

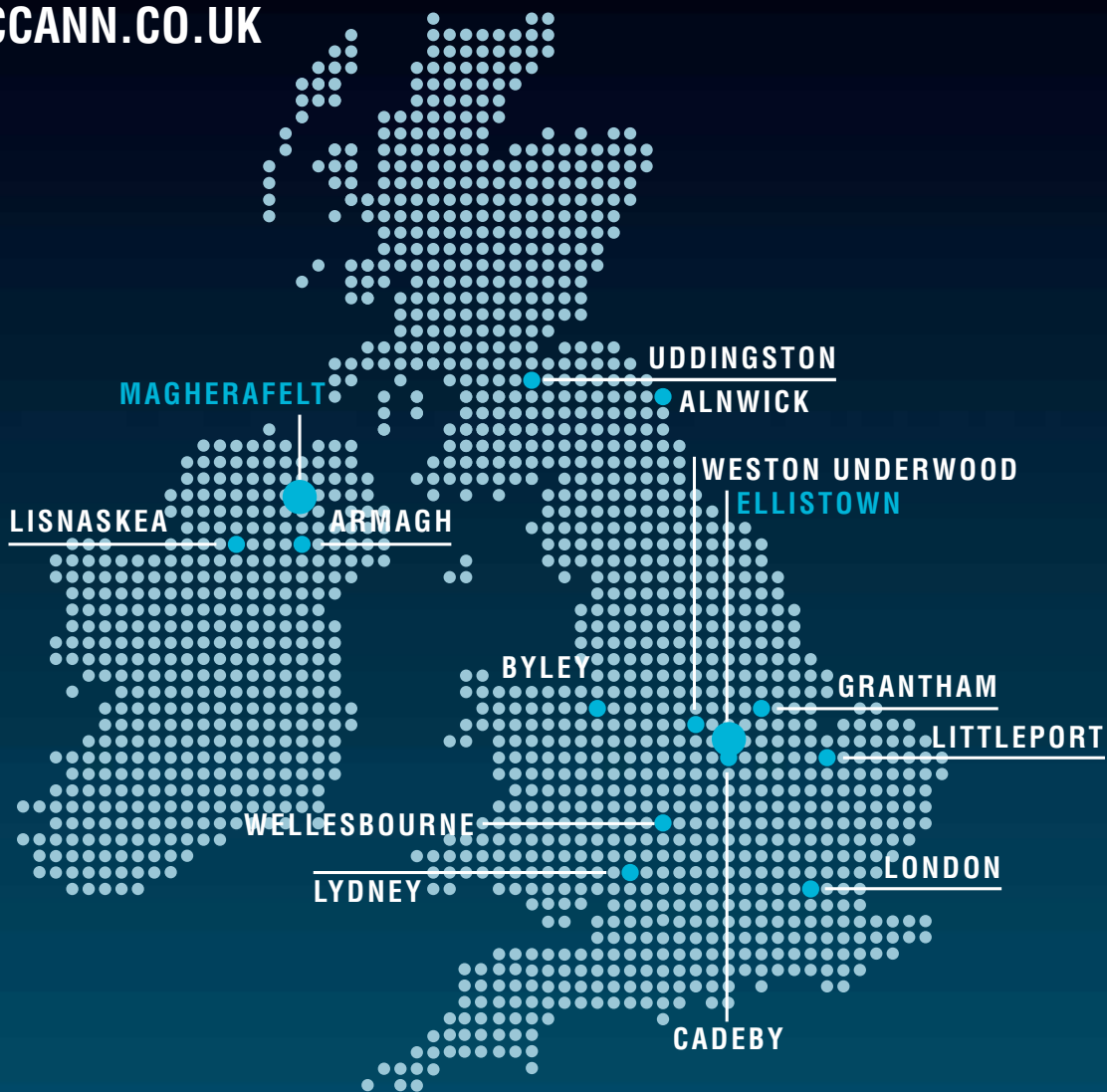


# BOX CULVERTS

## DRAINAGE & WATER MANAGEMENT

v2.1






FP McCann is the UK's market leader in the manufacture, supply and delivery of precast concrete solutions. Our comprehensive precast concrete business extends to include:

**AGRICULTURE | ARCHITECTURAL PRECAST | BOX CULVERTS | BUILDING PRODUCTS  
DOCK LEVELLERS | DRAINAGE | FENCING | FILTER BED SYSTEMS | FLOORING  
POWER & INFRASTRUCTURE | RAIL | SPECIALIST PRECAST | STRUCTURAL PRECAST  
TANKS & CHAMBERS | TUNNELS & SHAFTS | WALLING**

Modern manufacturing plants at Alnwick (Northumberland), Armagh (Northern Ireland), Byley (Cheshire), Cadeby (Warwickshire), Ellistown (Leicestershire), Grantham (Lincolnshire), Lisnaskea (Northern Ireland), Littleport (Cambridgeshire), Lydney (Gloucestershire), Magherafelt (Northern Ireland), Uddingston (Lanarkshire) and Weston Underwood (Derbyshire) incorporate the latest computerised batching, distribution, casting, curing and handling systems and are operated by skilled and experienced workforces to ensure consistency of quality. Their geographical spread gives us an unrivalled ability to serve the construction industry throughout the UK and Ireland.

By applying the DFMA principles, FP McCann's design engineers are able to evaluate individual precast concrete products part by part, in addition to documenting the assembly process step by step. This allows them to generate the cost, part count and assembly time to provide a benchmark to measure its success and identify the parts and process improvement opportunities. In turn, this has allowed FP McCann to design and manufacture more cost-effective and efficient high-quality precast concrete products with less wastage and greater on-site recycling. As a result, increased productivity, combined with a reduction in production time and costs, allows FP McCann to be more competitive within the marketplace.

*Please note: all information is correct at time of going to print.*



Designed and manufactured in accordance with all current design specifications and relevant standards, FP McCann's box culverts are available in span sizes from 1000mm to 6000mm and internal heights from 500mm to 3600mm. With our extensive range of moulds, we also strive to accommodate non standard variances, along with any other internal features requested by the client.

Based in a modern production facility at Byley, Cheshire, FP McCann's experienced engineers and detailing team have the flexibility to quickly respond to meet any design criteria and deliver nationally to just-in-time requirements.

Supplied in either single or multiple runs, the use of precast concrete box sections in civil engineering projects is wide-ranging, from their use for directing/diverting watercourses to the provision of attenuation tanks and underpasses.

FP McCann is a member of the British Precast Drainage Association (BPDA) and their products comply with all relevant standards, as set out in accordance with ISO 9001 and ISO 14001.

### **ADDITIONAL FEATURES**

These are varied and can be added to any culvert, as per requirement. For example, end walls, access points, vent holes, inlets, outlets, angles and splayed ends. Starter bars and sockets can be added to facilitate any additional casting on-site, which may be required as part of the finished work.

### **BOX CULVERT APPLICATIONS**

- Attenuation and storage tanks
- Water course diversion
- Open channels
- Road crossings
- Pedestrian and vehicle subways
- Shafts
- Service tunnels and ducts
- Conveyor protection



**British Precast  
Drainage Association**



# BOX CULVERTS

## TYPICAL CULVERT

Units are available in internal span sizes from 1000mm to 6000mm and internal heights from 500mm to 3600mm, with unit lengths to a maximum of 2000mm, dependent on final mould configuration (please refer to internal dimensions chart opposite).



## DRY WEATHER FLOW CHANNELS

Half round (or equivalent) channels can be cast into the floor of the units at any position, we offer a choice of equivalent half round diameters.



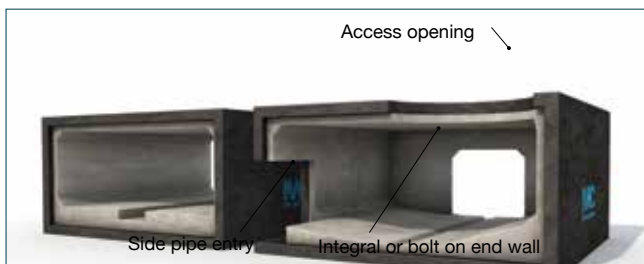
## BENCHING

Combined with either a channel or cast as a “vee”, benching improves self-cleansing flow rates.



## MAMMAL LEDGES

Cast-in mammal ledges allow access through the culvert to wildlife without the requirement for extra site provisions.



## SPECIALS

Bespoke units accommodating a variety of features can be manufactured to our customers' design requirements.

The proven strength and performance characteristics of precast concrete box culverts, together with their excellent service life, make them ideal for a wide variety of civil engineering and construction applications. Box culvert sections can be manufactured in a variety of internal profiles and sizes, offering exceptional versatility in the uses to which they can be applied.

In addition to the more common use for diverting water courses, box culverts have been used in an array of applications including balancing tanks, pedestrian subways, access shafts, service tunnels, sea outfalls, road crossings and many other situations where the whole life costing consideration requires strength, durability and economy to be of paramount importance.

Unlike other materials such as steel, precast concrete box culverts do not require additional treatments to prolong their life or improve performance. The concrete surface will not rust and the smooth internal finish of the box culvert ensures optimum flow of water through the concrete structure.

Precast concrete box culverts fulfil the current design life requirements for buried structures. With minimum maintenance and the ability to provide many years of service, precast concrete box culverts are the most cost-effective means of diverting water courses, especially with the ever present risk of corrosive elements in the water or soil.

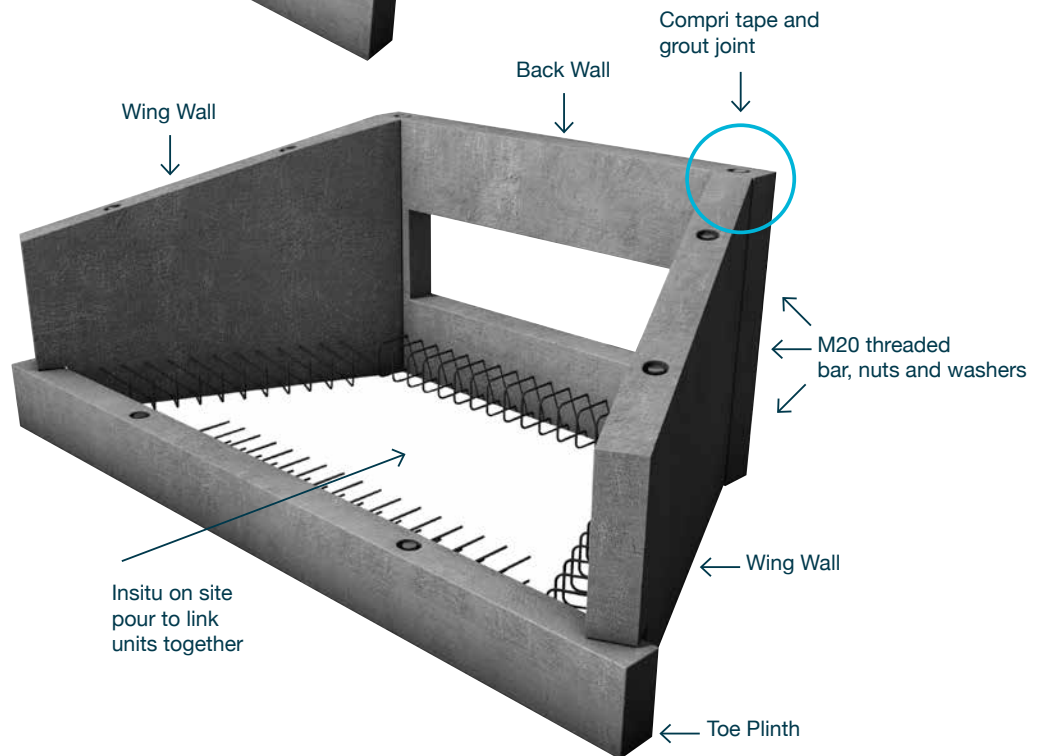
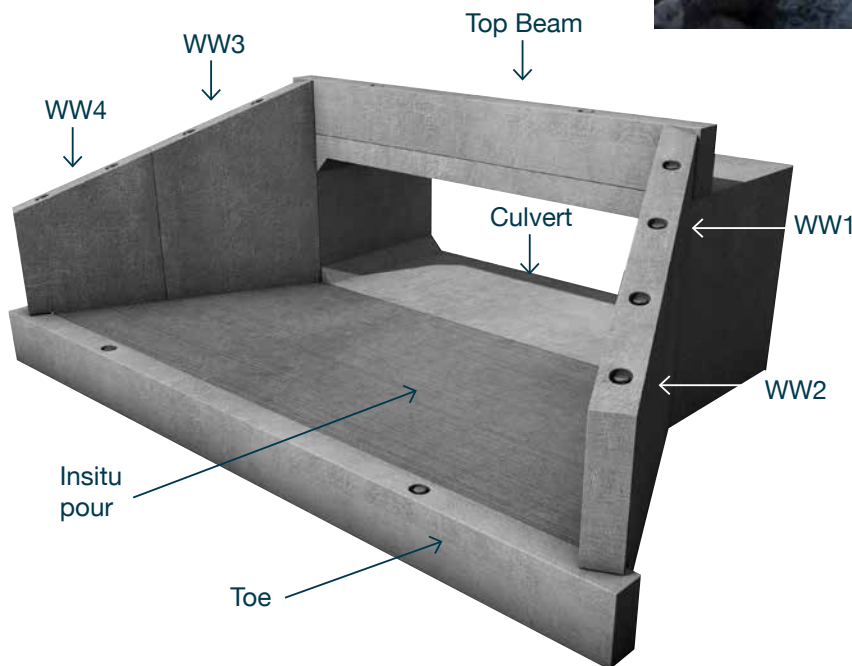
Whilst the methods and procedures for the installation of precast concrete box culverts are familiar to contractors, careful attention to detail will lead to safer working, a smoother flow of operations and a higher standard of finished culvert. Box Culvert installation and jointing details can be downloaded from [www.fpmccann.co.uk/box-culverts](http://www.fpmccann.co.uk/box-culverts)

This guide provides a reliable checklist for anyone engaged in the installation of box culverts. It is published to encourage good practice in the use of precast box culverts.



# BOX CULVERT HEADWALLS

FP McCann offers a bespoke headwall solution suitable for box culverts. These headwalls are made up of a number of precast panels and tied with an in-situ stitch.



# BOX CULVERTS



## INTERNAL DIMENSIONS

(Based on flat invert culvert units)

Key: **Flow area m<sup>2</sup>** / **Discharge rate m<sup>3</sup>/sec**

|                    |      | Width mm (internal span) |              |              |              |              |               |               |               |                |                |                |                |                |                |                |                |
|--------------------|------|--------------------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                    |      | 1000                     | 1200         | 1500         | 1800         | 2100         | 2400          | 2700          | 3000          | 3300           | 3600           | 3900           | 4200           | 4500           | 4800           | 5100           | 5400           |
| Internal height mm | 500  | 0.46<br>0.40             | 0.56<br>0.51 | 0.71<br>0.67 | 0.86<br>0.84 | 1.01<br>1.00 | -             | -             | -             | -              | -              | -              | -              | -              | -              | -              | -              |
|                    | 600  | 0.56<br>0.53             | 0.68<br>0.67 | 0.86<br>0.89 | 1.04<br>1.11 | 1.22<br>1.33 | -             | -             | -             | -              | -              | -              | -              | -              | -              | -              | -              |
|                    | 650  | 0.61<br>0.60             | 0.74<br>0.76 | 0.93<br>1.00 | 1.13<br>1.25 | 1.32<br>1.50 | 1.52<br>1.75  | 1.71<br>2.00  | -             | -              | -              | -              | -              | -              | -              | -              | -              |
|                    | 800  | 0.76<br>0.81             | 0.92<br>1.03 | 1.13<br>1.33 | 1.37<br>1.67 | 1.61<br>2.01 | 1.85<br>2.36  | 2.09<br>2.71  | 2.33<br>3.06  | 2.57<br>3.42   | 2.81<br>3.77   | 3.05<br>4.12   | -              | -              | -              | -              | -              |
|                    | 1000 | 0.96<br>1.10             | 1.16<br>1.40 | 1.43<br>1.84 | 1.73<br>2.32 | 2.03<br>2.80 | 2.33<br>3.29  | 2.63<br>3.79  | 2.93<br>4.29  | 3.23<br>4.79   | 3.53<br>5.30   | 3.83<br>5.80   | 4.13<br>6.30   | 4.43<br>6.81   | 4.73<br>7.32   | -              | -              |
|                    | 1200 | -                        | 1.37<br>1.76 | 1.73<br>2.37 | 2.09<br>3.00 | 2.45<br>3.64 | 2.81<br>4.29  | 3.17<br>4.95  | 3.53<br>5.61  | 3.89<br>6.28   | 4.25<br>6.95   | 4.61<br>7.62   | 4.97<br>8.29   | 5.33<br>8.97   | 5.69<br>9.64   | 6.05<br>10.32  | 6.41<br>11.00  |
|                    | 1500 | -                        | -            | 2.18<br>3.21 | 2.63<br>4.09 | 3.08<br>4.98 | 3.53<br>5.89  | 3.98<br>6.81  | 4.43<br>7.74  | 4.88<br>8.68   | 5.33<br>9.62   | 5.78<br>10.57  | 6.23<br>11.52  | 6.68<br>12.48  | 7.13<br>13.44  | 7.58<br>14.40  | 8.03<br>15.37  |
|                    | 1800 | -                        | -            | -            | 3.17<br>5.21 | 3.71<br>6.38 | 4.25<br>7.57  | 4.79<br>8.78  | 5.33<br>10.00 | 5.87<br>11.24  | 6.41<br>12.48  | 6.95<br>13.74  | 7.49<br>15.00  | 8.03<br>16.27  | 8.57<br>17.54  | 9.11<br>18.82  | 9.65<br>20.10  |
|                    | 2100 | -                        | -            | -            | -            | 4.34<br>7.83 | 4.97<br>9.31  | 5.60<br>10.83 | 6.23<br>12.36 | 6.86<br>13.92  | 7.49<br>15.49  | 8.12<br>17.07  | 8.75<br>18.67  | 9.38<br>20.27  | 10.01<br>21.89 | 10.64<br>23.50 | 11.27<br>25.13 |
|                    | 2400 | -                        | -            | -            | -            | -            | 5.69<br>11.11 | 6.41<br>12.94 | 7.13<br>14.81 | 7.85<br>16.70  | 8.57<br>18.62  | 9.29<br>20.55  | 10.01<br>22.50 | 10.73<br>24.46 | 11.45<br>26.44 | 12.17<br>28.42 | 12.89<br>30.41 |
|                    | 2700 | -                        | -            | -            | -            | -            | -             | 7.22<br>15.11 | 8.03<br>17.32 | 8.84<br>19.57  | 9.65<br>21.84  | 10.46<br>24.14 | 11.27<br>26.46 | 12.08<br>28.80 | 12.89<br>31.16 | 13.70<br>33.53 | 14.51<br>35.91 |
|                    | 3000 | -                        | -            | -            | -            | -            | -             | -             | 8.93<br>19.89 | 9.83<br>22.50  | 10.73<br>25.15 | 11.63<br>27.83 | 12.53<br>30.54 | 13.43<br>33.27 | 14.33<br>36.03 | 15.23<br>38.80 | 16.13<br>41.59 |
|                    | 3300 | -                        | -            | -            | -            | -            | -             | -             | -             | 10.82<br>25.49 | 11.81<br>28.52 | 12.80<br>31.60 | 13.79<br>34.71 | 14.78<br>37.86 | 15.77<br>41.03 | 16.76<br>44.22 | 17.75<br>47.43 |
| 3600               | -    | -                        | -            | -            | -            | -            | -             | -             | -             | 12.89<br>31.96 | 13.97<br>35.44 | 15.05<br>38.97 | 16.13<br>42.53 | 17.21<br>46.13 | 18.29<br>49.76 | 19.37<br>53.42 |                |

Please note: These figures are a guide only and will be dependent on the mould configuration used in manufacture. Discharge rates are calculated using Colebrooke-White equation for a fully wetted perimeter under uniform flow conditions and assuming a flat invert culvert unit. The assumed laying gradient (s) is 1:1000 with a roughness co-efficient (k) of 0.3. Where different values may be required, please contact the office number below to discuss your specific requirements. The hydraulic design of a box culvert should always be undertaken by the overall scheme designer, as they are able to take into account the upstream and downstream conditions and other parameters such as freeboard, restriction due to silt build-up and need for the culvert to be free flowing at all times. Due to the lack of this information, FP McCann will only give discharge rates for an idealised culvert, which may not suit the local conditions.



## INSTALLATION GUIDELINES

For installation and jointing details, refer to the Box Culvert Installation Guide which can be downloaded from our website.

## DESIGN CRITERIA

Design loading criteria is generally specified by the scheme engineer and ideally should include, as a minimum, the information below:

- Internal span
- Internal height
- Metres required
- Number of runs
- Minimum depth of fill over the culvert unit
- Maximum depth of fill over the culvert unit
- Culvert usage
- Surface loading conditions : green field, highway etc
- Invert type

**Exposure conditions should be specified and, where available, design codes provided.** Further design requirements may be required for inlet/outlet points, access holes and end walls.





#### **ELLISTOWN**

Whitehill Road  
Ellistown  
Leicestershire  
LE67 1ET  
T 01530 240000  
sales@fpmccann.co.uk

#### **MAGHERAFELT**

16-18 Quarry Road  
Knockloughrim  
Magherafelt  
BT45 8NR  
T 028 7954 9026  
sales@fpmccann.co.uk

#### **AGRICULTURE**

Lydney 01594 847500 Magherafelt 028 7954 9026

#### **ARCHITECTURAL PRECAST**

London 020 3905 7640

#### **BUILDING PRODUCTS**

Cadeby 01455 290780

#### **BOX CULVERTS**

Weston Underwood 01335 361269

#### **DRAINAGE**

Ellistown 01530 240000 (England/Wales) Magherafelt 028 7954 9026 (Scotland/NI)

#### **DOCK LEVELLERS**

Weston Underwood 01335 361269

#### **FENCING**

Cadeby 01455 290780

#### **FILTER BED SYSTEMS**

Littleport 01353 861416

#### **FLOORING**

Weston Underwood 01335 361269 Uddingston 01698 803300

#### **POWER & INFRASTRUCTURE**

Cadeby 01455 290780

#### **RAIL**

Cadeby 01455 290780

#### **SPECIALIST PRECAST**

Littleport 01353 861416

#### **STRUCTURAL PRECAST**

Byley 01606 843500

#### **TANKS & CHAMBERS**

Wellesbourne 01789 336960

#### **TUNNELS & SHAFTS**

Cadeby 01455 290780

#### **WALLING**

Lydney 01594 847500 Grantham 01476 562277

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