



Cast Iron

## Bridge Beany®

Combined Kerb and Drainage System

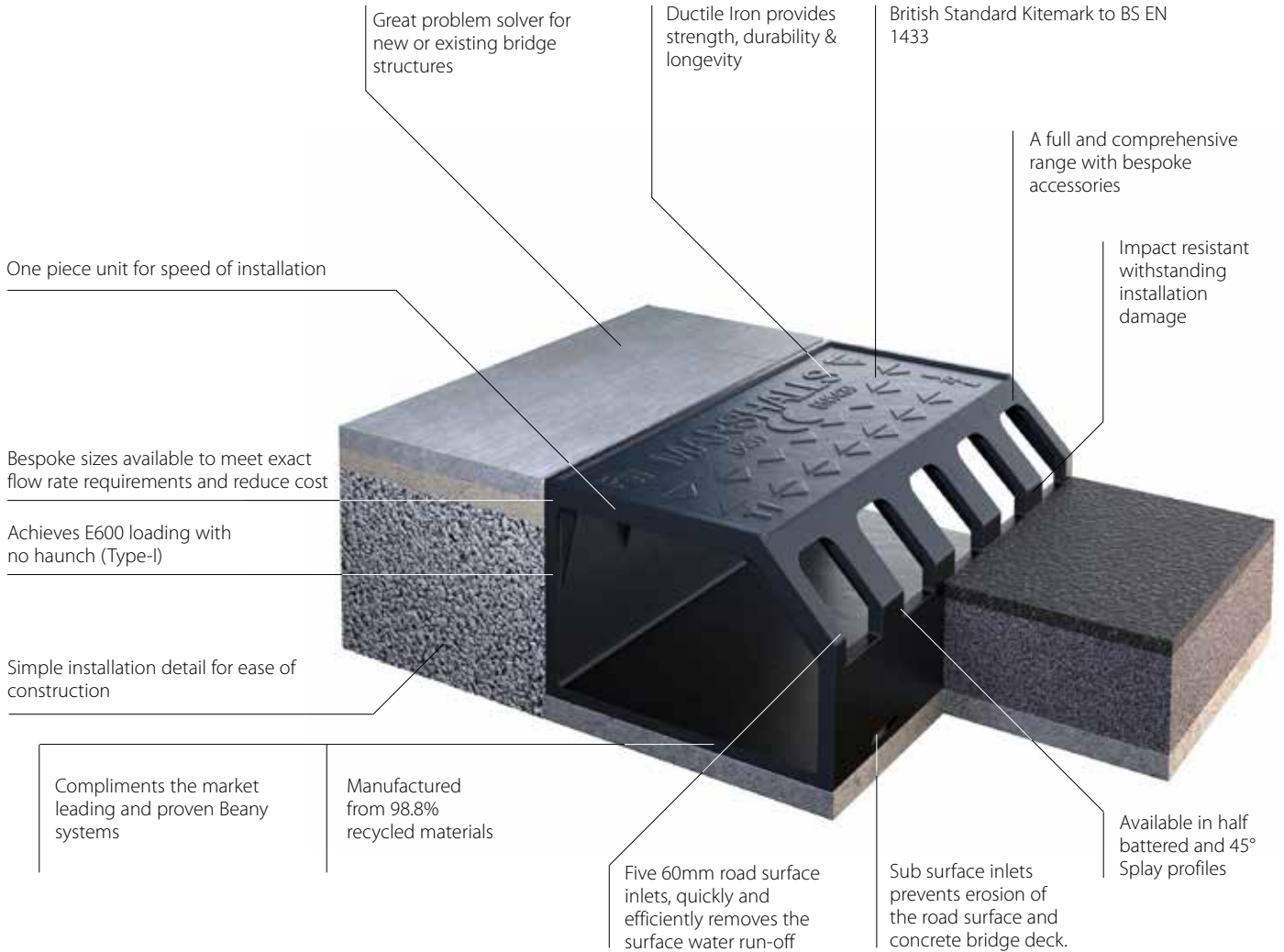


Providing a flexible, yet high performance solution, Marshall's exclusive Bridge Beany Drainage System is the only Type-I E600 available on the market.

A cost effective option for a variety of schemes, Marshall's Bridge Beany offers a tailored, value-engineered solution that can be used either as a standalone product or in conjunction with other products in the award-winning Beany range.

# Bridge Beany®

## Combined Kerb and Drainage System



- Bridge Beany is the markets only Type-I E600 bridge drainage system. This Kitemark proven system provides an E600 loading classification without any haunching providing a flexible and cost-effective solution for bridge deck drainage requirements.
- The product is compatible with Marshalls market leading Beany, Mini Beany, and Mono Beany systems, further extending the use of this product on highways and carriageways providing a total solution.

### The System

- Bridge Beany is manufactured as a one piece solution with five apertures along the face of each 500mm unit maximising inlet capacity. The Ductile Iron properties of the units guarantees an E600 rated bridge deck drainage system strong enough to withstand loadings imposed by both road and construction traffic when installed.

### Versatile

- Whether it be a new or existing bridge structure the simplistic design of Bridge Beany provides features which give it significant engineering benefits over alternative systems.
- The flexibility of bespoke units and accessories coupled with Marshalls hydraulic and product design service, delivers a tailored value engineered solution that provides excellent surface drainage efficiency meeting exact flow rate and design requirements.

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# Cost Advantages

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## High Capacity Performance

- Bridge Beany is available as a 450mm wide unit to compensate for the restricted construction depth, whilst proving extra capacity.
- Each unit has five 60mm inlets spaced at 40mm intervals to maximize inlet capacity in periods of heavy rainfall, ensuring surface water is quickly and efficiently removed.

## Construction Saving

- The Bridge Beany System combines water interception and transportation in one system. This eliminates the need for drilling the bridge deck to accommodate gullies and the connection of sub-surface and suspended carrier pipes reducing construction costs and savings time.
- Simple one part system – straight forward to design and detail, reducing design times and cost. Easy to set out and easy to install.
- The overall construction period can be reduced as carriage way materials may be laid in a continuous sequence. Unlike laying conventional drainage, excavations are kept to a minimum without exposing the formation and sub-base surfaces to possible periods of adverse weather
- Underground cables and services can be avoided so contractual/ insurance claims are likely to be much less than when laying conventional drainage.
- Bridge Beany is certified to E600 loading as a Type-I system. A type-I system can be laid in conjunction with standard parapet and surfacing material eliminating the time and material cost of a concrete haunch.

## Low Maintenance

- If a blockage does occur, it can be easily located and rectified by rodding or jetting from an access point or through an aperture adjacent to the blockage as oppose to maintaining carrier pipes that are set within the sub-base or suspended below the bridge.
- The one piece design ensures units lock into the construction of the concrete bridge deck and road surface reducing or eliminating the risk of units becoming lose or going missing, reducing replacement maintenance costs.
- Bridge Beany is manufactured in ductile iron enabling the units to be uplifted and re-laid after necessary maintenance on the road or bridge structure.

# Engineering Benefits

## Manufacture

The system's main components are manufactured from ductile iron with a bitumen coating applied.

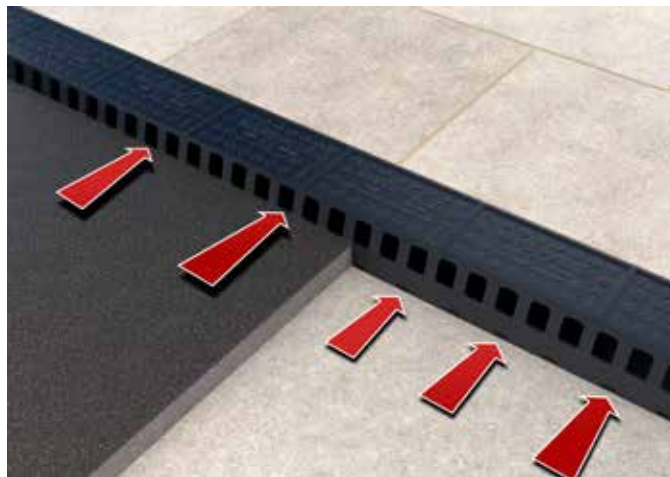
The high inherent strength and durability of ductile iron means the Bridge Beany System can:

- Allow complete compaction of surfacing materials adjacent to the channel during construction without damage.
- Be up-lifted and re-laid without effecting the performance of the units when road works needs to be carried out on the bridge structure.
- Provide flexibility of bespoke units enabling a solution to suit a wide range of capacity requirements minimizing outfalls.

## Water Inlet Aperture

Each Bridge Beany unit has a series of road surface and sub-surface inlets to maximize the inlet capacity and efficiency of the system, reducing the risk for traffic in adverse weather.

- The three Sub-surface inlets on each unit reduces the pressure created by the sub-surface water, preventing erosion of the road surface and concrete bridge deck.
- Each 500mm unit has five 60mm road surface inlets to quickly and efficiently remove the surface water run-off reducing the amount of water absorbed into the road sub-base.
- Located 40mm apart on each unit to give maximum strength preventing resistance against roads imposed by overriding heavy vehicles.



## Type-I System

Bridge Beany is the market's only kitemarked Type-I E600 system that can withstand a loading of 66 tonnes as a freestanding unit with no haunching material.

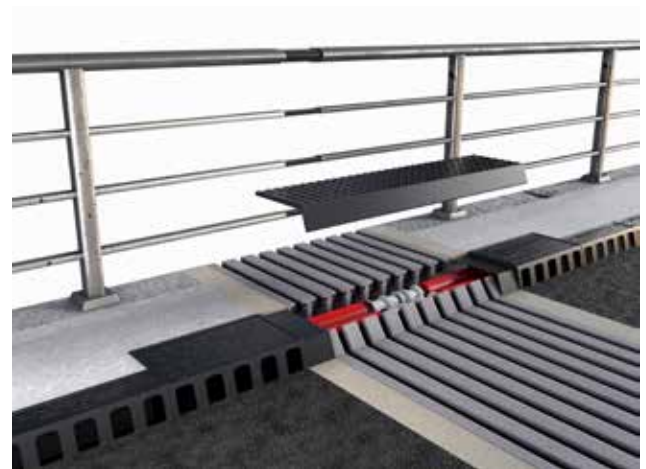
- Bridge Beany requires no concrete haunch resulting in a saving of approx. 250kg per linear meter reducing the overall weight on the bridge structure.
- Bridge Beany will perform to E600 without being reliant on the installation surround.

## Expansion Joint Solutions

The expansion joint on a bridge often proves to be the most problematic area for both Contractors and Designers. Allowing for movement whilst keeping the joint dry is of primary importance on any bridge.

The Bridge Beany system offers several types of expansion joints ranging from a small single pipe to a large capacity unit that enable the designer or contractor to cross an existing or new expansion joint.

The expansion units can allow horizontal, vertical, axial and lateral movement of the joint whilst meeting the same performance requirements as the standard bridge drainage units.



## Pinch Point Units

Bridge Beany pinch point units are designed for additional strength for heavily trafficked junctions, roadabouts and areas subject to HGV traffic.



# Components

## HALF BATTERED



Half Battered  
500 x 450 x 125



Half Battered  
500 x 350 x 125



Half Battered  
500 x 275 x 125



Half Battered  
500 x 175 x 125



Half Battered  
500 x 150 x 125

## 45° SPLAYED



45° Splayed  
500 x 450 x 100



45° Splayed  
500 x 350 x 100



45° Splayed  
500 x 275 x 100



45° Splayed  
500 x 175 x 100

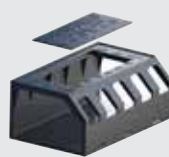


45° Splayed  
500 x 150 x 100

## ACCESSORIES

### Rodding & Outlet Units

- The access lid is lockable for improved security
- Compatible with the standard units regardless of size or profile
- Removable lid provides large access opening for the emptying of silt traps and outfall sumps using traditional equipment
- Special lids can be designed for all access requirements
- Outlet unit can be configured to meet individual requirements; size, exit angle or position (base, rear and end)



Rodding Unit



Base Outlet Unit

### Transition Units

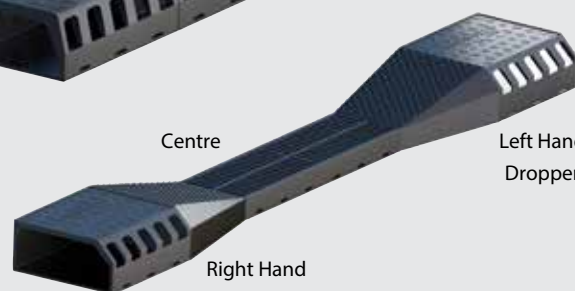
- Designed to allow smooth transition from one unit height to width to another or the Beany systems
- Provides uninterrupted flow between the units minimizing impact on the hydraulic performance



Transition Unit

### Droppers And Flush Units

- Droppers are available in left or right hand units
- Uninterrupted flow across a pedestrian crossing or road junctions
- Flush units are available with solid or heelsure slots



Centre

Left Hand Dropper

Right Hand Dropper

### End Units

- Available right and left hand units
- Forms the transition to normal half battered kerbs at pedestrian or vehicular crossings



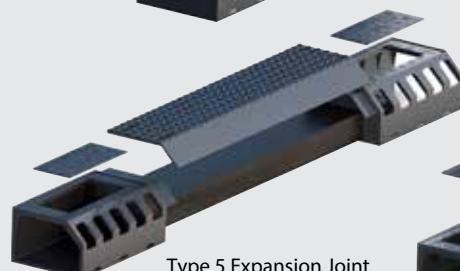
Left Hand End Unit



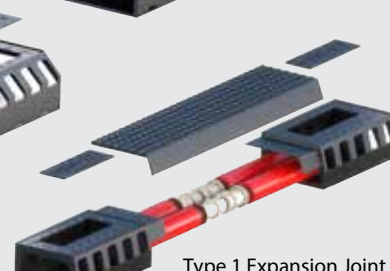
Right Hand End Unit

### Expansions Units

- Available as a type 1 or type 5 expansion joint
- Each unit is bespoke to enable the system to cross an existing or new expansion joint.
- Designed to allow horizontal, vertical, axial and lateral movement of the joint



Type 5 Expansion Joint



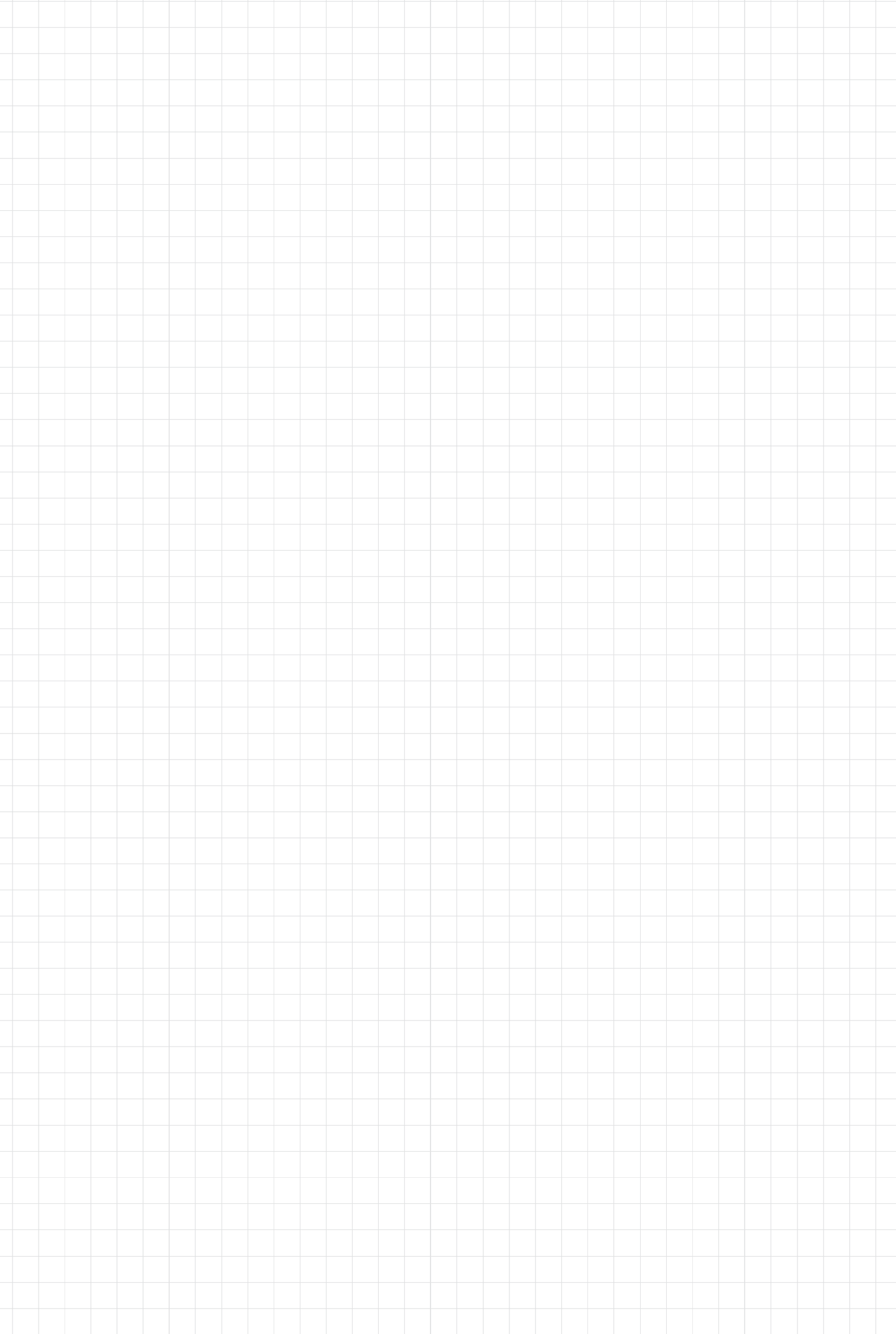
Type 1 Expansion Joint

# Hydraulic Data

## FLOW CAPACITY

Bridge Beany 150 x 100	Bridge Beany 175 x 100	Bridge Beany 275 x 100	Bridge Beany 350 x 100	Bridge Beany 450 x 100
Equivalent Pipe Diameter (mm) 125	Equivalent Pipe Diameter (mm) 135	Equivalent Pipe Diameter (mm) 175	Equivalent Pipe Diameter (mm) 200	Equivalent Pipe Diameter (mm) 225

	Bridge Beany Half Battered			Bridge Beany Splayed		
ref.	w	i	d	w	i	d
150	150	90 (65/115)*	100 (75/125)*	150	90 (65/115)*	100 (75/125)*
175	175	90 (65/115)*	100 (75/125)*	175	90 (65/115)*	100 (75/125)*
275	275	90 (65/115)*	100 (75/125)*	275	90 (65/115)*	100 (75/125)*
350	350	90 (65/115)*	100 (75/125)*	350	90 (65/115)*	100 (75/125)*
450	450	90 (65/115)*	100 (75/125)*	450	90 (65/115)*	100 (75/125)*



# Hydraulic Data

The Bridge Beany hydraulic data stated in the following tables is for the standard range only and comprises of flow capacity, in litres per second (l/s) and velocity in metres per second (m/s). This data has been calculated using the HR Wallingford method.

If a bespoke system is required, specific hydraulic flow calculations to meet the exact bridge deck requirements can be provided free of charge.

## Half Battered

450 Half Battered																
Gradient Length (m)	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
50	16.00	0.40	23.10	0.57	29.10	0.72	31.90	0.79	36.40	0.90	45.70	1.13	51.50	1.27	61.10	1.51
100	9.30	0.23	20.40	0.50	30.40	0.75	35.30	0.87	43.00	1.06	60.00	1.46	65.00	1.60	74.60	1.84
150	2.60	0.06	17.70	0.44	31.80	0.78	38.70	0.95	49.60	1.22	72.60	1.79	78.50	1.94	88.00	2.17
200	2.10	0.05	15.10	0.04	33.10	0.82	42.00	1.04	56.20	1.39	86.10	2.12	92.00	2.27	101.50	2.50

350 Half Battered																
Gradient Length (m)	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
50	11.60	0.37	16.70	0.53	21.00	0.67	23.10	0.74	26.30	0.84	33.00	1.06	37.20	1.19	44.10	1.41
100	6.70	0.22	14.80	0.47	22.00	0.70	25.50	0.82	31.10	0.99	42.70	1.37	46.90	1.15	53.80	1.72
150	1.90	0.01	12.80	0.41	23.00	0.73	27.90	0.89	35.80	1.15	52.40	1.69	56.70	1.81	63.60	2.03
200			10.90	0.35	24.00	0.77	30.40	0.97	40.60	1.30	62.20	1.99	66.40	2.12	73.30	2.35

275 Half Battered																
Gradient Length (m)	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
50	8.40	0.35	12.20	0.50	15.30	0.63	16.80	0.69	19.20	0.79	24.00	0.99	27.10	1.12	32.20	1.32
100	4.90	0.20	10.80	0.44	16.00	0.66	18.60	0.77	22.70	0.93	31.10	1.28	34.20	1.41	39.30	1.62
150	1.40	0.06	9.30	0.38	16.70	0.69	20.40	0.84	26.10	1.08	38.20	1.58	41.30	1.70	46.30	1.91
200			7.90	0.33	17.40	0.72	22.10	0.91	29.60	1.22	45.30	1.87	48.40	1.99	53.40	2.20

175 Half Battered																
Gradient Length (m)	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
50	4.60	0.31	6.70	0.44	8.40	0.56	9.20	0.61	10.50	0.70	13.10	0.88	14.80	0.99	17.60	1.17
100	2.70	0.18	5.90	0.39	8.80	0.58	10.20	0.68	12.40	0.83	17.00	1.14	18.70	1.25	21.50	1.43
150	0.70	0.05	5.10	0.34	9.10	0.61	11.10	0.74	14.30	0.95	20.90	1.40	22.60	1.51	25.30	1.69
200			4.30	0.29	9.50	0.64	12.10	0.81	16.20	1.08	24.80	1.65	26.50	1.77	29.20	1.95

150 Half Battered																
Gradient Length (m)	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s
50	2.90	0.28	4.20	0.41	5.30	0.51	5.80	0.56	6.60	0.64	8.30	0.80	9.30	0.90	11.00	1.07
100	1.70	0.16	3.70	0.36	5.50	0.53	6.40	0.62	7.80	0.75	10.70	1.04	11.80	1.14	13.50	1.31
150	0.50	0.05	3.20	0.31	5.70	0.56	7.00	0.68	9.00	0.87	13.10	1.27	14.20	1.37	15.90	1.54
200	0.50	0.05	2.70	0.26	6.00	0.58	7.60	0.74	10.20	0.98	15.60	1.51	16.60	1.61	18.40	1.78



# Hydraulic Data

## 45° Splayed

450 Splayed																
Gradient	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	Length (m)	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	
50	16.00	0.40	23.10	0.57	29.10	0.72	31.90	0.79	36.40	0.90	45.70	1.13	51.50	1.27	61.10	1.51
100	9.30	0.23	20.40	0.50	30.40	0.75	35.30	0.87	43.00	1.06	60.00	1.46	65.00	1.60	74.60	1.84
150	2.60	0.06	17.70	0.44	31.80	0.78	38.70	0.95	49.60	1.22	72.60	1.79	78.50	1.94	88.00	2.17
200	2.10	0.05	15.10	0.04	33.10	0.82	42.00	1.04	56.20	1.39	86.10	2.12	92.00	2.27	101.50	2.50

350 Splayed																
Gradient	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	Length (m)	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	
50	11.60	0.37	16.70	0.53	21.00	0.67	23.10	0.74	26.30	0.84	33.00	1.06	37.20	1.19	44.10	1.41
100	6.70	0.22	14.80	0.47	22.00	0.70	25.50	0.82	31.10	0.99	42.70	1.37	46.90	1.15	53.80	1.72
150	1.90	0.01	12.80	0.41	23.00	0.73	27.90	0.89	35.80	1.15	52.40	1.69	56.70	1.81	63.60	2.03
200			10.90	0.35	24.00	0.77	30.40	0.97	40.60	1.30	62.20	1.99	66.40	2.12	73.30	2.35

275 Splayed																
Gradient	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	Length (m)	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	
50	8.40	0.35	12.20	0.50	15.30	0.63	16.80	0.69	19.20	0.79	24.00	0.99	27.10	1.12	32.20	1.32
100	4.90	0.20	10.80	0.44	16.00	0.66	18.60	0.77	22.70	0.93	31.10	1.28	34.20	1.41	39.30	1.62
150	1.40	0.06	9.30	0.38	16.70	0.69	20.40	0.84	26.10	1.08	38.20	1.58	41.30	1.70	46.30	1.91
200			7.90	0.33	17.40	0.72	22.10	0.91	29.60	1.22	45.30	1.87	48.40	1.99	53.40	2.20

175 Splayed																
Gradient	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	Length (m)	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	
50	4.60	0.31	6.70	0.44	8.40	0.56	9.20	0.61	10.50	0.70	13.10	0.88	14.80	0.99	17.60	1.17
100	2.70	0.18	5.90	0.39	8.80	0.58	10.20	0.68	12.40	0.83	17.00	1.14	18.70	1.25	21.50	1.43
150	0.70	0.05	5.10	0.34	9.10	0.61	11.10	0.74	14.30	0.95	20.90	1.40	22.60	1.51	25.30	1.69
200			4.30	0.29	9.50	0.64	12.10	0.81	16.20	1.08	24.80	1.65	26.50	1.77	29.20	1.95

150 Splayed																
Gradient	Zero		1 in 1000		1 in 500		1 in 400		1 in 300		1 in 200		1 in 100		1 in 50	
	Length (m)	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	
50	2.90	0.28	4.20	0.41	5.30	0.51	5.80	0.56	6.60	0.64	8.30	0.80	9.30	0.90	11.00	1.07
100	1.70	0.16	3.70	0.36	5.50	0.53	6.40	0.62	7.80	0.75	10.70	1.04	11.80	1.14	13.50	1.31
150	0.50	0.05	3.20	0.31	5.70	0.56	7.00	0.68	9.00	0.87	13.10	1.27	14.20	1.37	15.90	1.54
200	0.50	0.05	2.70	0.26	6.00	0.58	7.60	0.74	10.20	0.98	15.60	1.51	16.60	1.61	18.40	1.78

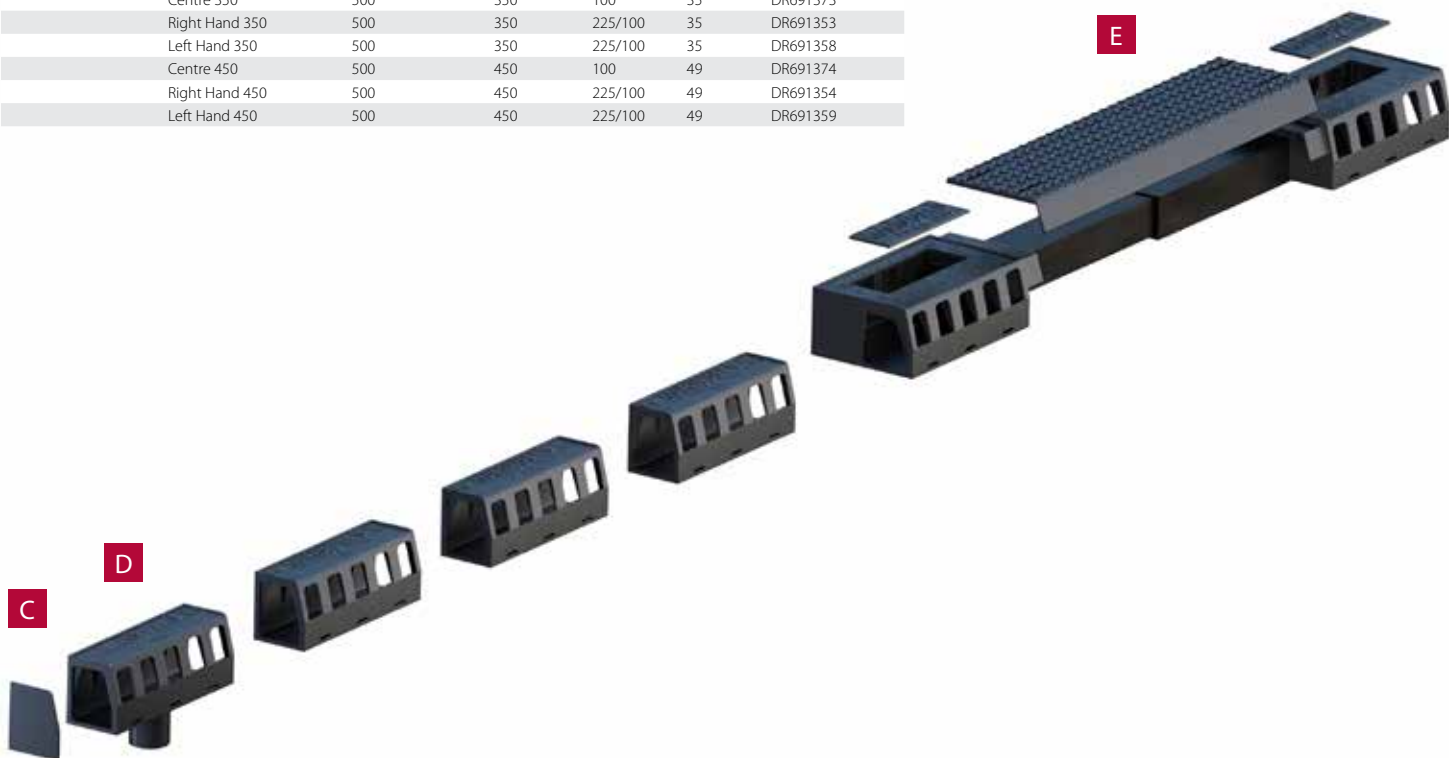
# Bridge Beany Component Codes

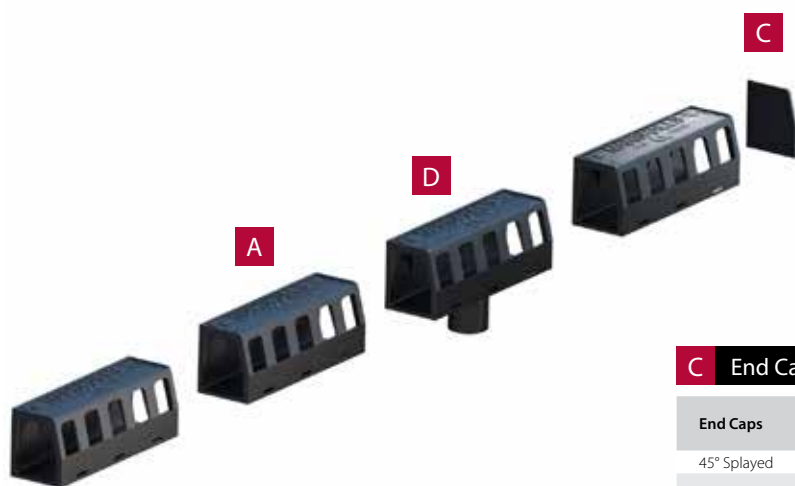
## A Constant Depth Channel

Constant Depth Channel	Length (mm)	Width (mm)	Wier Height (mm)	Height (mm)	Invert Depth (mm)	Unit Weight (kg)	Item Code
45° Splayed	500	150	100	200	186	14	DR691201
	500	175	100	200	186	17	DR691202
	500	275	100	200	186	26	DR691203
	500	350	100	200	186	35	DR691204
	500	450	100	200	186	49	DR691205
Half Battered	500	150	125	225	211	14	DR691290
	500	175	125	225	211	17	DR691291
	500	275	125	225	211	26	DR691292
	500	350	125	225	211	35	DR691293
	500	450	125	225	211	49	DR691294

## B Dropped Crossing Accessories

Road Crossing Accessories	Length(mm)	Width (mm)	Height (mm)	Unit Weight (kg)	Item Code	
45° Splayed	Centre 150	500	150	100	14	DR691280
	Right Hand 150	500	150	200/100	14	DR691260
	Left Hand 150	500	150	200/100	14	DR691265
	Centre 175	500	175	100	17	DR691281
	Right Hand 175	500	175	200/100	17	DR691261
	Left Hand 175	500	175	200/100	17	DR691266
	Centre 275	500	275	100	26	DR691282
	Right Hand 275	500	275	200/100	26	DR691262
	Left Hand 275	500	275	200/100	26	DR691267
	Centre 350	500	350	100	35	DR691283
	Right Hand 350	500	350	200/100	35	DR691263
	Left Hand 350	500	350	200/100	35	DR691268
	Centre 450	500	450	100	49	DR691284
	Right Hand 450	500	450	200/100	49	DR691264
	Left Hand 450	500	450	200/100	49	DR691269
Half Battered	Centre 150	500	150	100	14	DR691370
	Right Hand 150	500	150	225/100	14	DR691350
	Left Hand 150	500	150	225/100	14	DR691355
	Centre 175	500	175	100	17	DR691371
	Right Hand 175	500	175	225/100	17	DR691351
	Left Hand 175	500	175	225/100	17	DR691356
	Centre 275	500	275	100	26	DR691372
	Right Hand 275	500	275	225/100	26	DR691352
	Left Hand 275	500	275	225/100	26	DR691357
	Centre 350	500	350	100	35	DR691373
	Right Hand 350	500	350	225/100	35	DR691353
	Left Hand 350	500	350	225/100	35	DR691358
	Centre 450	500	450	100	49	DR691374
	Right Hand 450	500	450	225/100	49	DR691354
	Left Hand 450	500	450	225/100	49	DR691359





**C End Caps**

End Caps		Unit Weight (kg)	Item Code
45° Splayed	End Cap 150	5	DR691210
	End Cap 175	5	DR691211
	End Cap 275	10	DR691212
	End Cap 350	10	DR691213
	End Cap 450	15	DR691214
Half Battered	End Cap 150	5	DR691300
	End Cap 175	5	DR691301
	End Cap 275	10	DR691302
	End Cap 350	10	DR691303
	End Cap 450	15	DR691304

**D Outfalls & Rodding Units**

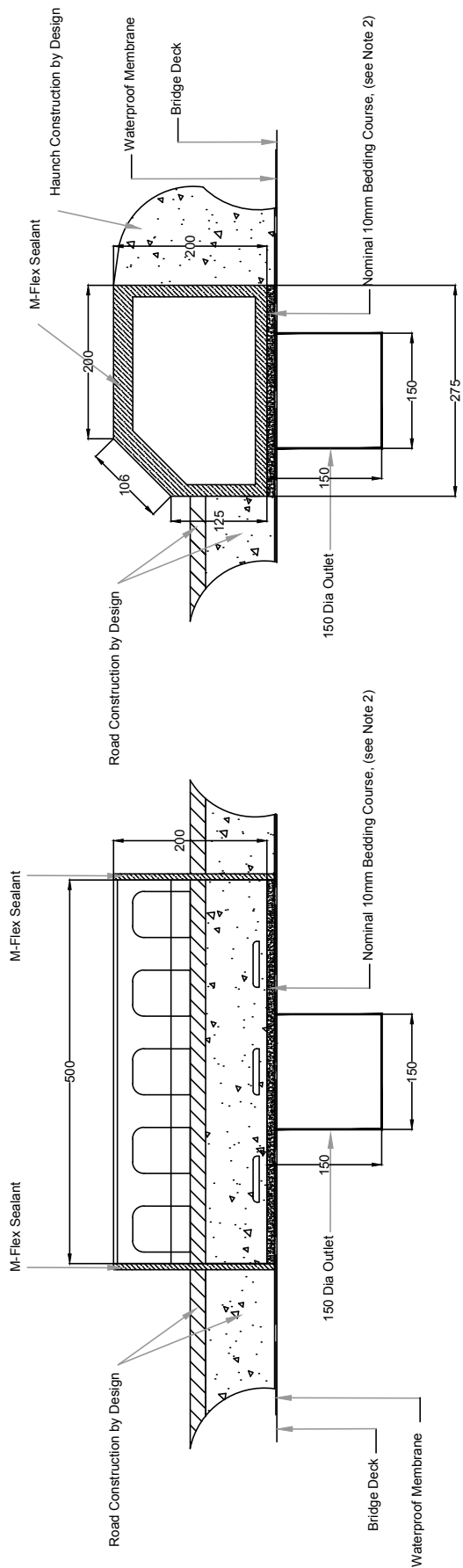
Outfalls & Rodding Units		Unit Weight (kg)	Item Code
45° Splayed	Outfall 150	18	DR691230
	Outfall 175	21	DR691231
	Outfall 275	30	DR691232
	Outfall 350	39	DR691233
	Outfall 450	54	DR691234
	Rodding Unit 150	14	DR691220
	Rodding Unit 175	17	DR691221
	Rodding Unit 275	26	DR691222
	Rodding Unit 350	35	DR691223
	Rodding Unit 450	49	DR691224
Half Battered	Outfall 150	18	DR691320
	Outfall 175	21	DR691321
	Outfall 275	30	DR691322
	Outfall 350	39	DR691323
	Outfall 450	54	DR691324
	Rodding Unit 150	14	DR691310
	Rodding Unit 175	17	DR691311
	Rodding Unit 275	26	DR691312
	Rodding Unit 350	35	DR691313
	Rodding Unit 450	49	DR691314

**E Expansion Joints**

Expansion Joints		Unit Weight (kg)	Item Code	
45° Splayed	Type 1 Expansion Joint 150	100	DR691240	
	Type 1 Expansion Joint 175	100	DR691241	
	Type 1 Expansion Joint 275	150	DR691242	
	Type 1 Expansion Joint 350	200	DR691243	
	Type 1 Expansion Joint 450	250	DR691244	
	Type 5 Expansion Joint 150	200	DR691245	
	Type 5 Expansion Joint 175	300	DR691246	
	Type 5 Expansion Joint 275	400	DR691247	
	Type 5 Expansion Joint 350	500	DR691248	
	Type 5 Expansion Joint 450	600	DR691249	
	Half Battered	Type 1 Expansion Joint 150	100	DR691330
		Type 1 Expansion Joint 175	100	DR691331
		Type 1 Expansion Joint 275	150	DR691332
		Type 1 Expansion Joint 350	200	DR691333
		Type 1 Expansion Joint 450	250	DR691334
Type 5 Expansion Joint 150		200	DR691335	
Type 5 Expansion Joint 175		300	DR691336	
Type 5 Expansion Joint 275		400	DR691337	
Type 5 Expansion Joint 350		500	DR691338	
Type 5 Expansion Joint 450		600	DR691339	

# Standard Details

Drawing 1 of 1



# Standard Details

## Notes For Bridge Beany

### Drawings 1 to 1

1. All dimensions are in millimetres
2. Mortar shall be Class 12 to BS EN 988-2:2003
3. Concrete shall be of a minimum compressive strength of designation ST1 in normal kerb applications.
4. Cementitious based bedding material shall contain a waterproofing additive.
5. The channel unit shall be ductile iron (S.G.) manufactured to EN-GJS-450-10.
6. The standard details show the general arrangements used by Marshalls for product evaluation and load test classification purposes which may differ from customer requirements and site conditions and should be checked and accepted by the Engineer for project use.

# Specification

## Introduction

The following specification covers the complete Bridge Beany linear drainage system including ancillary fittings and is compatible with the standard detail drawings.

Where the Manual of Contract Drawings for Highways Works is used, refer to 'Appendix 5/5: Linear Channels'.

## Bridge Beany

1. The linear drainage system shall be Bridge Beany supplied by Marshalls plc. All channel materials and ancillary products detailed in this specification shall be supplied by Marshalls.
2. All components of the system shall be type tested and be fully compliant with the requirements of BS EN 1433:2002: Drainage channels for vehicular and pedestrian areas – Classification, design and testing requirements, marking and evaluation of conformity' when installed as per manufacturers recommendations.
3. The linear drainage system shall be a one piece unit manufactured in a single material (Ductile Iron) with the exception of certain ancillary products as supplied by the manufacturers in accordance with standard details.
4. The linear drainage channel:-
  - a. Kerb profile shall be **Half Battered (HB) / 45° Splay (SP)\***.
  - b. Units shall be a maximum of 200mm deep and **150/175/275/350/450\*** mm wide. Units laid to radii of less than 50m shall utilise purpose made radial blocks as appropriate.
  - c. Kerb upstand shall be **125/100/75\*** mm.
  - d. The weir height shall be **125/100/75\*** mm.
  - e. Shall be of a constant depth between ancillaries or access points
  - f. The units shall be Type 'I' (unhaunched) and meet a minimum of load class of E600 when tested in accordance with BSEN 1433.
  - g. All units shall be 3rd party accredited with the Kite Mark complete with manufacturers identifying marks.
  - h. The weir height of the water inlet aperture shall be **125/100/75\*** mm (**HB/SP\***).
  - i. The water inlet apertures shall be of equal size and shape with a total of 5 apertures per 500mm unit.
  - j. The combined area of the inlet apertures shall be  $\geq$  the cross section area of the internal channel unit.
  - k. Water inlet apertures shall be wholly contained within individual units

## Specification

- l. The internal cross sectional area shall be a minimum **9100/10700/17500/22600/29300 mm<sup>2</sup>**.
  - m. Water shall exit the channel units via an outfall with an outlet of **150/225\*** mm nominal bore located in the **base/rear/side\*** of the drainage outfall unit.
  - n. The location of outfalls and silt traps shall be as detailed in contract documents.
5. Channel unit shall be bedded on a nominal **10/20\*** mm bed to allow for adjustment to line and level.
  6. Bedding mortar shall be Marshalls M-Bond or mortar designation (i) complying with Class M12 in accordance with BS EN 998-2.
  7. Bedding concrete shall be designation ST1 in normal kerb applications.
  8. Cementitious based bedding material shall contain a waterproofing additive.
  9. Bridge Beany expansion joints shall be **Type 1 / Type 5\*** to compliment the requirements of the proprietary expansion joint manufacturer.
  10. The primary material of the channel unit system shall be ductile iron (S.G.) manufactured to minimum standard EN-GJS-450-10.
  11. The unit shall consist of material which is 100% recyclable.
  12. The unit shall be fire resistant.
  13. The unit shall be UV resistant.
  14. The linear drainage shall be installed to line and level indicated in the contract and in accordance with manufacturer's instructions and standard details.
  15. The drainage system shall be installed in accordance with manufacturers recommendations, industry best practice or as detailed in the contract / WRc Sewers for Adoption; **7th Edition : 2012 / BS EN 752:2008 / BS 8000: Part 14:1989\***

Note: \* delete as required

## Construction

### Introduction

Installation of the Bridge Beany combined kerb and drainage system should be carried out in accordance with the specification and standard detail drawings.

The following method of installation is recommended by Marshalls and it is based on conventional UK best practice construction techniques, installation and testing trials and if applicable, installation shall comply with the recommendations in the Construction Phase Plan as defined by the 'Construction (Design and Management) Regulations 2015'.

Should your application differ from standard installation guidance you should consult with your Engineer or Marshalls Technical Advice Team.

### Excavation

Excavation is not normally required for Bridge deck units on new installations but the following advice should be taken on refurbishment or retro-fit projects.

Sufficient material should be excavated to accommodate the channel unit, levelling bed, and working areas. Place excavation support as required depending on channel size, native ground conditions and method of working. Any 'soft spots', poorly compacted formation or defective bridge deck structure should be made good.

### Setting Out

Setting out pins should be accurately located in accordance with the contract drawings, with a string line level with the top and rear of the channel units. Pins should be located to avoid having to lift the channel units over the string line. The slots should be set so as to follow the longfall and crossfall of the final surface as required by the contract drawings.

Alternatively, a theodolite or similar electronic surveying equipment may be used. It is not recommended that line and level is set using internal channel faces.

Line and level should be checked at regular intervals and channels adjusted as required

### Outfalls

Outfalls are preformed units and are laid in the same manner as standard kerb channel units. 125, 175 & 250 channels are supplied with a 150 mm nominal bore (NB) bottom outlet and 350 & 450 channels are supplied with a 225 mm NB bottom outlet as standard. Rear, end and other NB outlets and be supplied on request.

Outfalls should be laid first and positioned as per the contract drawings or at the appropriate orifice on the bridge structure.

# Construction

Outfalls do not require bedding or haunching to achieve an E600 load class but should be bedded on a nominal 10 to 20 mm bed to allow for adjustment to line and level.

Bedding mortar shall be a 2 part epoxy type mortar such as Marshalls M-Bond or mortar designation (i) complying with class M12 in accordance with BS EN 998-2.

Bedding concrete shall be of a minimum compressive strength designation ST1 in normal kerb applications.

Cementitious based bedding material shall contain a waterproofing additive.

Care should be taken to not damage any waterproof membrane system during installation.

## Channel Units

Channel units do not require bedding or haunching to achieve an E600 load class but should be bedded on a nominal 10 to 20 mm bed to allow for adjustment to line and level.

Bedding mortar shall be a 2 part epoxy type mortar such as Marshalls M-Bond or mortar designation (i) complying with class M12 in accordance with BS EN 998-2.

Bedding concrete shall be of a minimum compressive strength designation ST1 in normal kerb applications.

Cementitious based bedding material shall contain a waterproofing additive.

Care should be taken to not damage any waterproof membrane system during installation.

Starting at the outfall chamber, i.e. working uphill, Marshalls recommend the following installation technique:-

Place the bedding to the correct line and level allowing the channel units to be placed on to the upper surface.

Units should be placed using mechanical lifting apparatus such as a scissor or magnetic lifter and final adjustment can be made using a rubber mallet or similar tool.

To maintain water tightness, channels shall be sealed at each joint using Marshall's M-Flex. A nominal 10 mm bead shall be applied to one vertical face and placed adjacent to the next unit and pushed 'home' to complete the joint.

Where a channel run does not terminate at an outfall, the unit shall be sealed using the Bridge Beany End Cap which should be securely placed against the vertical end of the unit and sealed with Marshalls M-Flex.

Marshalls recommend the use of full channels and do not recommend cutting or alteration of channels and designs are produced to accommodate full lengths with ancillaries.

Line and level should be checked as required during installation.

## Bridge Expansion Joints and Sealing of Gaps

Expansion joint units are installed in the same manner as outfall units.

### Type 1 Expansion Joints

Install and fix the downstream and upstream unit either side of the joint. The end spigots should be facing each other and pointing at the joint.

Place the jubilee clips loosely over the ends of the flexible pipe and place each end of the pipe over a spigot stub. Trim or cut the connecting pipe to suit. Tighten the jubilee clip to ensure a good fit and ensure water tightness.

Place any waterproofing or joint material as required by the specification or expansion joint supplier ensuring that the pipe retains the ability to expand and contract.

Place the cover plate between the two expansion joint units in the recess area ensuring the slots in the plate align with the fixing points on the units. Secure the 'fixed' end of the plate with M10 bolts and lightly tighten the 'sliding' end of the plate. The plate should be sufficiently secure to avoid vertical or lateral movement by hand pressure but allow free movement under expansion and contraction of the bridge deck sections.

### Type 5 Expansion Joints

Install and fix the downstream expansion joint unit.

Attach the rectangular bridging channel to the side of the upstream unit using M10 bolts.

Insert the free end of the rectangular channel on the upstream unit in to the downstream expansion joint unit and install and fix in place the upstream expansion joint unit. The rectangular bridging channel does not require any other method of fixing or securing.

Place any waterproofing or joint material as required by the specification or expansion joint supplier ensuring that the bridging channel retains the ability to 'slip' and move freely and to expand and contract without damage.

Place the cover plate between the two expansion joint units in the recess area ensuring the slots in the plate align with the fixing points on the units.

# Construction

Secure the fixed end of the plate with M10 bolts and lightly tighten the 'sliding' end of the plate. The plate should be sufficiently secure to avoid vertical or lateral movement by hand pressure but allow free movement under expansion and contraction of the bridge deck sections.

## Site Storage, Handling and Placing

Marshalls recommend that units are stored in their original packaging until required to help reduce the risk of damage and to help with movement around site.

It is the site contractor's responsibility to ensure that units are stored on solid level ground and in a clean and protected area away from potential site damage. Care should be taken when removing units from secure packaging and pallets and units should not be stacked more than one pallet high. Units shall not be stored close to sources of heat such as engine exhaust outlets or hot works areas such as welding and cutting.

Should the units be put in long term storage Marshalls recommend that the units are covered to protect mating surfaces and slot opening from dirt and debris until such time that they are required. Additional protection may be required to prevent accidental damage.

Marshalls advise that all drainage components should be installed by a safe method of working. The use of mechanical handling equipment such as magnetic or scissor lifters have proven to be of benefit and will eliminate manual handling. Marshalls do not recommend manual handling.

## Commissioning

Whilst the channel units are strong enough to receive traffic as soon as installed, Marshalls do not recommend you load or traffic over the channel until the unit has been surrounded or 'bound' by the finished pavement to avoid the units being moved out of alignment and/or breaking the waterproof seal between units.

Particular care should be taken during the construction phase when conditions may be more onerous due to construction plant and machinery movements and/or incomplete construction.

As soon as then channel units are fully installed and the outfalls are connected, the Bridge deck units can be used straight away.

Where necessary, the drainage channel inlets shall be protected against the ingress of construction material during subsequent construction operations by covering with waterproof cloth tape.

## Notes

1. Marshalls recommended that channels are not cut to length on site, drainage runs will be calculated and supplied to multiples of whole units with ancillaries.
2. Outfalls, access chambers and silt traps shall be constructed in accordance with the Standard Details. Access chambers should be located at no more than 50m centres in long runs.
3. Access chamber covers are secured with M10 retaining screws.
4. All necessary Personal Protective Equipment (PPE) should be worn on site, as site rules stipulate. Goggles, ear defenders, dust masks and protective footwear must always be worn whenever cutting operations are undertaken.
5. COSHH - All relevant health and safety information, including COSHH data sheets, can be obtained from Marshalls Advisory Services, or the Marshalls Design Team on 0845 3020606.