameters greater than DN3600 Humes offers one-piece caisson shafts, see page 41.

Pump station dimensions

Nominal ID	OD	Actual ID	Mass (t/m)	Max depth to floor (m)	Max. depth per unit (m)	Convert slab mass (t)
DN1200	1,359	1,199	0.8	9.0	2.44	0.7
DN1350	1,524	1,360	1.0	9.0	2.44	0.9
DN1500	1,676	1,456	1.4	6.0	2.44	1.0
DN1650	1,842	1,612	1.6	6.0	2.44	1.2
DN1800	2,005	1,775	1.7	6.0	2.44	1.4
DN1950	2,197	1,955	2.4	6.0	2.44	1.5
DN2100	2,388	2,138	2.6	6.0	2.44	1.6
DN2400	2,720	2,450	2.9	8.0	2.40	1.9
DN2700	3,030	2,710	3.8	8.0	3.00	2.2
DN3000	3,410	3,070	4.6	8.0	3.00	3.7
DN3600	4,130	3,600	8.2	9.0	2.40	5.8



Note: For diameters greater than DN3600 Humes offers one-piece caisson shafts

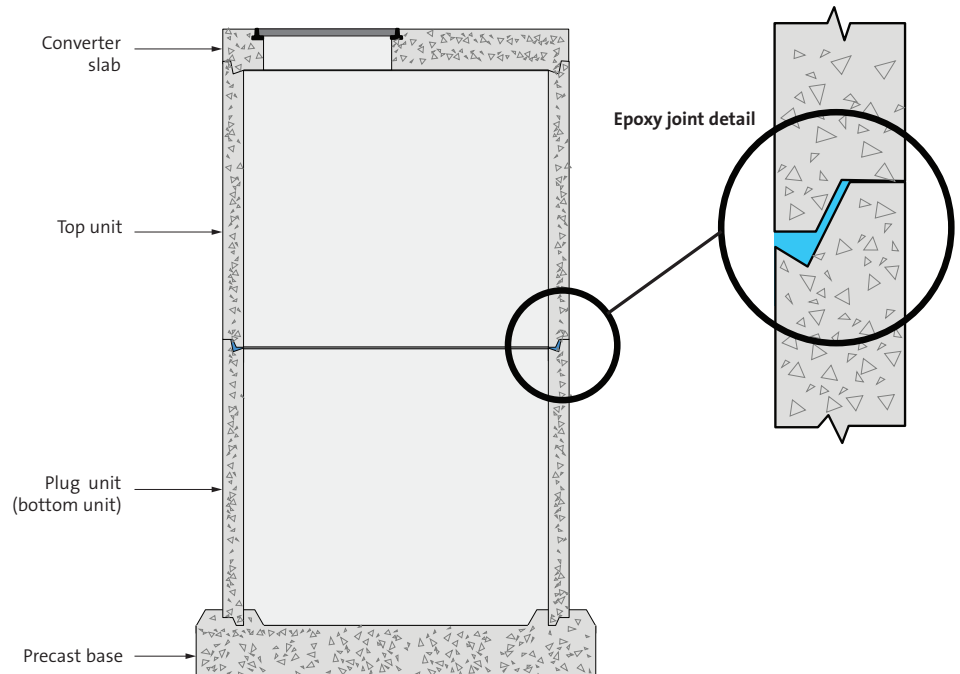




Photo: Segmental ventilation shaft

3. Tunnel and shaft solutions



One piece shafts

37



Segmental shafts

38



3-pin arches

40

One piece shafts



Humes range of standard one piece caisson shafts suits fast and simple construction of small diameter shafts. The units bolt together vertically with water tight seals, to form a finished shaft, and can be custom designed if required.

Lead units have a steel cutting edge for installation purposes.

One piece shafts are available with corrosion protection linings. Precast roof slabs are also available.



Standard one piece caisson units

Nominal diameter (DN)	Internal diameter (mm)	External diameter (mm)	Height of standard units (mm)	Mass of standard units (tonnes)	Number of tie rod couplers
2,400	2,374	2,782	1,000	4.3	6
3,000	3,060	3,460	1,000	5.2	8
3,600	3,600	4,000	1,000	6.0	9



Segmental shafts

Segmental shaft linings provide a safe and efficient method for construction of permanent and temporary shafts for sewer, ventilation and tunneling launch and retrieval shafts. Standard segment designs are suited to shaft depths of up to 30 metres.

Humes offer the established Buchan range of segmental shafts - with a long and successful history in the United Kingdom.

The range includes two types of segmental shafts to suit both caisson and underpin installation methods.

The caisson method is suitable for soft soil conditions, where the shaft rings can be constructed above ground and pushed down from the surface using jacking force.

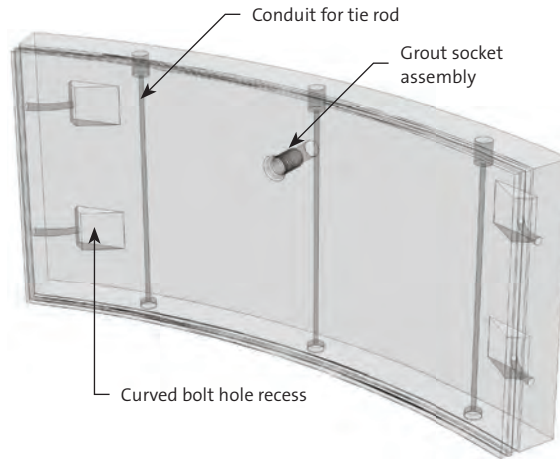
The underpin method maintains the same strength and benefits of the caisson method but is more suitable for hard soil conditions where shaft jacking is not feasible. Shaft rings are constructed progressively at the base of the excavation.

Both types of shaft feature two tapered segments per ring which allows for efficient closing of the rings.

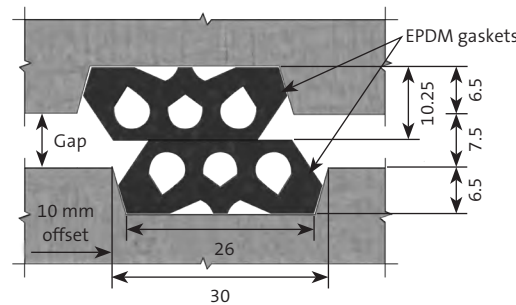
Resistance to infiltration

Humes segmental shafts have been pressure tested to show that the seals between segments resist infiltration pressures of greater than 350 kPa.

Caisson segment



Detail of seal between segments



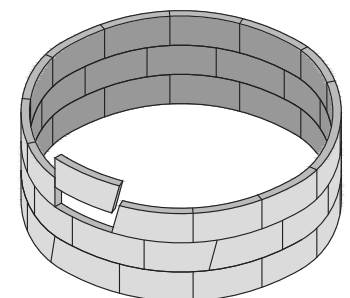
Caisson installation



Underpin installation



Tapered segment detail



Segmental shaft details

Internal diameter (m)	External diameter (m)	Height (m)	Segments per ring		Mass per ring (tonnes)	Mass per segment (kg)
			Ordinary	Tapered		
4.50	4.90	1.00	5	2	7.36	1,050
6.00	6.45	1.00	7	2	10.78	1,200
7.50	7.95	1.00	8	2	13.37	1,340
9.00	9.50	1.00	12	2	17.80	1,270
10.50	11.00	1.00	12	2	25.40	1,820
12.50	13.15	1.00	14	2	32.80	2,050
15.00	15.75	1.00	16	2	44.50	2,500

Note: Diameters up to 25 m are also available, contact Humes for availability.

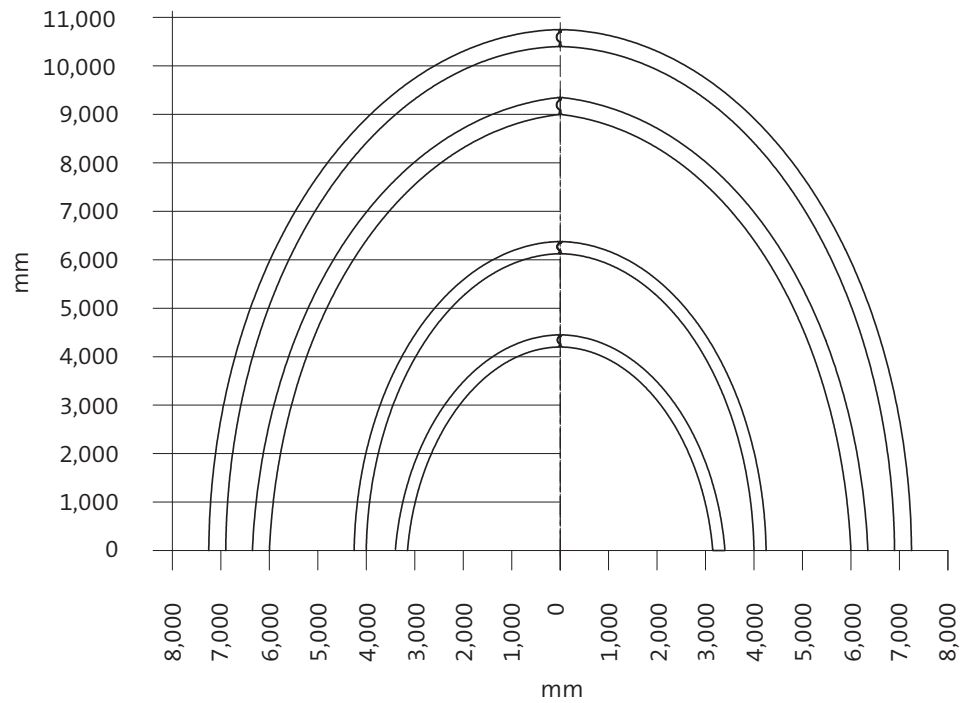


3-pin arches

The 3-pin arch range has been widely used for reclaim tunnels in mining applications, catering for coal and other mineral stockpiles up to 25 m.

The concrete arch is designed to meet the mine's designated design life, and requires minimal maintenance. Conveyor belts are easily attached to the internal soffit of the arch, and precast concrete feeder chambers are also available to fit intake valves.

3-pin arch profiles



Example of a reclaim tunnel with feeder chambers (in-situ)





Photo: Prestressed decks

4. Bridge and platform solutions



Precast arches 43



HumeDeck® system 46



Box culverts - large 47



Prestressed decks 48

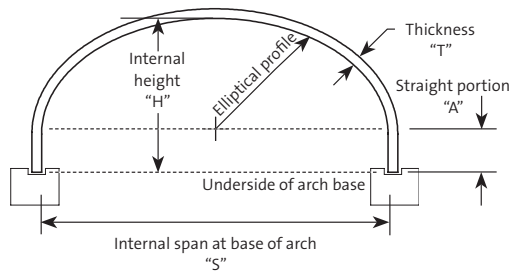


HumeSlab® bridge decking 49

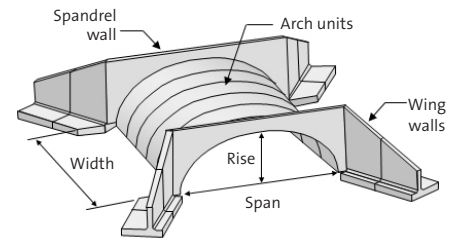


The standard arch data below covers a broad range of spans and heights to accommodate a wide range of applications including bridges, tunnels and drainage culverts. All these shapes have been designed to comply with AS 5100 - Bridge Design, design loadings as well as a maximum 3 m of overlying fill.

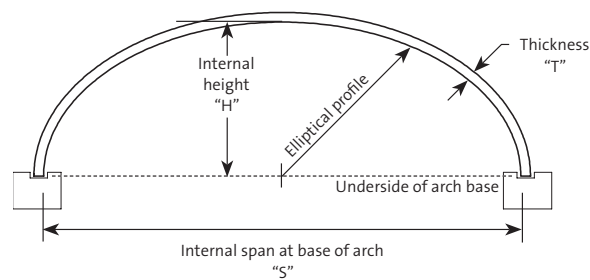
Arch profiles 6310S and 9400S



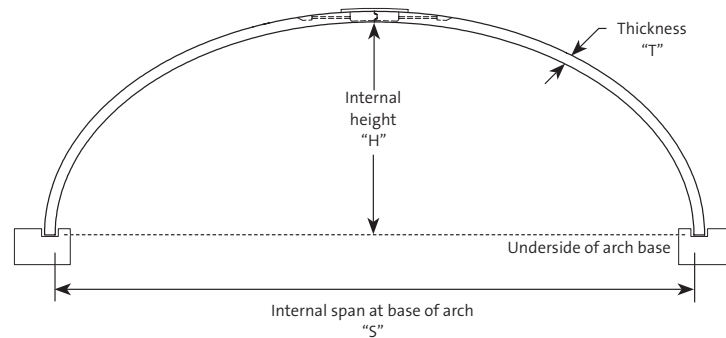
Arch system general assembly



Arch profiles 6210S, 9300S, 12300S and 12400S



Arch profiles 15500T, 18600T, 21700T and 25900T



Standard arch data (refer figures above)

Profile	Dimensions					No. of pieces	Unit mass (t)	Total mass (t)
	Internal Span 'S' (m)	Internal Height 'H' (m)	Straight portion 'A' (m)	Thickness 'T' (mm)	Unit length (mm)			
6210S	6.0	2.1	0	200	2,500	One	11.9	11.9
6310S	6.0	3.1	1	200	2,500	One	13.2	13.2
9300S	9.0	3.0	0	250	1,800	One	14.2	14.2
9400S	9.0	4.0	1	250	1,800	One	16.5	16.5
12300S	12.0	3.0	0	250	1,800	One	16.8	16.8
12400S	12.0	4.0	0	250	1,800	One	18.9	18.9
15500T	15.0	5.0	0	350	1,800	Two	15.6	31.1
18600T	18.0	6.0	0	350	1,800	Two	18.8	37.6
21700T	21.0	7.0	0	350	1,800	Two	22.7	45.3
25900T*	25.6	9.0	1	450	1,200	Two	25.5	50.1

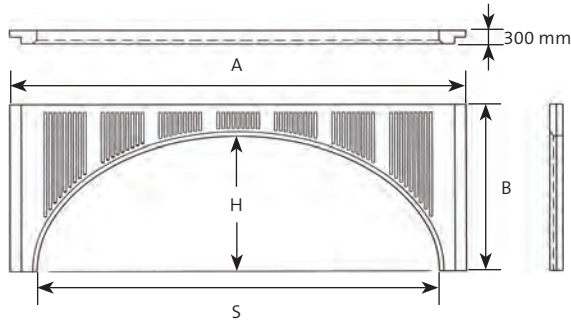
Notes:

- Standard two piece arches may be configured with either a concrete interlocking joint or an in-situ concrete joint and this detail is of extreme importance to the installer. Humes' designers will detail in the drawings the type of connection that will be required.
- * Contact Humes for technical data on this profile.



Precast arches

Spandrel wall

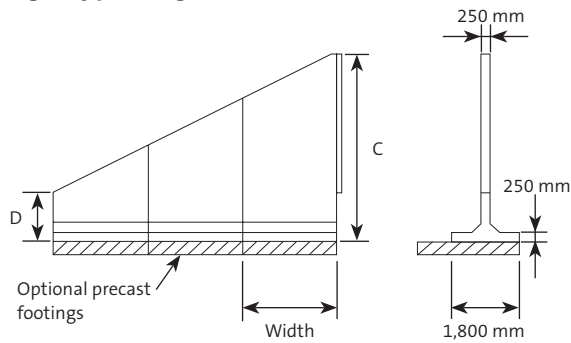


Spandrel walls dimensions and masses (see figure left)

Arch profile	Dimensions (m)				Unit mass (t)
	S	H	A	B	
6210S	5.9	2.05	7.5	2.75	8.2
6310S	5.9	3.05	7.5	3.75	9.3
9300S	8.9	2.95	10.1	3.7	12.2
9400S	8.9	2.95	10.1	3.7	12.2
12300S	11.9	2.95	13.3	3.7	17.2
12400S	11.9	2.95	13.3	3.7	17.2

- Notes:**
- The top level of the spandrel wall is 450 mm higher than the external top level of the arch.
 - The top of the spandrel is at the same height as the top of the wing wall.
 - Spandrel walls 9400S and 12400S are placed on 1m high pedestals
 - The foundation level for spandrel walls 9300S and 12300S is identical to the arches.
 - The spandrel wall internal ellipse profile overlaps the arch by 50 mm.

Light type wing wall

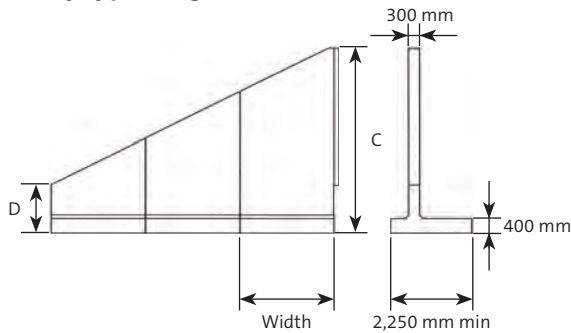


Light type wing walls dimensions and masses (see figure left)

Arch profile	Light type wing wall element	Standard height dimensions (mm)		Unit mass (t)
		C	D	
6210S	W10	3,000	2,725	6.9
6310S, 9300S, 12300S	W5	4,000	2,825	8.4
	W6	2,795	1,570	6.4
9400S, 12400S	W1	5,000	3,825	9.7
	W2	3,795	2,570	7.9
	W3	2,540	1,315	5.9

Note: Maximum width of light type wing walls is 2,500 mm.

Heavy type wing wall



Heavy type wing walls dimensions and masses (see figure left)

Arch profile	Heavy type wing wall element	Standard height dimensions (mm)		Unit mass* (t)
		C	D	
9300S, 1200S	HL1	4,000	2,825	11.3
	HL2	2,795	1,570	9.6
9400S, 12400S	HM1	5,000	3,825	13.3
	HM2	3,795	2,570	11.5
	HM3	2,540	1,315	9.1

- Notes:**
- Maximum width of heavy type wing walls is 2,500 mm.
 - *Unit mass based on 2,250 mm base.
 - For wing wall heights greater than 5 m, contact your local Humes sales representative.

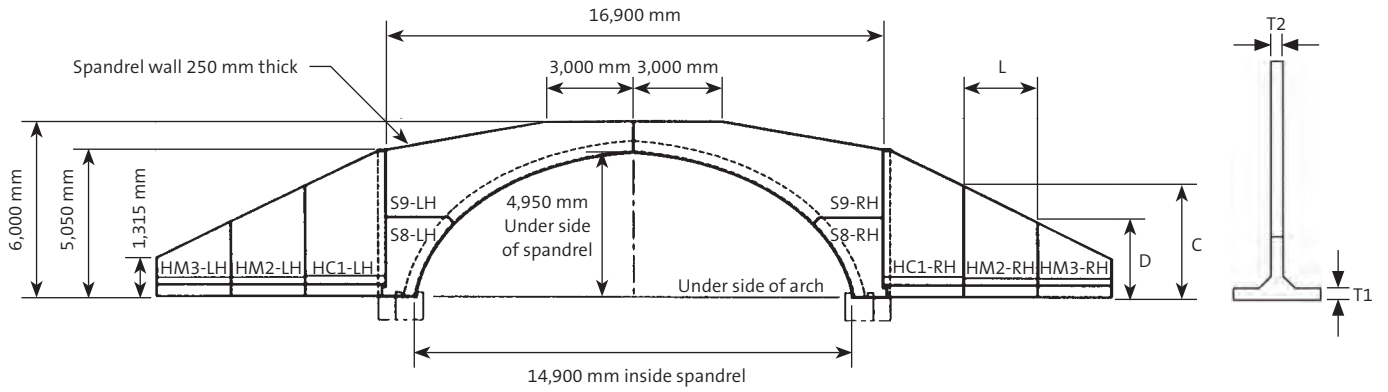
Wing walls dimensions and masses – Arches with spans > 12m (see figures next page)

Arch profile	Wing wall type	Standard height dimensions (mm)						Unit mass (t)
		C	D	W	T1	T2	L	
21700T	W1	7,325	6,330	3,500	450	450	2,500	22.7
21700T	W2	6,278	5,223	3,000	450	450	2,500	20.9
21700T, 18600T	W3	5,170	4,115	2,500	400	355	2,500	14.7
21700T, 18600T	W4	4,063	3,008	2,000	400	355	2,500	11.5
21700T, 18600T	W5	2,955	1,900	1,500	400	250	2,500	7.6
18600T	W2a	6,245	5,223	3,000	450	450	2,500	20.0
15500T	HC1	5,000	3,825	2,250	400	300	2,580	13.5
15500T	HM2	3,795	2,570	2,250	400	300	2,580	11.5
15500T	HM3	2,540	1,315	2,250	400	300	2,580	9.1

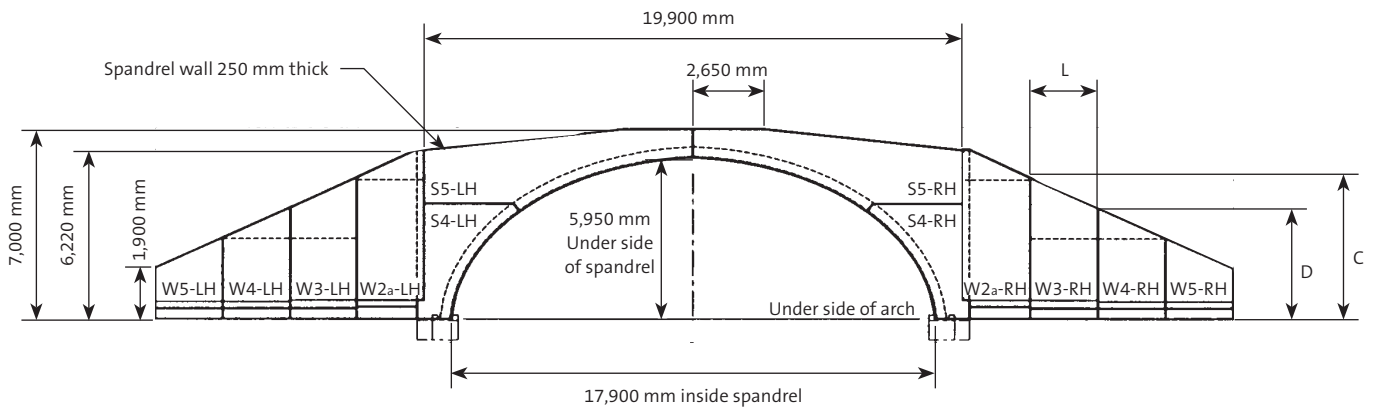


Precast arches

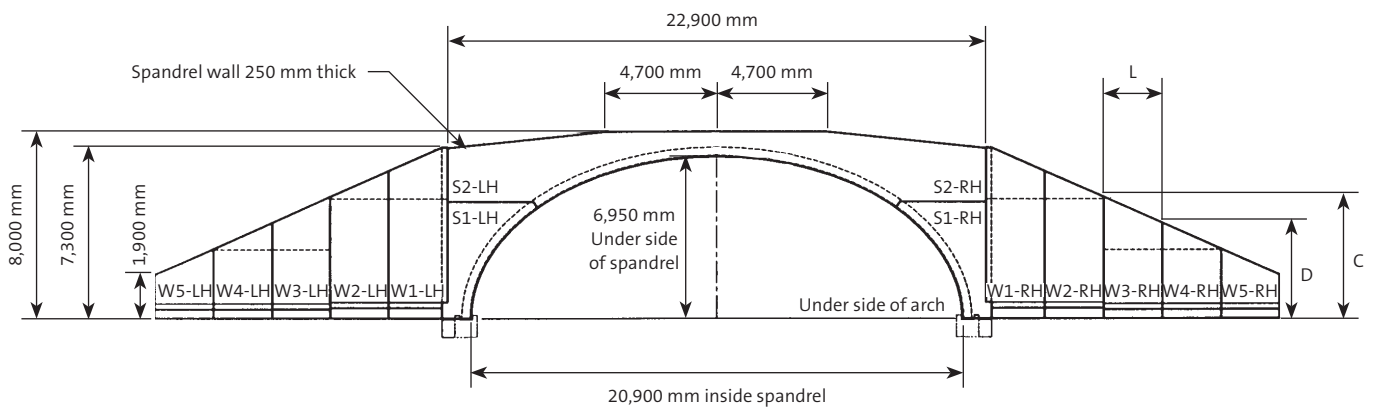
Spandrel and wing wall for 15500T profile



Spandrel and wing wall for 18600T profile



Spandrel and wing wall for 21700T profile

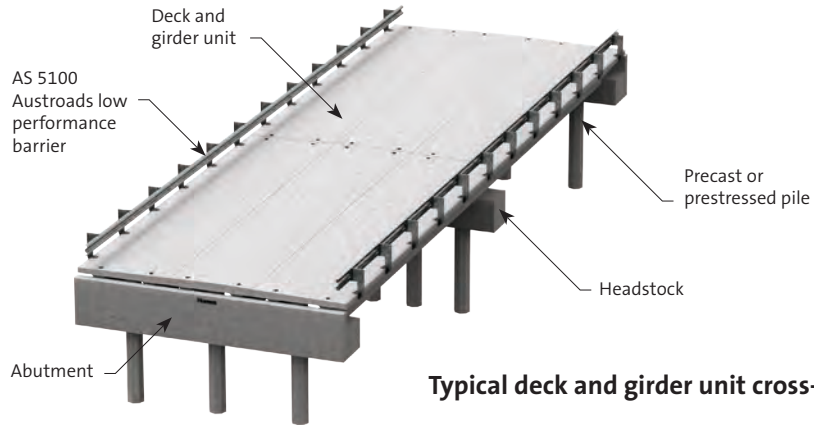




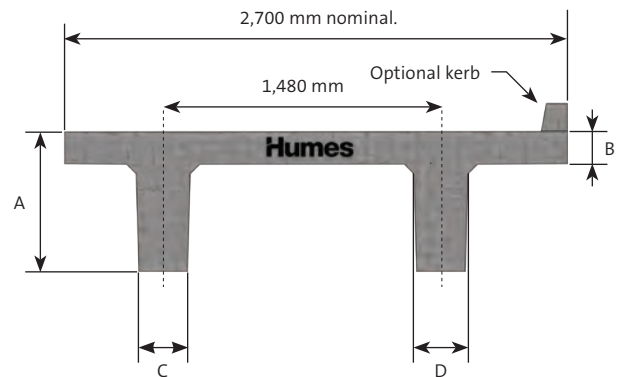
HumeDeck® bridge system is a modular precast solution for trafficable bridges spanning 6 m to 12 m. It is suitable for installation onto an existing or new substructure, or can be combined with precast concrete piles, abutments and headstocks to achieve a total precast solution.

HumeDeck® can also be utilised for pedestrian crossings and bikeways, with spans up to 13m.

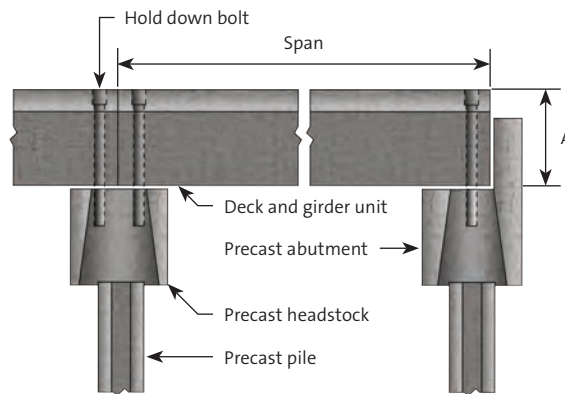
A complete HumeDeck® system assembly



Typical deck and girder unit cross-section



Detail of a complete HumeDeck® bridge system



Deck and girder unit sectional dimensions and masses

Span (m)	A (mm)	B [†] (mm)	C (mm)	D (mm)	Mass for 2.7 m wide deck* (t)
8	550	150 - 180	280	300	15.41
9	650	150 - 180	274	300	18.60
10	725	150 - 180	270	300	21.74
11	825	150 - 180	264	300	25.40
12	900	150 - 180	260	300	29.03

Notes:

1. Refer to Humes Technical Services for decks spanning more than 12 m.
2. *Mass does not include kerb.
3. [†]Typical thickness between 150 mm - 180 mm.



Box culverts - large

Humes manufactures a full range of large box culverts from 1,500 mm to 6,600 mm span available in standard lengths of 1.2 m and 2.4 m but can be manufactured in custom designs such as splayed units. Penetrations, post tensioning ducts, openings and cast-in items such as ferrules can be easily accommodated.

The box culvert is available either as an inverted U on a concrete base foundation (crown type) or as a U shaped trough with a lid (invert type). Humes can supply precast bases and lids to suit.

Placing two or more box culverts together forms a multiple cell installation. A Linkslab® unit placed between two culverts is a cost effective solution for installations of three cells and above.

Unless specified otherwise, box culverts are typically designed for 0-2 m fill with concrete exposure class B2. Other specifications can be accommodated on request.

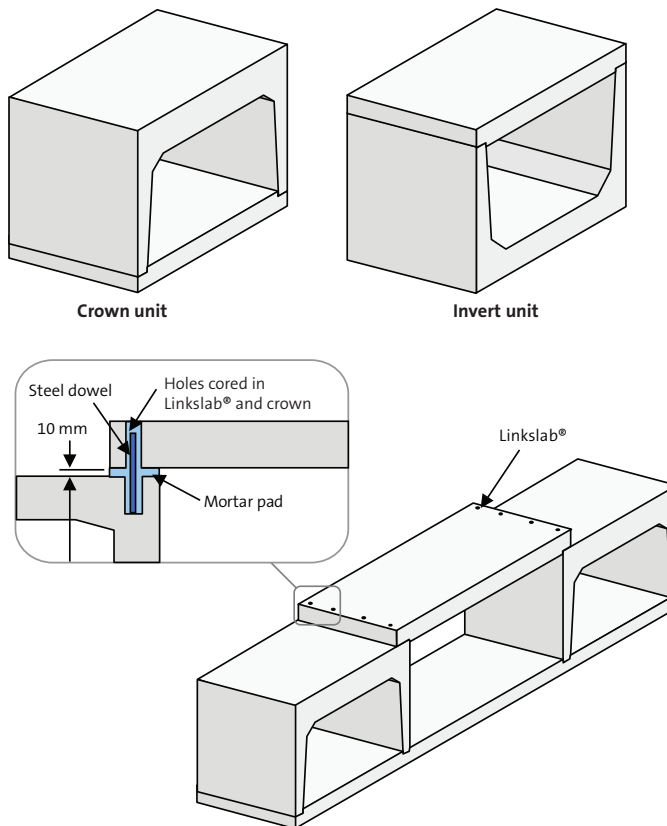
Mine portals

Humes manufactures extra large spanned box culverts for safe access to mine and construction sites and as conveyer tunnels, with spans and leg heights up to 6 m.

Our design team can customise culvert designs to suit various applications and site conditions.



Box culverts and Linkslab® unit details



Large RCBC size range

Leg height (mm)	Span (mm)							
	1,500	1,800	2,100	2,400	2,700	3,000	3,300	3,600
600	■	■	■					
900	■	■	■	■	■			
1,200	■	■	■	■	■	■	■	■
1,500	■	■	■	■	■	■	■	■
1,800		■	■	■	■	■	■	■
2,100			■	■	■	■	■	■
2,400				■	■	■	■	■
2,700					■	■	■	■
3,000						■	■	■
3,600								■

Note: Other sizes may be available on request

For information on small box culverts see page 16.



Prestressed decks

Humes manufactures a range of prestressed bridge componentry including decks, planks, hexagonal prestressed piles, and parapets.

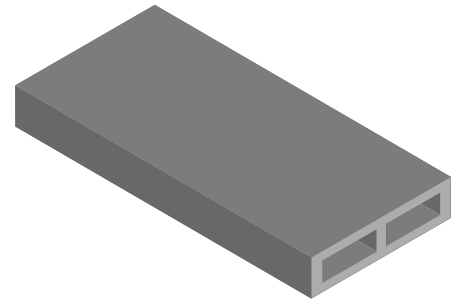
Humes' prestressed items are suitable for major bridge and wharf infrastructure through to minor capital works. Our in-house engineering team can design non-standard items.

Humes is an accredited manufacturer of prestressed structures for road and rail authorities, including a range of decks and planks (up to 25 m).

Slab spans

Span (m)	Depth (mm)
3.5 - 3.8	300
3.5 - 6.1	400
5.9 - 7.3	500
7.1 - 10.2	600
9.3 - 12.2	700
15.0 or 15.24	915

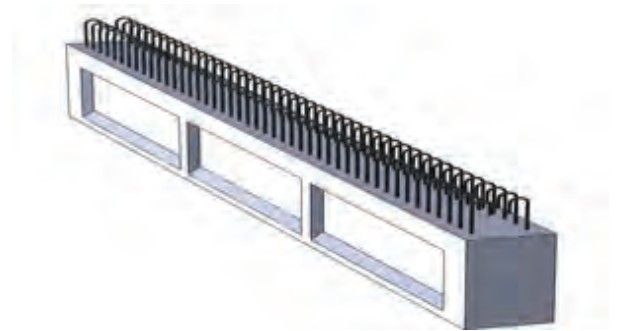
Note: Spans are nominal and may change regionally.



Deck units

Span (m)	Depth (mm)
10 (deck)	400
10 (kerb)	715
11 (deck)	450
11 (kerb)	765
12 (deck)	500
12 (kerb)	815
13	540
14	580
15	620
16	660
17	700
18	730
19	760
20	800
21	850
22	900
23	950
24	1,000
25	1,050

Note: Spans are nominal and may change regionally.





HumeSlab® bridge decking

The HumeSlab® system is a formwork solution that combines precast concrete panels with an in-situ concrete topping.

The HumeSlab® panel forms the bottom portion of the slab and the platform for the deck above – a cost effective way to maintain the structural integrity of a monolithic slab.

The HumeSlab® system is ideal for heavy duty bridge decks and localised load areas as it easily accommodates varied designs, shapes, thicknesses, penetrations and cast-in fittings.

The precast concrete panels are normally between 55 mm and 100 mm thick and incorporate the bottom steel of the slab with specially designed steel trusses to increase spans between temporary props.

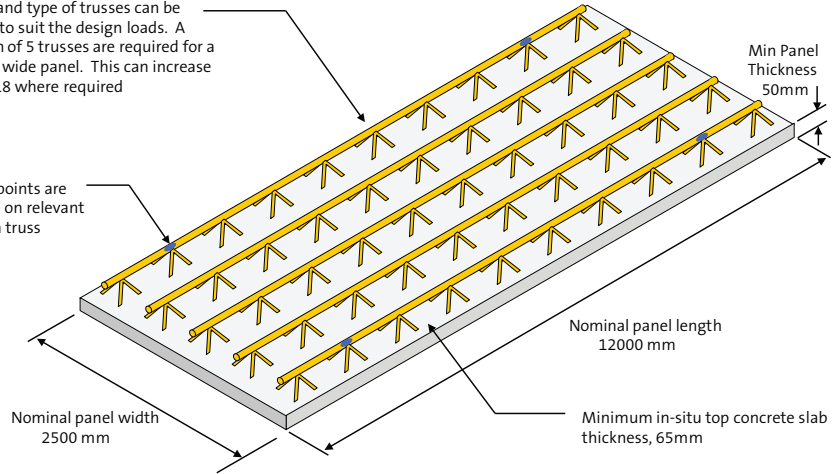
Panels are generally limited to 12 m in length for easier transport. However, road bridge panels can be custom designed to suit any shape and size, catering for complex geometry such as vertical and horizontal curves, camber and superelevation.



Typical HumeSlab® panel

Number and type of trusses can be adjusted to suit the design loads. A minimum of 5 trusses are required for a 2500mm wide panel. This can increase to up to 18 where required

Lifting points are marked on relevant point in truss



HumeSlab® bridge deck section

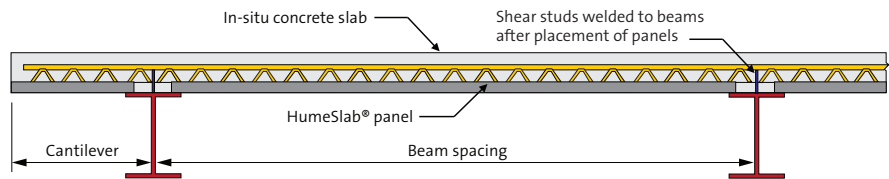




Photo: Precast arch units, spandrel and wing walls

5. Walling solutions



Land T walls

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Grain bunker modules

53



L and T walls

L and T units can be used for indoor or outdoor applications including:

- bulk material confinement (eg. coal, coke, aggregate, sand, ore, grain, sugar, chemicals, metal, salt)
- material separation
- earth retaining (special design to AS 4678 required for this application).

The design of Humes L and T units is based on the standard concept of a cantilever retaining wall.

Standard L units are normally used for single loading applications where material is stored only on the heel side of the wall. (The heel is the part of the base which extends under the retained material and the toe is the part of the base which is on the side away from the retained material).

Standard T units are normally used for double loading applications where materials are stored on both sides of the wall. Standard L units can also be used for double loading applications provided that a single loading on the toe side does not occur at any time.

Special purpose units, either a custom shape or a modification of the standard unit, can be manufactured to client requirements. A common modification is a reduced height unit, either for stepped walls or where greater stability is required for a given wall height.

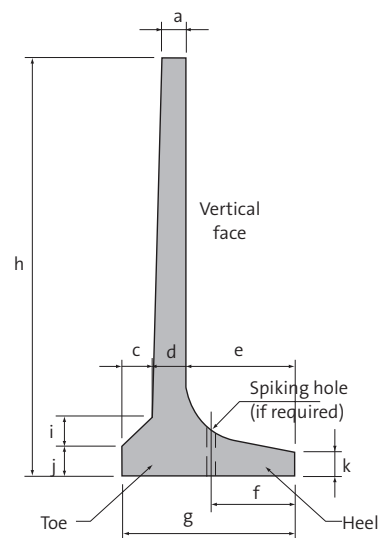
Angles, intersections and curves

Toe panels, heel panels and mitred units are available to provide angles, intersections and curves. These can be manufactured to suit client requirements. Some examples are shown opposite.

Standard units are entirely self-supporting however, strapping is desirable for angles and intersections but is normally not required for curves.

Standard L wall unit details

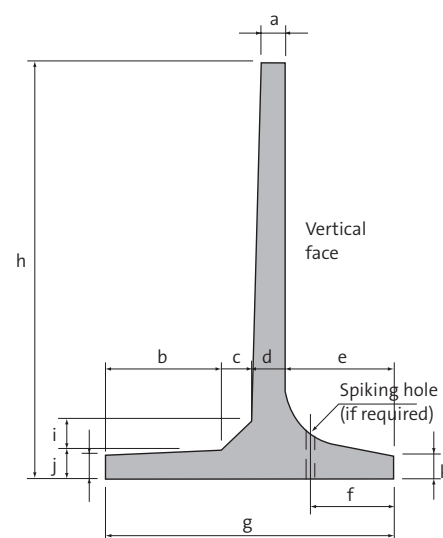
Dimension	Nominal height (m)				
	1.07	1.52	2.44	3.66	4.57
a	64	79	102	133	152
c	76	114	152	229	305
d	89	133	152	267	318
e	280	420	814	1,371	1,523
f	216	324	699	1,181	1,067
g	445	667	1,118	1,867	2,146
h	1,067	1,524	2,438	3,658	4,572
i	76	114	152	229	305
j	76	114	152	229	305
k	64	95	83	102	127
Mass (kg) 0.61 m wide	185	405	780	1,855	2,645
Mass (kg) 1.20 m wide	365	795	1,530	3,645	-



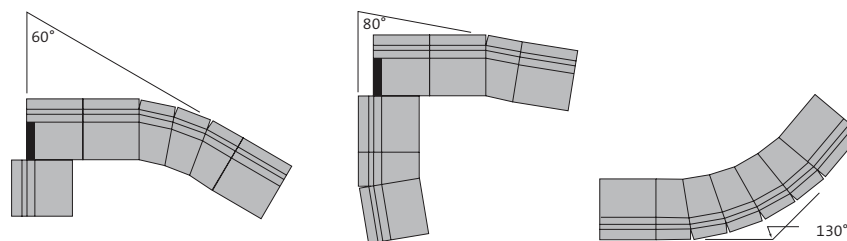
Note: Dimension b has been intentionally omitted for consistency with T wall details

Standard T wall unit details

Dimension	Nominal height (m)		
	2.44	3.66	4.57
a	102	133	152
b	660	1,142	1,220
c	152	229	305
d	152	267	318
e	814	1,371	1,523
f	699	1,181	1,067
g	1,778	3,009	3,366
h	2,438	3,658	4,572
i	152	229	305
j	152	229	305
k	83	102	127
Mass (kg) 0.61 m wide	930	2,235	3,165
Mass (kg) 1.20m wide	1,830	4,395	



Use of mitred units to achieve angle changes (plan view)





Walling solutions

Grain bunker modules

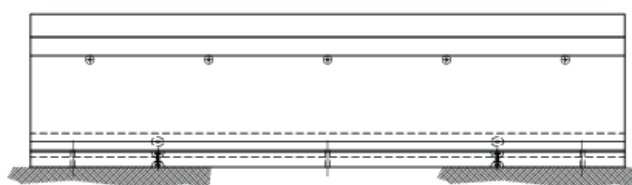
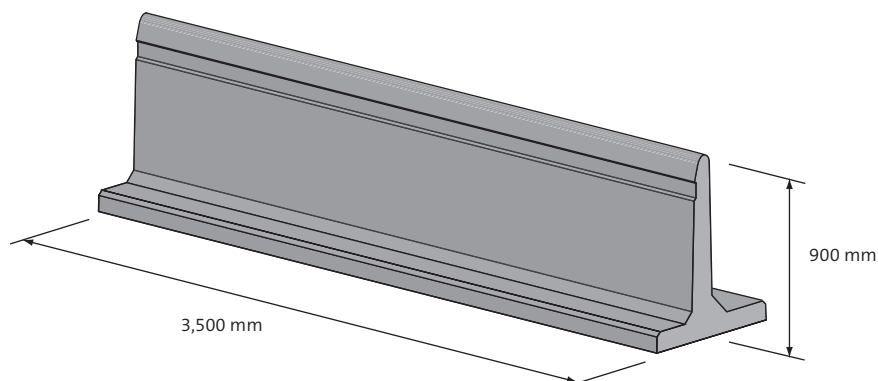
Humes grain bunker system consists of T wall modules with integrated tarpaulin clamps to secure and seal the grain cover. The modules are usually aligned to create rectangular or horseshoe shaped bunkers that can be made larger or smaller as required.

Modules are 900 mm high by 3,500 mm long and weigh 1.6 tonne.

The system was successfully developed with GrainCorp to reduce grain waste and remove safety hazards of other storage methods. The modules are designed and certified by Humes – providing a structurally integral but flexible system that can be installed permanently or temporarily as required.

Features and benefits

- Horizontal grooves allow clamping of tarpaulins to secure and seal the grain cover.
- Supplied with lifting anchors and a module weight of 1.6 t so can be handled by most plant equipment.
- The simple design allows for fast and easy assembly and dismantling.
- No limitations in the length or shape of a storage area.
- Increased capacity of a storage area compared to open stacks.
- Uniformity of structure enhances the appearance of storage areas.



Steel pin driven into ground for lateral support when required.

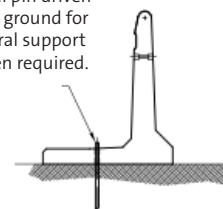
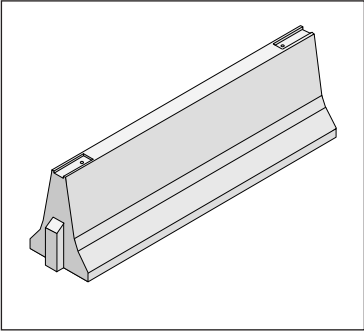




Photo: Precast arch units, spandrel and wing walls

6. Traffic management solutions



Jersey kerbs (Type F)

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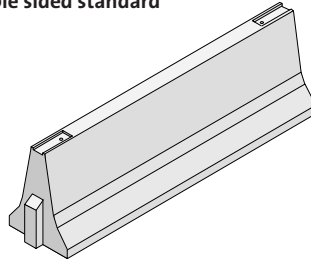


Jersey kerbs (Type F)

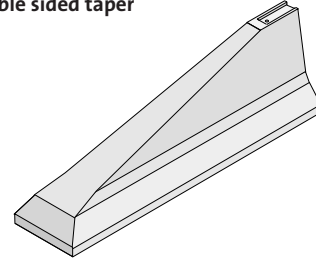
Humes manufactures precast concrete jersey kerbs to suit the specifications of local road authorities. The units are available in single or double sided configurations and can be supplied with tapered ends and scuppers.

Unit types

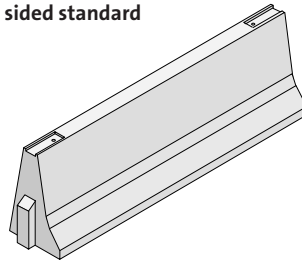
Double sided standard



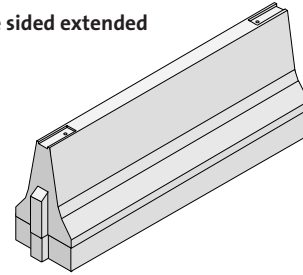
Double sided taper



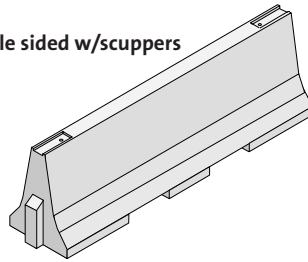
Single sided standard



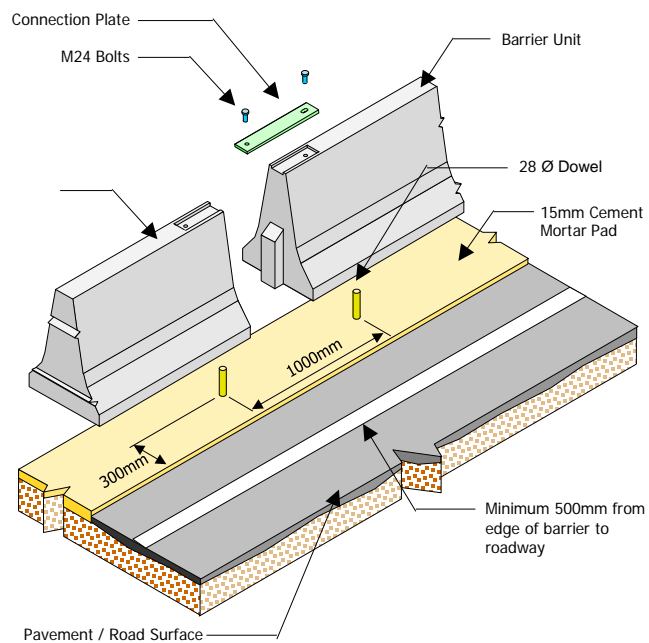
Double sided extended



Double sided w/scuppers



Sample installation details



7. Cable and power management solutions



Cable jointing pits and access chambers

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Light pole bases

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Oil separators

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Cable jointing pits and access chambers

These products are installed to facilitate the jointing of cables and optical fibres.

The products are divided into two groups:

1. Worker-entry
2. Non-worker-entry

Originally developed in collaboration with Telstra the prime driver for choosing concrete was that pits manufactured from other materials were unstable in areas of expansive and reactive soils. The extra mass of concrete provides the stability to ensure the integrity of the precast installation.

Humes precast concrete pits offer significant advantages including:

- Humes keeps the inventory and only delivers to site when required
- reduced time that excavations need to be kept open
- no requirement for premix concrete on site
- no wastage of excess concrete and no clean up required
- no formwork costs
- 'at-strength' concrete on delivery
- Swiftlift® anchors enable easy handling
- strategically placed knockouts allows for uniform cable connection
- manufacture in steel moulds so dimensions are always the same.

J8



Type A



J9



Type B



Dimensions and weights

Type	Length (mm)	Width (mm)	Height (mm)	Mass (t)
J8	1,429	619	948	0.63
J9	2,250	710	975	1.70
Type A	1,610	1,260	1,058	1.73
Type B	1,560	3,238	1,357	3.85
Type C	1,492	4,365	1,864	6.85

Type C





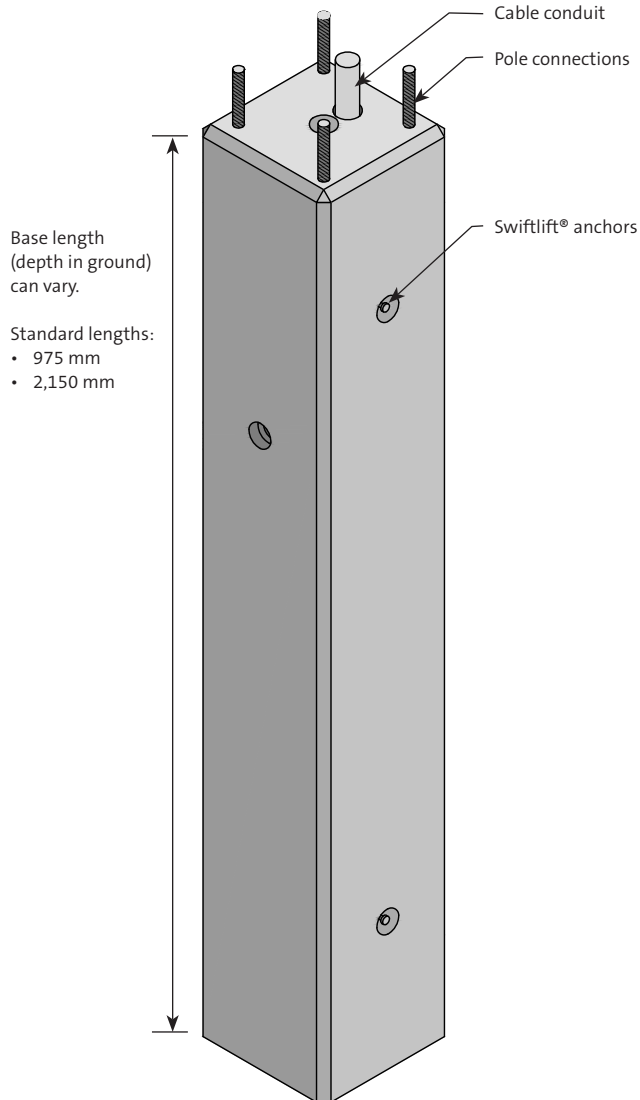
Light pole bases

Light pole bases are placed in the ground to support and resist the forces produced by the column/post/shaft and can be used for both main roads or minor roads (residential/estates). Humes bases have been designed and developed in collaboration with Energex and tests conducted during the development showed high resistance to design loads.

The base length (depth in ground) can be modified to suit a range of light pole sizes and applications. The light pole and base are connected through a plate that can be bolted to the concrete base via cast-in ferrules. The maximum mounting height depends on the base size and increases for larger columns. The 350 mm by 350 mm square bases vary in length depending on the intended use. Standard lengths are 975 mm and 2,150 mm.

Conduits can be cast into the bases to provide a clear path for electrical cables. Swiftlift® anchors are cast in for ease of handling and installation.

350 x 350 mm light pole base





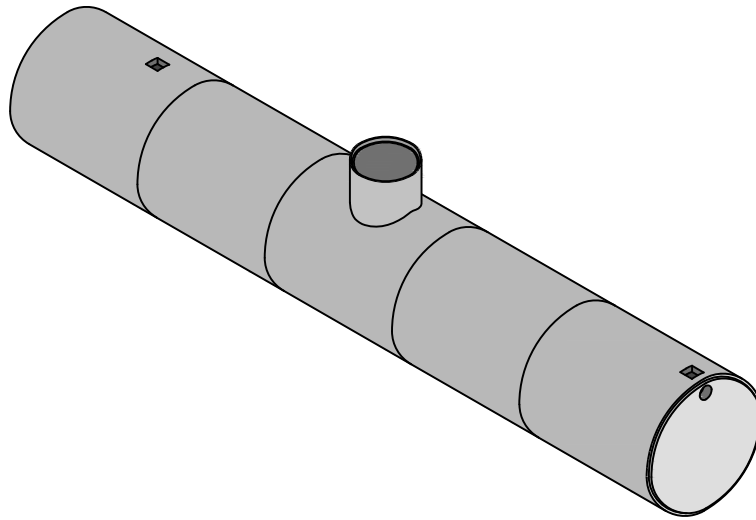
Oil separators

Humes manufactures oil separation tanks which are designed to capture oil in the event of a transformer or substation failure, and prevent its release into the environment.

The tanks capture flows from banded areas and contain the waste material until it can be removed by a licensed waste transporter.

Tank sizes are usually DN1950 or DN2400 of varying lengths (oil holding capacity).

Oil separation tanks can be manufactured to Energex or Powerlink design specifications.



Oil holding capacity

DN (mm)	Indicative storage capacity per length of 2.44 m pipe (litres)
1,950	7,500
2,400	11,000

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