Structural Precast Products
FOR THE CIVIL ENGINEERING SECTOR
Hanson Building Products provides structural precast concrete solutions and products for civil engineering, commercial and domestic applications.

In addition to our dedicated flooring products the company designs, manufactures and supplies non-standard structural precast components to clients’ specifications.
By taking an active involvement in the design work to offer value engineered solutions, Hanson Building Products is able to offer a competent and economic service, to provide quality assured units to a wide range of bespoke precast concrete structures. These include:

- Box culverts and channel sections
- Omnia Bridgedeck
- Beams
- Columns
- Wall and floor panels
- Sandwich panels
- Bespoke units to a maximum handling capacity of 24 tonnes.

Specialist structure precast concrete components can be incorporated into a wide range of applications.
Box Culverts

PRODUCT OVERVIEW

Easy to install, suitable for very shallow or deep fill, ideal for use in a wide variety of civil engineering applications.

Hanson Building Products is the largest producer of box culverts in the UK, and are members of the Box Culvert Association. Since its introduction over 45 years ago the range of box culverts we offer has continued to expand.

Whilst offering increased flexibility Hanson Box Culverts retain all their original advantages. They are easy to install and can be made to suit very shallow or deep fill. They also offer economy by being uniquely designed for particular loading conditions and are efficiently produced in standard sizes.

As these advantages have become widely recognised their range of applications has increased making them ideal in a wide variety of civil engineering applications.
Box Culverts benefits

- **Flexibility of range to accommodate almost any size requirement**
  - Availability of multi-cell sections
  - Use with shaped invert for dry weather flow situations eg. sloping vee and half round

- **Ease of installation**
  - Can be laid as singles or in multiple runs

- **Accommodation of high storage volumes**

- **Box culvert design specific to client requirement**
  - Qualified technical department with CAD facilities, available to assist at all stages with design specification and contract development

- **Quality Service Guaranteed**
  - Available nationwide on a supply only basis
  - Complies with all relevant standards and manufactured in accordance with ISO 9001 and 14001

Hanson Box Culverts are available in a range of 144 standard sizes from 1000mm x 600mm to 6000mm to 3600mm. Non-standard sizes and internal profiles can also be readily provided including shaped inverts, dwf channels, and units with cross over channels.

Reference to our table of standard sizes will give the size necessary to meet any conditions which may be required in terms of storage volume, flow capacity etc. For larger culvert widths, twin or multiple sections may also be considered.

Unlike pipes and corrugated steel assemblies, box culverts can be designed to carry vertical load without the relieving effect of side pressure.

Therefore, when culverts are used in multiple sections, they can be laid side by side with only a nominal gap between them.

By comparison with arched or circular sections no flow area is lost through either excessive spacing apart or curved profiles.
Hydraulic design

Discharge rates for box culverts in the Hanson standard range are calculated for a gradient of 1 in 1000 in accordance with the Colebrook-White equation assuming the culvert running full under uniform flow conditions. Comparable discharge rates for circular pipes are given in the Table 2 (overleaf).

For any gradient between 1 in 1000 and 1 in 250, the gradient multiplier (Table 3 overleaf) should be applied.

A value of 0.3mm has been assumed for roughness coefficient, ks, which depends upon the accuracy of laying and jointing in addition to the quality of the culvert surface. Where a different value is required, the discharge rate at the appropriate gradient should be adjusted by the use of the roughness multiplier (Table 4 overleaf).

Thus, for a 2400 x 1200 section laid at a gradient of 1 in 500 and with an assumed roughness coefficient of 0.6mm, the discharge rate is given by $4.29 \times 1.4 \times 0.93 = 5.59\text{m}^3/\text{s}$.

The flow capacity of a culvert is determined by a number of different factors. In addition to the gradient and roughness coefficient, the geometry of the inlet and outlet and the tailwater level can affect the mode of flow and may prevent the culvert from running full or under uniform flow conditions.

In such cases the flow capacity will be lower than the full discharge rate.
Surface loading and fill depth

Loading applied at the ground surface and weight of fill material produce a combination of vertical and horizontal forces on the box culvert.

Surface loading may be specified as a standard loading type, equivalent uniform loading or individual wheel loads. The critical load on a culvert can occur at minimum or maximum fill.

Each enquiry for a culvert should state the minimum and maximum fill depth and the amount or type of surface loading.

It is recommended that the minimum fill depth should be not less than 200mm or one fifteenth of the internal width of the culvert if this is greater.
# Box Culverts

TECHNICAL DATA

Please size by span x height. All dimensions are internal

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Notes:
1. The standard range of box culverts generally have flat inverts and 190mm corner splays up to 4800mm span and 225mm splays from 5100mm to 6000mm span and a maximum length of 2m.
2. Sizes other than those stated can be manufactured to suit customer requirements.
3. Special internal profiles, shaped inverts and dry weather flow channels can be produced and are available on request.
4. Tapered units for bends, units with manhole openings and pipe access holes can be produced and are available on request.

5. All box culverts are manufactured to order and to the specific required design criteria, the external loading conditions will govern the wall, roof and floor thickness, unit length and reinforcement content.

6. Joints are a standard rebate within the wall of the unit and the box culverts can be jointed using sealant strip to provide a seal and flexible joint if required.

7. Special insert pins are cast in to each box culvert to enable them to be lifted.

8. Channel units can also be produced if required.

For more technical information please contact Hanson Building Products
Tel: 0870 609 7094
Box Culverts
INSTALLATION GUIDE

Delivery and offloading

It is the contractors responsibility to offload the box culverts on delivery. A hard level access area should be provided which can be used safely by standard articulated delivery vehicles. The contractor should provide a suitable crane of adequate capacity for lifting the culvert.

For reasons of safety and economy certain box culverts are delivered to site on end rather than as laid, and will require a safe method of turning during offloading. A data sheet giving guidance of lifting and turning is available and is issued to clients prior to the first delivery.

The offloaded box culverts should be levelled carefully on a firm level base away from the edge of the trench, and if any further movement is required it should be by lifting; the culvert should never be dragged or dropped.

Bedding, laying and backfilling

Excavation can be kept to a minimum with only nominal working space required on each side of the box culvert. When working in trenches the normal requirements for health and safety must always be observed.

The base of the trench should be uniformly prepared before laying a 200mm bedding of compacted granular material over the full width of the trench. A surface blinding of the fine material will assist levelling. Local packings are subject to settlement and should not be used.

As an alternative to granular bedding a concrete blinding layer is sometimes preferred to protect the formation or to allow a faster rate of laying the culverts.

A layer of unreinforced concrete approximately 75mm thick on a trench bottom which has been well prepared to provide a uniform support is generally sufficient.

A culvert line is usually laid directly on the bedding starting from the downstream end with the sockets facing upstream, to receive the next culvert.

The trench should be backfilled as soon as possible after the culvert has been laid and it should be filled evenly on each side of the trench. Backfilling should continue in 200mm compacted layers to reach the required depth of cover.

Where loads from construction plant may exceed the design load of the box culvert protective measures will be required. This is particularly relevant at shallow fill depths.
Jointing

The culvert sections generally have rebated joints and can be laid open, or sealed using preformed strips and/or pointing materials. Reference should be made to the jointing material manufacturer’s specification and recommendation for use of the product.

A system using preformed strip within the joint is most commonly used. When the strip is bitumen based the joint faces should be cleaned, primed and allowed to dry.

The strip is then applied to the internal corner of the socket just before the culvert is laid in the trench.

Joints are closed to a nominal gap by pulling against previously laid culverts with an applied load of approximately one tonne per metre of strip plus about half of the weight of the culvert unit to overcome base friction, less if the unit is suspended from the crane whilst jointing.

Heat may be required to soften the strip when working at low temperature.

When the box culvert is of sufficient size for access, it can be pointed internally with an elastomeric or bitumen based material using a suitable primer. Not all methods of jointing, however, should be expected to be completely watertight.
Omnia Bridge Deck

PRODUCT OVERVIEW

Provides a solid base for deck slabs on Civil Engineering structures

Omnia Bridge Deck

Hanson Building Products has supplied Omnia Bridge Deck for numerous projects to most civil engineering contractors.

Omnia Bridge Decking is a practical and economical means of providing permanent formwork to deck slabs of bridges, especially where these span over live roads, rail tracks and rivers.

Omnia Bridge Decking can be considered as participating formwork, and the concrete and reinforcement in the pre-cast plank taken as part of the deck with corresponding cost savings compared to traditional methods of construction.
Omnia Bridge Deck Benefits

- **Practical and economical**
  - Can be designed to cope with splayed and curved structures
  - Each panel is designed to suit its specific location

- **Fully participating**
  - Omnia Bridge Decking can be considered as participating formwork, if required

- **Easy to handle, simple to lay**
  - Panels are lifted into place without the need for slings
  - Minimises road/rail closures

- **Saves time and money on site**
  - Concrete and reinforcement in the precast Omnia unit may be taken as part of the deck with corresponding savings

- **Quality service**
  - Factory-manufactured to consistent quality standards
  - Complies with all relevant standards
  - Omnia Bridge Deck is manufactured to all relevant British Standards and the ‘Specification for Highway Works’
The planks are primarily designed to cope with temporary condition loads only, however it is very often the case that Bridge Designers use the reinforcement provided as part of the permanent works design, and furthermore often ask us to increase the amount of reinforcement in the plank thereby saving reinforcement in the in-situ portion.

Hanson Building Products design the planks to carry construction loading but also limit deflections to span/400 and crack widths to 0.1mm in the temporary case.

Wherever possible, the correct size of lattice girder will be selected to provide a chair for the top mat of reinforcement and they are aligned during manufacture to ensure ease of fixing longitudinal reinforcement over the Omnia planks.

There will normally be 3 or 4 reinforcing bars cast within each plank, minimum 10mm diameter, maximum 16mm diameter.

The Interim Advice Note (IAN 74/06) allows 35mm cover to the reinforcement at the soffit.

Threaded anchors can also be cast into the planks for supporting lighting, drainage etc.

A typical cross section of a Bridge Deck plank shows the arrangement of the lattice girder and the reinforcement within the precast concrete.
**Manufacture**

Omnia Bridge Deck is manufactured to all relevant British Standards and the 'Specification for Highway Works', using C40/50 concrete in planks 300mm wide x 60mm deep, although special widths can be manufactured up to 600mm wide for use as infill panels at transverse beams or abutments.

Each 300mm wide Omnia Bridge Deck plank has an Omnia lattice girder centrally placed and the plank is reinforced with either 3 or 4 steel bars 10-16mm dia.

The upper surface of the Omnia planks has a Class 2 finish as required by the 'Specification for Highway Works' to expose the aggregate.

This surface accommodates the horizontal shear stresses at the precast/in-situ interface. The manufacturing tolerances and soffit finish (Type F2), are also as specified and the production process is controlled by the procedures set out in our model specification.

The Omnia lattice girder is at the heart of all of the Omnia product range and is responsible for ensuring that the panels will span the required distance in the temporary condition. The lattice also acts as a physical link between the precast panel and the in-situ portion, and as lifting points during erection. We will also endeavour wherever possible to provide a lattice girder that is set at the correct height for placing of the top mat of reinforcement.

**Dimensions**

Omnia Bridge Decking can be manufactured in lengths up to 3.80m and depending on the overall slab depth can be used for clear spans of 3.69m with a preferred bearing of 55mm at each end.

The graph below shows the maximum clear span for a range of span depths. Please contact the office for spans and depths outside of this range.

The long edges are formed with a chamfer to the underside, so that when placed adjacent to each other, the effect of a birds-mouth joint at 300mm centres can be seen on the soffit.

Planks can be manufactured with skewed ends to suit the shape of the structure if necessary, however as the maximum plank length can be no greater than 3.80m, the clear span will be reduced.

Soffit Treatment

We can now offer Pavix CCC100 surface protection treatment applied at works, which meets the requirements of BD43/03.

Please contact us for a quotation.
Omnia Bridge Deck Planks are generally laid on Structural Steel beams, and whilst the details and recommendations below may apply to other structures, they are primarily written for Steelwork structures.

Preparation

Bearings
All bearings should be structurally acceptable before any Omnia planks are placed. Any variation in levels of bearing will need to be addressed prior to the planks being delivered.

Temporary Supports
Omnia Bridge Deck planks are always designed to be erected without any temporary props during the construction sequence.

Minimum Bearing Dimension
All planks will be designed to have a minimum bearing of 55mm both ends, therefore the minimum plank length will be ‘clear span + 110mm’ to a maximum of 3.80m.

Prevention of grout loss
We would recommend that flanges of steel that will be supporting Omnia Bridge Deck planks be treated to prevent grout loss when pouring the in-situ section of the slab. We would suggest a 12mm deep bituminised compressible strip available from a number of sources including Illbruk Alfas at Washington (0191-419-0505).

Safety Notes

Notwithstanding the above, propping may be necessary in the following circumstances:
- Where the top or diagonal bars of the Omnia lattice has been cut or damaged.
- Where the bearings are not true and or level.
- Where a bearing of less than 40mm is provided
- Cantilever sections and adjacent to the edges of large openings.

Delivery

Omnia Bridge Deck planks are generally delivered on articulated vehicles paletted in batches of 24 planks (6 deep x 4 wide) and will be delivered to a previously agreed sequence of planks and times/dates. Depending on the spans of the planks, each delivery will have approx. 130m² of planks. Except where agreed previously, the first delivery of planks will come with a lifting frame which should be used to lift a layer of planks.

Offloading

We would recommend that full pallets of planks are offloaded adjacent to their ultimate position on the structure, and then each layer is lifted and placed in position at a later date.

All personnel who are required to be on the trailer bed whilst on site should be protected from falling from height in accordance with “The Work At Height Regulations”.

A lifting frame will normally be provided to suit 4 planks and will weigh approx 500kg, however if required, a larger frame can be provided (weighing approx. 750kg) to lift 8 planks, in which case pallets need to be placed adjacent to each other.
Lifting Weights

Each plank weighs 36kg/m and each pallet will normally have 24 planks. The pallet weight will need to be calculated prior to uplifting from the vehicle, and the layer weight of 4 (or 8) planks will need to be calculated before lifting to the structure.

**Pallet Weight**
A pallet of 24 planks 3.60m will weigh: 24 x 3.60m x 36kg/m = \(3110\)kg

**Use the calculator below...**

\[ \text{Planks x } \text{m} \times 36\text{kg/m} = \text{kg} \]

**Layer Weight**
A layer of 4 planks 3.20m long plus frame will be:

\[ 4 \times 3.20m \times 36\text{kg/m} = 461\text{kg plus }500\text{kg frame} = 960\text{kg} \]

\[ 4 \text{ planks } \times \text{m} \times 36\text{kg/m} = \ldots + 500\text{kg} = \ldots \]

A layer of 8 planks 3.40m long plus frame will be:

\[ 8 \times 3.40m \times 36\text{kg/m} = 979\text{kg plus }750\text{kg frame} = 1729\text{kg} \]

\[ 8 \text{ planks } \times \text{m} \times 36\text{kg/m} = \ldots + 750\text{kg} = \ldots \]

Slab Completion

**Placing in position**
Panels lifted in sets of 4 will be approx 1200mm wide (8 planks will be 2.40m wide) and will need to be butted together to close any gap between them, minimising the risk of grout loss. It is recommended that a method of setting adjacent ‘sets’ be adopted so that each set is placed at 1200mm dimensions. This will keep the layout of the planks close to that on the drawing, the amount of gaps to a minimum, and reduce the risk of any cutting or make-ups due to creep.

**Protection against falls**
In line with the FFF Code of Practice, the erection of Omnia units will be subject to the application of a hierarchy of safety systems as recommended by the HSE. There are a range of measures available from passive systems such as working platforms, staging, safety nets and air bags to active systems such as work restraint/fall arrest using safety harnesses.

**Joint Grouting**
Joints will need to be addressed to prevent grout loss during concreting. Various methods can be used, and we would suggest a bead of sand/cement grout towelled along all joints.

**Placing of Reinforcement**
Reinforcement will need to be placed in accordance with the Structural Engineers requirements and one layer may need to be threaded through the diagonals. Other layers are placed between and over the lattice.

**Concreting**
The slab will then be concreted in accordance with the Structural Engineers specification.

**Erection**

**Handling**
Units must be lifted and placed without jerking to prevent cracking to the panel or damage to the lattice.

Always lift Omnia panels by the lattice with the hooks positioned under the diagonal.

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**Concreting**
The slab will then be concreted in accordance with the Structural Engineers specification.
Hanson have developed a suite of prefabricated panels which include precast concrete, masonry or composite panels of brick/block and concrete with or without insulation.

These may be used for retaining walls, parapets, bridge abutments, flood defence systems or as both external and internal walls for buildings.

Where speed of construction and a high quality finish are necessary, Hanson’s QuickBuild™ and FloodWall™ products provide rapid installation of finished masonry components. Wall panels may consist of single leaf masonry of clay brickwork, concrete blockwork or natural stone, or a composite precast concrete/masonry construction. Wall lengths can vary up to 9m.
QuickBuild™/Floodwall™ Benefits

- **Off-site factory production**
  - Consistent quality factory finish
  - Wall lengths up to 9m available
  - Brickwork, blockwork or natural stone options

- **Enhanced strength characteristics**
  - Sheet piled or reinforced concrete structural wall
  - Watertight construction
  - Full bricks or slips may be used
  - Tried and tested materials

- **Saves time and money on site**
  - Virtual elimination of formwork
  - Reduced scaffolding requirement
  - No wet trades required
  - No down time due to inclement weather

- **Environmental benefits**
  - Sustainably produced, environmentally stable product
  - Reduced noise during construction
  - No wet trades working adjacent to a watercourse
Bespoke Products
EXPERTISE AND CAPABILITIES

In addition to core product ranges Hanson provides a comprehensive design and manufacturing service, supplying bespoke precast concrete components to the civil engineering sector, public utilities and local authorities.

Hanson facilities include three sites in the Midlands with the capability of producing single component units up to 24 tonnes. These are at Derby, Hoveringham and Cotes Park, Derbyshire.

Mould manufacturing, reinforcement, cutting, bending and cage fabrication are all generally completed in-house.
Benefits of using precast concrete solutions

- Cost savings on site programme
- Factory controlled processes; engineered products to recognised 3rd party quality assured standards
- Efficiency of thermal mass
- Inherent fire protection
- Low whole-life cost benefits

Typical bespoke structures

- **Bridge structures**
  - Deck slabs
  - Edge beams
  - Parapets etc

- **Marine & Sea Defence Works**
  - Flood retaining walls etc

- **Stadia**
  - Terraces
  - Staircases
  - Dormitory walls
  - Raker beams etc

- **Railway Schemes**
  - Platform units
  - Specialist culverts for jacking etc

- **Frame Structures**
  - Beams
  - Columns
  - Edge beams
  - Spandrels etc

- **Bespoke specialist items**
  - Digester tanks
  - Towers etc
The Floors and Precast Division of Hanson Building Products now operates from a total of three dedicated plants located in the Midlands.

All three sites – Hoveringham (near Nottingham), Derby, and Cotes Park in Derbyshire – are directly involved in the manufacture and supply of Box Culverts, Omnia Bridge Deck and Bespoke Products.

These central locations enable us to provide a fast and efficient service of structural precast products to sites throughout the country.

Standards

All products are manufactured in accordance with relevant British/European/Trade Association Standards. All Hanson Building Products sites are quality assured to BS EN ISO 9001:2000.

We operate environmental management systems at all our production sites in accordance with the methodology set out in the BS EN ISO 14001:2004.

Other precast concrete products

- Jetfloor
- Beam and Block
- Staircases
- Hollowcore
- Omnia products

For structural precast concrete solutions please contact us at:

Hanson Building Products
Birchwood Way
Cotes Park Industrial Estate
Alfreton, Derbys UK
Tel: 0870 609 7094

Hanson Building Products Floors and precast locations

- Omnia Bridge Deck production
- Bespoke Structures and Box Culverts
Our companies and products

Hanson UK is split into three business lines – Hanson Quarry Products, Hanson Cement and Hanson Building Products. We also offer a range of contracting services. For detailed information on all areas of Hanson and our products visit: [www.hanson.com/uk](http://www.hanson.com/uk)

### Hanson Quarry Products
- Crushed rock
- Sand and gravel
- Asphalt
- Contracting
- Ready-mixed concrete
- Ready-mixed mortar
- Screed
- Civil engineering

### Hanson Cement
- Bulk cement
- Ground granulated blastfurnace slag (GGBS)
- Pulverised fuel ash (PFA)
- Packed products

### Hanson Building Products
- Bricks
- Blocks
- Precast concrete products
- Permeable paving (SUDS)
- Chimneys and roofing
- Cladding
- Off-site solutions
- Specialist brick and block laying

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** logos [THERMALITE, CRADLEY, RED BANK, Formpave]
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Maidenhead
SL6 4JJ

Website: www.hanson.com/uk

Floors and Precast Division
0870 6097094

Hanson - A global business

Hanson is one of the world’s largest suppliers of heavy building materials to the construction industry. We produce aggregates (crushed rock, sand and gravel), ready-mixed and precast concrete, asphalt and cement-related materials and a range of building products including concrete pipes, concrete pavers, tiles and clay bricks.

We are part of the HeidelbergCement Group, which employs 70,000 people across five continents, has leading positions in concrete and heavy building products and is the global leader in aggregates.

Hanson Building Products is the UK’s largest brick and aircrete block producer. We also produce aggregate blocks, bagged aggregate and cement products, renders, pavers, pre-cast floors and stairs, SUD systems and prefabricated building systems. The division incorporates London Brick, Thermalite, Red Bank, Cradley, Formpave and Structherm.

Hanson Building Products - A sustainable business

Hanson Building Products is committed to being a sustainable business and contributing to sustainable development. We achieve this by continuous improvement of our manufacturing and extraction processes and by providing products which contribute to sustainable construction.

Made at factories certified to ISO 14001, our clay and concrete products have many features which assist our customers in constructing attractive, sustainable buildings which enrich the built environment and are ideal for zero carbon developments. These include: thermal mass, insulation, longevity, durability, low maintenance, flexibility, flood resistance and the ability to be recycled. We can advise on how best to use our products in sustainable buildings and how they contribute to high ratings under the Code for Sustainable Homes and BREEAM.

Email: sustainabilityuk@hanson.biz
Web: www.hanson.com/uk/sustainability

SP 01 | July 2010