

## Asset International SS

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**Roads and Bridges**  
**Agrément Certificate**  
**91/R059**  
**Product Sheet 1**

## MP100 AND MP200 CULVERTS

### PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to MP100 and MP200 Culverts, corrugated galvanized steel bolted segmental structures.

### AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to Highways Agency Requirements
- factors relating to compliance with Regulations where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



### KEY FACTORS ASSESSED

**Seam strength** — satisfactory seam strength can be achieved (see section 6).

**Durability** — available evidence indicates that if the product is designed and installed in accordance with BD 12/01 a 120 year life can be achieved (see section 8).

The BBA has awarded this Agrément Certificate to the company named above for the product described herein. This product has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Simon Wroe  
Head of Approvals — Materials

Greg Cooper  
Chief Executive

Date of First issue: 3 September 2008

Originally certificated on 22 January 1991

*The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at [www.bbacerts.co.uk](http://www.bbacerts.co.uk)*

*Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.*

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# Highways Agency Requirements

The requirements for the design and construction of corrugated steel buried structures must be in accordance with the following documents:

- Design Manual for Roads and Bridges BD 12/01 *Design of Corrugated Steel Buried Structures with Spans Greater Than 0.9 metres and up to 8.0 metres*
- Manual of Contract Documents for Highway Works, Volume 1 (MCHW1)<sup>(1)</sup> *Specification for Highway Works, Series 600 Earthworks, Clause 623<sup>(2)</sup> Earthworks for Corrugated Steel Buried Structures and Series 2500 Special Structures, Clause 2501<sup>(3)</sup> Corrugated Steel Buried Structures.*

(1) The MCHW is operated by the Overseeing Organisations: The Highways Agency (HA), Transport Scotland, the Welsh Assembly Government and The Department for Regional Development (Northern Ireland).

Notes: Also see relevant notes for Guidance

(2) NG623.

(3) NG2501.

## Regulations

### Construction (Design and Management) Regulations 2007

### Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 2 *Manufacture and quality control* (2.1), 3 *Delivery and site handling* (3.2 to 3.4) and 9 *General*.

## General

This Certificate relates to MP100 and MP200 Culverts, corrugated galvanized steel bolted segmental structures for use in accordance with BD 12/01.

The design and construction must be in accordance with the requirements of the Highways Agency, acting on behalf of the Department for Transport, Transport Scotland, the Welsh Assembly Government and the Department for Regional Development, Northern Ireland; and the conditions set out in the *Design Considerations* and *Installation* parts of this Certificate.

The culverts should only be installed by installers approved by the Certificate holder.

## Technical Specification

### 1 Description

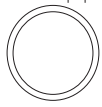

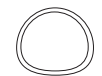
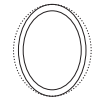
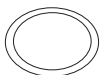

1.1 MP100 and MP200 Culverts are formed from steel to BS 1449-1.8 : 1991, Grade HR4 with a minimum yield strength of 229 Nmm<sup>-2</sup>. The steel plates are pressed, punched and then hot-dip galvanized to BS EN ISO 1461 : 1999 (see Table 1).

1.2 The culverts are available in a range of steel thicknesses, corresponding galvanizing specifications and bolt hole configurations (see Table 1).

Table 1 Steel galvanizing and thicknesses

Culvert	Steel base plate thickness (mm)	Average galvanizing thickness (µm)
MP100	1.50	43
	2.00	43
	2.50	43
	3.00	43
MP200	2.75	55
	3.00	70
	3.25	70
	4.00	70
	4.75	70
	5.00	70
	5.50	70
	6.00	85
	6.25	85
7.00	85	
8.00	85	

1.3 The culverts are available in a range of shapes and sizes, conforming to those permitted in BD 12/01 (see Table 2).

Table 2 Product range			
Profile	MP100 size range (m)	MP200 size range (m)	Some typical uses
Round pipe: 	Diameter 0.9–3.2	Diameter 1.5–8.0	Culverts, underpasses, service, recovery tunnels piling or back shutters
Pipe arch: 	Span 1.0–4.13	Span 1.8–8.0	Culverts, tunnels or re-lining where headroom is limited
Underpass: 	Span 1.0–4.13	Span 2.0–8.0	Underpasses beneath embankments for pedestrians, livestock or vehicles, culverts
Vertical ellipse: 	Span 0.9–3.2	Span 1.5–8.0	Culverts, underpasses, service tunnels or vehicle tunnels
Horizontal ellipse: 	Span 1.0–4.0	Span 1.9–8.0	Culverts or tunnels where headroom is limited
Arch: 	Span 0.9–3.5	Span 1.0–8.0	Culverts, tunnels or re-lining

1.4 Assembly bolts for MP200 Culverts have round heads and 20 mm diameter threads, and are available in lengths of 40 mm, 50 mm and 65 mm. The bolts and nuts are produced to BS EN ISO 898-1 : 1999 and BS EN 20898-2 : 1994 respectively, and hot-dip galvanized to BS EN ISO 1461 : 1999.

1.5 Assembly bolts for MP100 Culverts have hexagonal heads and 16 mm diameter threads and length of 32 mm. The bolts and nuts are produced to ISO 272 : 1982, and hot-dip galvanized to BS EN ISO 1461 : 1999.

1.6 A secondary protective coating system as defined in BD 35/99 (DMRB 2.4.1) is applied to all galvanized steel surfaces. The protective coating meets the minimum requirements as defined in BD 12/01, Chapter 8, clause 8.3.

## 2 Manufacture and quality control

2.1 Pre-cut sections of steel plate are punched, corrugated and curved to the required shapes on a large capacity brake press. Each section is then pretreated and hot-dip galvanized to the required specification to BS EN ISO 1461 : 1999.

2.2 The steel plate, zinc, assembly nuts and bolts are obtained from quality-assured suppliers, approved to BS EN ISO 9001 : 2000.

2.3 Quality controls include visual and dimensional checks on the incoming steel, galvanized sections and secondary protective coating.

## 3 Delivery and site handling

3.1 Culvert sections are delivered to site 'nested' in bundles of up to two tonnes in weight, complete with all bolts and nuts necessary for erection. Each bundle bears a code assembly number, the BBA identification mark incorporating the number of this Certificate, and installation instructions showing the order of assembly and the position of each plate in the structure.

3.2 Reasonable care must be taken during unloading and erection to avoid damage. Lifting equipment should have padded contact areas or nylon slings, and the sections should not be dropped or dragged.

3.3 For ease of installation, during unloading all sections should be sorted for correct placement sequence on the basis of their radii and location in the structure.

3.4 On site, sections should be stored on a firm, dry base, fully supported on bearers and away from the possibility of damage.

# Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on MP100 and MP200 Culverts.

## Design Considerations

### 4 General

4.1 MP100 and MP200 Culverts with a secondary protective coating are satisfactory for use as corrugated steel buried structures in accordance with BD 12/01.

4.2 The culvert specification must be designed in accordance with BD 12/01 to give an overall life of 120 years, taking into consideration any proposed loadings, corrosivity classification of the surroundings, atmospheric environment and the amount of water flow approved for use.

#### Secondary protective coating

4.3 The secondary protective coating applied to the galvanized steel surfaces meets the minimum requirements as detailed in Chapter 8, Clause 8.3 of BD 12/01.

4.4 The life of the secondary protective coating system should not be taken into account when calculating the required sacrificial steel thickness in accordance with BD 12/01, Clauses 8.10 to 8.13.

#### Invert protection

4.5 Where specified, an invert system complying with the minimum requirements of BD 12/01, Chapter 8, Clause 8.14, should be installed.

### 5 Practicability of installation

The product should be installed by installers approved by the Certificate holder.

### 6 Seam strength

Tests conducted by an independent laboratory show that MP100 and MP200 Culverts, in the various thicknesses and bolt configurations, have adequate longitudinal compressive seam strengths (see section 15 — Table 3, *Seam strength compression test results*).

### 7 Maintenance

No maintenance of the product is required to achieve the durability stated in section 8.

### 8 Durability

The installation should be designed to achieve a 120 year life using the criteria defined in section 4.

## Installation

### 9 General

The installation of MP100 and MP200 Culverts should be conducted in accordance with the procedures detailed in BD 12/01 and Asset International's *Design Manual*.

### 10 Excavation and base preparation

Excavation for the bedding and trench should be conducted in accordance with Chapter 9 of BD 12/01.

### 11 Construction

11.1 The assembly method used to construct MP100 and MP200 Culverts should be chosen to suit site conditions and the shape and size of the culvert. There are three basic methods:

- plate-by-plate assembly — the structure is assembled directly on the prepared bedding in a single plate-by-plate erection sequence, commencing with the bottom plates, then the sides and finally the top
- component sub-assembly — the bottom plate, the side plate and the top plate sections are assembled separately away from the bedding. This allows the foundation and bedding operation to be carried out at the same time as the sub-assembly operation
- complete pre-assembly — the structure is assembled at either the factory or the construction site and then lifted intact onto a prepared foundation and bedding. This pre-assembly technique is essential for installations under submerged bedding conditions.

11.2 Initially structures are assembled with as few bolts as possible. Normally three or four untightened bolts are fitted near the centre of each side and end of each plate. The plates are overlapped by one corrugation and the curved surface of the nut is always placed against the plate.

11.3 After part of the structure has been assembled into shape by partial bolting, the remaining bolts are inserted from the centre seam to the corners and progressively tightened. The torque range is 135 Nm to 270 Nm in the case of MP200, and torque of 100 Nm to 160 Nm for MP100 structures.

## 12 Backfill

The structural backfill materials should be granular type soils complying with the requirements of the MCHW1 Series 600 and selected in accordance with sections 9.10 to 9.17 of BD 12/01. The fill material under the haunches and around the structure should be placed in alternate layers 150 mm to 300 mm thick on both sides of the pipe and a thorough uniform compaction achieved by hand or mechanical equipment such as tamping rollers or vibrating compactors, depending on site conditions (in accordance with the *Asset Design Manual*). After the minimum cover requirements of the design have been met and the structure is firmly in place, further filling to grade may continue using procedures applicable to regular embankment construction.

## 13 Invert

The reinforced concrete invert should be installed in accordance with Chapter 13 *Concrete Invert Paving for Closed Invert Structures* of BD 12/01 in maximum cast lengths of 10 m.

## 14 Repair

14.1 Any damaged or exposed cut areas should be treated using a zinc-based paint applied in accordance with the Certificate holder's instructions.

14.2 Damage to the secondary protective coating system can be repaired on site by re-applying the system in accordance with the manufacturer's instructions.

# Technical Investigations

## 15 Tests

Tests in accordance with Appendix A<sup>(1)</sup> of BD 12/88<sup>(2)</sup> for seam strength of longitudinal bolted plate assemblies in various bolt configurations were conducted by an independent laboratory. The results are summarised in Table 3.

(1) Appendix A of BD 12/88 has been replaced by BD 12/01, Annex B *Longitudinal Seam Strength for Bolted Segmental Structures*.

(2) BD 12/88 has been replaced by BD 12/01, and MP100 and MP200 Culverts comply with this Standard.

*Table 3 Seam strength compression test results*

Culvert	Base plate thickness (mm)	No of bolts per corrugation	Average seam strength (kNm <sup>-1</sup> )	
MP100	1.50	1	227	
		2	425	
	2.00	1	261	
		2	472	
	2.50	1	323	
		2	602	
	3.00	1	486	
		2	888	
	MP200	2.75	2	582
			3	657
4			719	
2			667	
3.00		3	738	
		4	827	
		2	752	
		3	819	
4.00		4	934	
		2	961	
		3	1264	
		4	1368	
4.75		2	1255	
		3	1428	
		4	1784	
		2	1354	
5.00		3	1561	
		4	1915	
		2	1584	
		3	1872	
6.00	4	2221		
	3	1996		
	4	2402		
	3	2049		
6.25	4	2479		
	4	2859		
8.00	4	3188		

## 16 Investigations

16.2 The manufacturing process was examined, and details were obtained of the quality controls conducted on the raw materials and finished products, the material specifications and the method of manufacture.

16.3 A visit was made to a site in progress to assess the practicability of installation.

## Additional Information

The management systems of Asset International have been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2000 and QAS 3138/294 by British Standards Institution Quality Assurance, Certificate No FM 01453.

## Bibliography

BS 1449-1.8 : 1991 *Steel plate, sheet and strip — Carbon and carbon-manganese plate, sheet and strip — Specification for hot rolled narrow strip based on formability*

BS EN 20898-2 : 1994 *Mechanical properties of fasteners — Nuts with specified proof load values — Coarse thread*

BS EN ISO 898-1 : 1999 *Mechanical properties of fasteners made of carbon steel and alloy steel — Bolts, screws and studs*

BS EN ISO 1461 : 1999 *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

BS EN ISO 9001 : 2000 *Quality management systems — Requirements*

ISO 272 : 1982 *Fasteners — Hexagon products — Widths across flats*

*Manual of Contract Documents for Highway Works, Volume 1 : Specification for Highway Works : May 2001 edition (as amended)*

BD 12/88 *Corrugated Steel Buried Structures*

BD 12/01 *Design of Corrugated Steel Buried Structures with Spans Greater Than 0.9 metres and up to 8.0 metres*

## 17 Conditions

17.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

17.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

17.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate
- remain in accordance with the requirements of the Highways Agency.

17.4 In granting this Certificate, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

17.5 Any information relating to the manufacture, supply, installation, use and maintenance of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.

