## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>2</td>
</tr>
<tr>
<td>Brief History of Prestressed Bridge Beams</td>
<td>3</td>
</tr>
<tr>
<td>Banagher Precast Concrete Bridge Beam Types</td>
<td>4</td>
</tr>
<tr>
<td>M &amp; UMB Edge Beam - for Beam and Slab Construction</td>
<td>8</td>
</tr>
<tr>
<td>MY &amp; MYE Edge Beam - for Solid Slab Construction</td>
<td>10</td>
</tr>
<tr>
<td>Solid Box Beam</td>
<td>12</td>
</tr>
<tr>
<td>SY &amp; SYE Edge Beam</td>
<td>14</td>
</tr>
<tr>
<td>T Beam - for Solid Slab Construction</td>
<td>16</td>
</tr>
<tr>
<td>TB Beam - for Solid Slab Construction</td>
<td>18</td>
</tr>
<tr>
<td>TY &amp; TYE Edge Beam - for Beam and Slab Construction</td>
<td>20</td>
</tr>
<tr>
<td>TY &amp; TYE Edge Beam - for Solid Slab Construction</td>
<td>22</td>
</tr>
<tr>
<td>U &amp; SU Beam</td>
<td>24</td>
</tr>
<tr>
<td>W Beam</td>
<td>28</td>
</tr>
<tr>
<td>Y &amp; YE Edge Beam</td>
<td>32</td>
</tr>
<tr>
<td>Fibre Reinforced Concrete Permanent Shutter</td>
<td>34</td>
</tr>
<tr>
<td>Precast Parapet, Coping and Edge Beam details</td>
<td>36</td>
</tr>
<tr>
<td>Lifting and Handling Details</td>
<td>42</td>
</tr>
<tr>
<td>Delivery and Installation</td>
<td>44</td>
</tr>
</tbody>
</table>
Introduction

Banagher Precast Concrete is the largest precast concrete manufacturer in Ireland and the UK. Our track record in the field of precast concrete manufacture is exceptional. We have established an internationally recognised reputation for innovation in design, manufacture and installation of precast components.

The Banagher Precast Concrete team, comprising of experienced chartered structural engineers, graduates and technicians, is continually working on enhancing our range of products to meet the latest demands. We also offer early stage design assistance to consultant engineers and contractors.

- Trusted and experienced supply partner with vast experience. Bridge beams have been manufactured in Banagher for over 60 years.
- Largest Bridge beam manufacturing facility in Ireland and the UK with capacity to manufacture 2km of bridge beams per week.
- All beams are designed to British and Eurocode standards by our Design Team.
- All beam sections and profiles are available in BIM format.
- All Precast elements including Bridge Beams have CE marking and concrete is certified to EN 206. We operate and maintain ISO 9001 Quality Assurance standards.
- All our Bridge beam sections including the W beam and MY Beams (designed and developed by Banagher) are recognised and used in Computer Bridge Beam design packages.

Brief History of Prestressed Bridge Beams

Pretensioned prestressed concrete bridge beams were introduced into many countries in the period 1948 to 1995. In the period after the war, infrastructure which had been damaged or neglected had to be replaced. The newly developed pretensioning technique was put to use in the manufacture of beams which could be used for a variety of bridging and decking problems.

At first, manufacturers rushed in competition to develop their own sections, which provided choice but only at the provisional layout stage.

In some countries this was seen as a major disadvantage, compared with standard steel sections which could be specified and bought freely and competitively at the time of construction. Industry groups, with the blessing of National Authorities, removed this disincentive by developing a series of beam sections which could be made by any manufacturer. The Standard Bridge Beam was born.

In Ireland the first prestressed concrete bridge beam project was the "OB62 Dublin to Cork Line at Sallins" in 1952. It consisted of 15 number I Beams, 1440mm long weighing 4.5 tonnes. The beams were 560mm deep and 460mm wide with a prestressing force of 950 kilonewtons and 4 number prestressing bars per beam.

In the UK the first Standard beams were developed by the PCBG (Prestressed Concrete Bridge Development Group) and were an Inverted T beam for a solid slab deck, an I beam for a beam and top slab deck and a Box Beam for a voided deck. In the USA an I Beam, a Box beam and a Bulb T were similarly developed. The PCBG Inverted T beam is still made today, after 60 years of excellent service.

In the UK and Ireland by 1973, the M Beam, a larger version of the Inverted T beam for beam and slab and voided decks and a U Beam which provided a voided deck of more elegant appearance had been introduced.

By the mid 1980’s it became clear that although bridge beams were performing well, the joints between decks and their supporting abutments tended to leak and winter road salt was being allowed to penetrate down to bearing shelves and substructures causing corrosion damage. This problem applied to bridges of all forms of construction, insti concrete and steel included.

The way forward was to provide continuity in decks over supports of multi span bridges and at abutments.

For this and other reasons a new beam the Y Beam was introduced with variants for Solid Slab - TY Beam and slab - Y and for spans up to 40 metres - YY. At the same time, experience in the USA with a compromise form of continuity, Integral Construction, was brought across the Atlantic. This was followed by back up research and finally a presumption that Integral Construction should be used for all bridges of any material up to lengths of 60 metres.

Transport and crane capabilities have now increased to the extent that spans in excess of 45 metres can now be delivered and erected with beams weighing 150 tonnes. The Banagher Precast Concrete W Beam was brought to the market in 2005 and has successfully taken advantage of this change in scope.

The W Beam bridge beam was designed and developed exclusively by Banagher Precast Concrete. The first ever W Beam was produced by Banagher Precast Concrete in 2005 and was manufactured for the Kinsale Road Flyover on the outskirts of Cork City.

There was considerable research, design and investment required to bring this new and unique Bridge Beam to the UK and Irish markets. The W Beam was developed by Banagher Precast Concrete as a more economical solution to traditional bridge beam types existing in the market. It is also capable of spanning in excess of 45m, which is beyond the range of other beam types.

As well as these benefits the W Beam is inherently more stable during transportation and erection on site, thus providing better Health and Safety on sites.

A couple of years later in 2007 the MY Beam bridge beam was designed and developed by Banagher Precast Concrete. The MY Beam was developed as a more economical solution to traditional Inverted T Beam and Ty Beam type bridge beams which existed in the market place. For spans up to approximately 15m the MY Beam provides a more efficient solution than tradition beams, reducing the amount of precast concrete required. The MY Beam is a more environmentally friendly beam with a smaller carbon footprint than other beam types for similar spans.

The Pretensioned Prestressed Bridge Beam has been with us for nearly 70 years and with its original sound engineering background still has proven excellent durability to this day.
### Bridge Beam Type

<table>
<thead>
<tr>
<th>Beam Type</th>
<th>Span Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>M &amp; UMB Edge Beam</td>
<td>16 - 35m</td>
</tr>
<tr>
<td>MY &amp; MYE Edge Beam</td>
<td>9 - 19m</td>
</tr>
<tr>
<td>Solid Box Beam</td>
<td>10 - 35m</td>
</tr>
<tr>
<td>SY &amp; SYE Edge Beam</td>
<td>16 - 45m</td>
</tr>
<tr>
<td>T Beam</td>
<td>11 - 21.75m</td>
</tr>
</tbody>
</table>

#### Typical Applications
- **M & UMB Edge Beam**
  - Provides a voided bridge deck with a closed soffit for beam and slab construction for medium and long span bridges.

- **MY & MYE Edge Beam**
  - Solid slab construction for short and medium span bridges, road and railway overbridges.

- **Solid Box Beam**
  - Solid slab construction for short spans, railway overbridges, jetties, marine docks and loading bay construction.

- **SY & SYE Edge Beam**
  - Beam and slab construction for long span bridges.

- **T Beam**
  - Solid slab construction for short and medium span bridges, jetties, marine docks and loading bay construction.

#### Advantages
- **Very Efficient Span - Weight Ratio.**
- **A more economical solution to traditional T Beam and TY Beam Bridge Construction which exist in the market place.** Provides a flat soffit with no need for formwork.
- **A very robust bridge construction.**
- **Y Beam when the need for longer spans arises.** Practical and economical solution for spans up to 45m.

#### Typical Construction Details
- **Underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance.**
- **Good capacity for negative bending at supports.**
- **Followed on from the successful Y Beam when the need for longer spans arises.**
- **Very robust bridge construction.**

#### Photo
- Images of bridge beams and construction details.

---

The information provided below will enable our customers to make a preliminary assessment of the suitability of one or more beam types for a particular bridge design requirement. The detailed cross sections, section properties, notional load span tables and normal methods of use are given in the following pages.
# Banagher Precast Concrete Bridge Beams

## Bridge Beam Type | Span Ranges | Typical Applications | Advantages | Typical Construction Details | Photo
--- | --- | --- | --- | --- | ---
TB Beam  
For Solid Slab Construction | 11 - 23m | Solid slab construction for short and medium span bridges, jetties, marine docks and loading bay construction. | A very robust bridge construction. No need for formwork. Very good resistance in marine environments. Can be easily designed for continuity. | underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | ![TB Beam](image1.jpg)

TY & TYE Edge Beam  
For Beam and Slab Construction | 12 - 26.5m | Solid slab construction for short and medium span bridges. | Beam and slab construction for short and medium span bridges. | Underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | ![TY Beam](image2.jpg)

TY & TYE Edge Beam  
For Solid Slab Construction | 12 - 26m | Solid slab construction for short and medium span bridges, jetties, marine docks and loading bay construction. | A very robust bridge construction. No need for formwork. Very good resistance in marine environments. Can be easily designed for continuity. | Underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | ![TY Beam](image3.jpg)

U & SU Beam | 13 - 41.5m | Beam and slab construction for long span bridges, major motorway schemes. | Suitable for skew decks and areas where torsion is high. Visually pleasing. | | ![U Beam](image4.jpg)

W Beam | 17 - 50m | Beam and slab construction for long span bridges, major motorway schemes. | The W Beam was developed by Banagher Precast Concrete as a more economical solution to traditional bridge beam types existing in the market. It is also capable of spanning in excess of 45m, which is beyond the range of other beam types. As well as these benefits, the W Beam is inherently more stable during transportation and erection on site, thus providing for better Health and Safety on site. | | ![W Beam](image5.jpg)

Y & YE Edge Beam | 16 - 40m | Beam and slab construction for short and medium span bridges. | Underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | | ![Y Beam](image6.jpg)

## Bridge Beam Type | Span Ranges | Typical Applications | Advantages | Typical Construction Details | Photo
--- | --- | --- | --- | --- | ---
TB Beam  
For Solid Slab Construction | 11 - 23m | Solid slab construction for short and medium span bridges, jetties, marine docks and loading bay construction. | A very robust bridge construction. No need for formwork. Very good resistance in marine environments. Can be easily designed for continuity. | underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | ![TB Beam](image1.jpg)

TY & TYE Edge Beam  
For Beam and Slab Construction | 12 - 26.5m | Solid slab construction for short and medium span bridges. | Beam and slab construction for short and medium span bridges. | Underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | ![TY Beam](image2.jpg)

TY & TYE Edge Beam  
For Solid Slab Construction | 12 - 26m | Solid slab construction for short and medium span bridges, jetties, marine docks and loading bay construction. | A very robust bridge construction. No need for formwork. Very good resistance in marine environments. Can be easily designed for continuity. | Underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | ![TY Beam](image3.jpg)

U & SU Beam | 13 - 41.5m | Beam and slab construction for long span bridges, major motorway schemes. | Suitable for skew decks and areas where torsion is high. Visually pleasing. | | ![U Beam](image4.jpg)

W Beam | 17 - 50m | Beam and slab construction for long span bridges, major motorway schemes. | The W Beam was developed by Banagher Precast Concrete as a more economical solution to traditional bridge beam types existing in the market. It is also capable of spanning in excess of 45m, which is beyond the range of other beam types. As well as these benefits, the W Beam is inherently more stable during transportation and erection on site, thus providing for better Health and Safety on site. | | ![W Beam](image5.jpg)

Y & YE Edge Beam | 16 - 40m | Beam and slab construction for short and medium span bridges. | Underside of deck and surfaces of beams and bridge bearings are fully visible for inspection and maintenance. Good capacity for negative bending at supports. | | ![Y Beam](image6.jpg)
M & UMB Edge Beam for Beam and Slab Construction

Precast

M & UMB-BEAM - BEAM AND SLAB SPAN CHART - BASED ON ACTUAL BEAM LENGTH AND 1300mm BEAM SPACING

C57/70 precast concrete grade @ 28 days with up to C45/55 @ transfer - see

Note: The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

« Traffic loading as per Eurocode 1
« Design to Eurocode 2
« Simply supported bridge beam structure
« Beams spaced at 1.3m centres.
« C40/50 inside deck slab 200mm over beam

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

To determine the required beam spacing for a given beam length "Lg" and beam

To determine the beam length "Ladj" for a beam spacing "S" other than 1.3m

adjust the actual beam length "L" above using the following formula. Ladj = L(1.3/S)0.5

above chart. S=1.3(L/Lg)2

»   C40/50 Insitu deck slab 200mm over beam
»   Simply supported bridge beam structure
»   Traffic loading as per Eurocode 1
»   The above figures are for actual beam length
»   The clear span will be 1m less than the figures given above
»   The centre to centre of bearing in a simply supported structure will be 500mm
»   Beams spaced at 1.3m centres will be perhaps 500mm greater than the above figures
»   M-Beams can be poured to any beam depth from 640mm to 1400mm deep if it is

found necessary to match the depths to those of other beams like Y Beams, W Beams, etc.
»   This table also covers UMB Beams

Alternative Spacings & Spans:

» To determine the beam length "Lg" for a beam spacing "S" other than 1.3m
adjust the actual beam length "Lg" above using the following formula. Lg = S/L(1.3/S)2

» To determine the required beam spacing for a given beam length "L" and beam

size use the following formula where L = beam length for a 1.3m spacing from the
above chart. S=1.3(L/Lg)2

» In order to keep control of deck slab moments, beam interface shear links and

to use standard 50/20 ribbed FRC shutter BPC recommends a general beam spacing in mm of 1350+0.28D for M-beams where D= beam depth.

Beam spacings greater than this may be used but the permanent shutter will
have to be either 75mm deep ribbed FRC or prestressed wide slab with

a corresponding increase in deck slab thickness over the beam up to 250mm.

if using prestressed 75mm wide slab permanent shutter the outside beam face
shutter rebates will have to be increased in size from the standard 40mm wide

× 50mm deep to 60mm wide × 75mm deep. This also requires the shear links to
be narrowed and some adjustment of the top strand locations.

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

To determine the required beam spacing for a given beam length "Lg" and beam

To determine the beam length "Ladj" for a beam spacing "S" other than 1.3m

adjust the actual beam length "L" above using the following formula. Ladj = L(1.3/S)0.5

above chart. S=1.3(L/Lg)2

»   C40/50 Insitu deck slab 200mm over beam
»   Simply supported bridge beam structure
»   Traffic loading as per Eurocode 1
»   The above figures are for actual beam length
»   The clear span will be 1m less than the figures given above
»   The centre to centre of bearing in a simply supported structure will be 500mm
»   Beams spaced at 1.3m centres will be perhaps 500mm greater than the above figures
»   M-Beams can be poured to any beam depth from 640mm to 1400mm deep if it is

found necessary to match the depths to those of other beams like Y Beams, W Beams, etc.
»   This table also covers UMB Beams

Alternative Spacings & Spans:

» To determine the beam length "Lg" for a beam spacing "S" other than 1.3m
adjust the actual beam length "Lg" above using the following formula. Lg = S/L(1.3/S)2

» To determine the required beam spacing for a given beam length "L" and beam

size use the following formula where L = beam length for a 1.3m spacing from the
above chart. S=1.3(L/Lg)2

» In order to keep control of deck slab moments, beam interface shear links and

to use standard 50/20 ribbed FRC shutter BPC recommends a general beam spacing in mm of 1350+0.28D for M-beams where D= beam depth.

Beam spacings greater than this may be used but the permanent shutter will
have to be either 75mm deep ribbed FRC or prestressed wide slab with

a corresponding increase in deck slab thickness over the beam up to 250mm.

if using prestressed 75mm wide slab permanent shutter the outside beam face
shutter rebates will have to be increased in size from the standard 40mm wide

× 50mm deep to 60mm wide × 75mm deep. This also requires the shear links to
be narrowed and some adjustment of the top strand locations.

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

To determine the required beam spacing for a given beam length "Lg" and beam

To determine the beam length "Ladj" for a beam spacing "S" other than 1.3m

adjust the actual beam length "L" above using the following formula. Ladj = L(1.3/S)0.5

above chart. S=1.3(L/Lg)2

»   C40/50 Insitu deck slab 200mm over beam
»   Simply supported bridge beam structure
»   Traffic loading as per Eurocode 1
»   The above figures are for actual beam length
»   The clear span will be 1m less than the figures given above
»   The centre to centre of bearing in a simply supported structure will be 500mm
»   Beams spaced at 1.3m centres will be perhaps 500mm greater than the above figures
»   M-Beams can be poured to any beam depth from 640mm to 1400mm deep if it is

found necessary to match the depths to those of other beams like Y Beams, W Beams, etc.
»   This table also covers UMB Beams

Alternative Spacings & Spans:

» To determine the beam length "Lg" for a beam spacing "S" other than 1.3m
adjust the actual beam length "Lg" above using the following formula. Lg = S/L(1.3/S)2

» To determine the required beam spacing for a given beam length "L" and beam

size use the following formula where L = beam length for a 1.3m spacing from the
above chart. S=1.3(L/Lg)2

» In order to keep control of deck slab moments, beam interface shear links and

to use standard 50/20 ribbed FRC shutter BPC recommends a general beam spacing in mm of 1350+0.28D for M-beams where D= beam depth.

Beam spacings greater than this may be used but the permanent shutter will
have to be either 75mm deep ribbed FRC or prestressed wide slab with

a corresponding increase in deck slab thickness over the beam up to 250mm.

if using prestressed 75mm wide slab permanent shutter the outside beam face
shutter rebates will have to be increased in size from the standard 40mm wide

× 50mm deep to 60mm wide × 75mm deep. This also requires the shear links to
be narrowed and some adjustment of the top strand locations.
MY & MYE Edge Beam for Solid Slab Construction

**MY & MYE Edge Beam for Solid Slab Construction**

<table>
<thead>
<tr>
<th>Section</th>
<th>Depth (mm)</th>
<th>Area (mm²)</th>
<th>Ht. centroid over soffit Y (mm)</th>
<th>Dist. centroid to vertical face X (mm)</th>
<th>Section modulus - Top fibre (mm³ x 10⁶)</th>
<th>Section modulus - Bottom fibre (mm³ x 10⁶)</th>
<th>Second Moment of Area I (mm⁴ x 10⁶)</th>
<th>Approximate self-weight (Kg/m)</th>
<th>Top Flange Width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MY1</td>
<td>300</td>
<td>170000</td>
<td>111.7</td>
<td>485.0</td>
<td>6.39</td>
<td>10.78</td>
<td>1.2033</td>
<td>4.25</td>
<td>360.0</td>
</tr>
<tr>
<td>MY2</td>
<td>350</td>
<td>186500</td>
<td>123.6</td>
<td>485.0</td>
<td>9.01</td>
<td>14.84</td>
<td>1.9661</td>
<td>4.71</td>
<td>380.0</td>
</tr>
<tr>
<td>MY3</td>
<td>400</td>
<td>208000</td>
<td>154.5</td>
<td>485.0</td>
<td>12.31</td>
<td>19.39</td>
<td>3.0123</td>
<td>5.20</td>
<td>400.0</td>
</tr>
<tr>
<td>MY4</td>
<td>450</td>
<td>228500</td>
<td>179.6</td>
<td>485.0</td>
<td>16.18</td>
<td>24.37</td>
<td>4.3753</td>
<td>5.71</td>
<td>420.0</td>
</tr>
<tr>
<td>MY5</td>
<td>500</td>
<td>259000</td>
<td>205.0</td>
<td>485.0</td>
<td>20.67</td>
<td>29.74</td>
<td>6.0972</td>
<td>6.25</td>
<td>440.0</td>
</tr>
<tr>
<td>MY6</td>
<td>550</td>
<td>280000</td>
<td>230.9</td>
<td>485.0</td>
<td>25.61</td>
<td>37.40</td>
<td>7.8425</td>
<td>6.80</td>
<td>460.0</td>
</tr>
<tr>
<td>MY7</td>
<td>600</td>
<td>294000</td>
<td>256.6</td>
<td>485.0</td>
<td>30.83</td>
<td>41.26</td>
<td>9.0878</td>
<td>7.35</td>
<td>480.0</td>
</tr>
<tr>
<td>MY1</td>
<td>300</td>
<td>170000</td>
<td>111.7</td>
<td>485.0</td>
<td>6.39</td>
<td>10.78</td>
<td>1.2033</td>
<td>4.25</td>
<td>360.0</td>
</tr>
<tr>
<td>MY2</td>
<td>350</td>
<td>186500</td>
<td>123.6</td>
<td>485.0</td>
<td>9.01</td>
<td>14.84</td>
<td>1.9661</td>
<td>4.71</td>
<td>380.0</td>
</tr>
<tr>
<td>MY3</td>
<td>400</td>
<td>208000</td>
<td>154.5</td>
<td>485.0</td>
<td>12.31</td>
<td>19.39</td>
<td>3.0123</td>
<td>5.20</td>
<td>400.0</td>
</tr>
<tr>
<td>MY4</td>
<td>450</td>
<td>228500</td>
<td>179.6</td>
<td>485.0</td>
<td>16.18</td>
<td>24.37</td>
<td>4.3753</td>
<td>5.71</td>
<td>420.0</td>
</tr>
<tr>
<td>MY5</td>
<td>500</td>
<td>259000</td>
<td>205.0</td>
<td>485.0</td>
<td>20.67</td>
<td>29.74</td>
<td>6.0972</td>
<td>6.25</td>
<td>440.0</td>
</tr>
<tr>
<td>MY6</td>
<td>550</td>
<td>280000</td>
<td>230.9</td>
<td>485.0</td>
<td>25.61</td>
<td>37.40</td>
<td>7.8425</td>
<td>6.80</td>
<td>460.0</td>
</tr>
<tr>
<td>MY7</td>
<td>600</td>
<td>294000</td>
<td>256.6</td>
<td>485.0</td>
<td>30.83</td>
<td>41.26</td>
<td>9.0878</td>
<td>7.35</td>
<td>480.0</td>
</tr>
</tbody>
</table>

**The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.**

- Traffic loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 915mm centres
- C40/50 Insitu w/t solid slab deck to 150mm over the beam
- C50/60 precast concrete grade @ 28 days with up to C50/60 @ transfer - see 
- C57/70 precast concrete grade @ 28 days with up to C45/55 @ transfer - see 

Note:

- The above figures are for actual beam length
- The clear span will be 1m less than the figures given above.
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures.
- The part to slab centres will be 500mm greater than the above figures.
- Longer spans can be achieved by propping the beams while pouring the slab and slab construction.
- MY Beams have been designed specifically for solid slab construction. The bottom flange thickness and link shape are not sufficient for beam and slab construction.
- If beam and slab construction is preferred please use the TV beam version.
- This table also covers MYE Beams, but please note that when dealing with MYE Beams the prestressing force should be centered on the lateral (transverse) centroid Xc.
**Solid Box Beam**

**Solid Box Beam (Generic)**

<table>
<thead>
<tr>
<th>Section</th>
<th>Depth (mm)</th>
<th>Area (mm²)</th>
<th>HT centroid over soffit (Y) (mm)</th>
<th>Section modulus - (mm³ x 10⁶)</th>
<th>Approximate self-weight (kN/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD7 (1)</td>
<td>300</td>
<td>123625</td>
<td>140.0</td>
<td>6.32</td>
<td>6.79</td>
</tr>
<tr>
<td>SD7 (1)</td>
<td>400</td>
<td>168125</td>
<td>194.0</td>
<td>11.23</td>
<td>11.90</td>
</tr>
<tr>
<td>SD8 (1)</td>
<td>500</td>
<td>206625</td>
<td>244.0</td>
<td>17.50</td>
<td>18.58</td>
</tr>
<tr>
<td>SD8 (1)</td>
<td>600</td>
<td>249125</td>
<td>294.0</td>
<td>25.11</td>
<td>26.20</td>
</tr>
<tr>
<td>SD8 (1)</td>
<td>700</td>
<td>288625</td>
<td>343.6</td>
<td>34.08</td>
<td>33.38</td>
</tr>
<tr>
<td>SD8 (1)</td>
<td>800</td>
<td>330125</td>
<td>393.0</td>
<td>44.40</td>
<td>45.91</td>
</tr>
<tr>
<td>SD7 (1)</td>
<td>900</td>
<td>370625</td>
<td>433.0</td>
<td>56.08</td>
<td>57.79</td>
</tr>
<tr>
<td>SD7 (1)</td>
<td>1000</td>
<td>411125</td>
<td>493.0</td>
<td>69.10</td>
<td>71.02</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>300</td>
<td>204125</td>
<td>147.0</td>
<td>18.17</td>
<td>18.62</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>400</td>
<td>270125</td>
<td>196.0</td>
<td>18.05</td>
<td>18.71</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>500</td>
<td>336125</td>
<td>246.0</td>
<td>28.13</td>
<td>29.90</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>600</td>
<td>402125</td>
<td>296.0</td>
<td>40.44</td>
<td>41.50</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>700</td>
<td>468125</td>
<td>346.0</td>
<td>54.92</td>
<td>56.21</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>800</td>
<td>534125</td>
<td>396.0</td>
<td>71.62</td>
<td>73.11</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>900</td>
<td>600125</td>
<td>446.0</td>
<td>90.52</td>
<td>92.22</td>
</tr>
<tr>
<td>SD2 (1)</td>
<td>1000</td>
<td>666125</td>
<td>496.0</td>
<td>111.62</td>
<td>113.52</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>300</td>
<td>201125</td>
<td>145.0</td>
<td>18.47</td>
<td>19.32</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>400</td>
<td>265125</td>
<td>197.0</td>
<td>23.92</td>
<td>24.58</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>500</td>
<td>330125</td>
<td>247.0</td>
<td>37.30</td>
<td>38.17</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>600</td>
<td>384125</td>
<td>297.0</td>
<td>56.83</td>
<td>54.70</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>700</td>
<td>432125</td>
<td>347.0</td>
<td>72.90</td>
<td>74.17</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>800</td>
<td>476125</td>
<td>397.0</td>
<td>90.09</td>
<td>96.58</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>900</td>
<td>520125</td>
<td>447.0</td>
<td>110.23</td>
<td>121.92</td>
</tr>
<tr>
<td>SD3 (1)</td>
<td>1000</td>
<td>564125</td>
<td>497.0</td>
<td>131.70</td>
<td>150.19</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>300</td>
<td>429350</td>
<td>148.4</td>
<td>21.44</td>
<td>21.91</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>400</td>
<td>507350</td>
<td>192.0</td>
<td>38.08</td>
<td>38.76</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>500</td>
<td>575350</td>
<td>241.0</td>
<td>50.43</td>
<td>50.33</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>600</td>
<td>642350</td>
<td>291.0</td>
<td>65.48</td>
<td>68.59</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>700</td>
<td>702350</td>
<td>341.0</td>
<td>86.25</td>
<td>86.25</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>800</td>
<td>760350</td>
<td>391.0</td>
<td>107.22</td>
<td>153.23</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>900</td>
<td>817350</td>
<td>441.0</td>
<td>128.20</td>
<td>193.95</td>
</tr>
<tr>
<td>SD4 (1)</td>
<td>1000</td>
<td>920350</td>
<td>491.0</td>
<td>149.18</td>
<td>238.67</td>
</tr>
</tbody>
</table>

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

**NOTE:** Beam depths from 350mm to 950mm in 100mm steps are also available and can be produced - contact Banagher Precast Concrete for further details.

- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 510mm, 770mm and 990mm centres depending on beam width
- C40/15 In-situ infill between beams - 75mm topping assumed

The pier to abutment centres will be perhaps 500mm greater than the above figures.

- The clear span will be 1m less than the above figures.
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures.
- The pair to abutment centres will be perhaps 500mm greater than the above figures.

Longer spans can be achieved by propping the beams while pouring the in-situ concrete.

SD8 (4) Beam Showing All Possible Strand Locations

SD8 (3) Beam Showing All Possible Strand Locations

SD8 (2) Beam Showing All Possible Strand Locations

SD8 (1) Beam Showing All Possible Strand Locations
SY & SYE Edge Beam

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

- Traffic loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 1.2m centres
- C40/50 insitu deck slab 200mm over beam

Alternative Spacings & Spans:

- To determine the beam length \( L_{\text{adj}} \) for a beam spacing \( S \) other than 1.2m use the following formula where \( L = \) beam length for a 1.2m spacing from the above chart. \( S = 1.2(L/L_{\text{g}})^2 \)
- To determine the required beam spacing for a given beam length \( L_{\text{adj}} \) and beam size use the following formula where \( S = \) beam length for a 1.2m spacing from the above chart. \( L = \frac{S^2}{1.2S} \)

In order to keep control of deck slab moments, beam interface shear links and to a corresponding increase in deck slab thickness over the beam up to 250mm. If using prestressed 75mm wide slab permanent shutter the outside beam face shutter rebars have to be increased in size from the standard 40mm wide x 50mm deep to 60mm wide x 75mm deep. This also requires the shear links to be narrowed and some adjustment of the top strand locations.

Alternative Spacings & Spans:

- Beam spacings greater than this may be used but the permanent shutter will either have to be 75mm deep ribbed FRC or prestressed wide slab with prestress in SY-beams due to their slenderness in handling and transportation criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.
- The above figures are for actual beam length
- The clear-span will be 1m less than the above figures
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures
- The pier to abutment centres will be perhaps 500mm greater than the above figures

Note: The above figures are for actual beam length

We do not normally recommend using C37/20 concrete with high levels of prestress in SY-beams due to their slenderness in handling and transportation

- Beam spacings greater than this may be used but the permanent shutter will either have to be 75mm deep ribbed FRC or prestressed wide slab with a corresponding increase in deck slab thickness over the beam up to 250mm. If using prestressed 75mm wide slab permanent shutter the outside beam face shutter rebars have to be increased in size from the standard 40mm wide x 50mm deep to 60mm wide x 75mm deep. This also requires the shear links to be narrowed and some adjustment of the top strand locations.

Alternative Spacings & Spans:

- To determine the beam length \( L_{\text{adj}} \) for a beam spacing \( S \) other than 1.2m use the following formula where \( L = \) beam length for a 1.2m spacing from the above chart. \( S = 1.2(L/L_{\text{g}})^2 \)
- To determine the required beam spacing for a given beam length \( L_{\text{adj}} \) and beam size use the following formula where \( S = \) beam length for a 1.2m spacing from the above chart. \( L = \frac{S^2}{1.2S} \)

In order to keep control of deck slab moments, beam interface shear links and to a corresponding increase in deck slab thickness over the beam up to 250mm. If using prestressed 75mm wide slab permanent shutter the outside beam face shutter rebars have to be increased in size from the standard 40mm wide x 50mm deep to 60mm wide x 75mm deep. This also requires the shear links to be narrowed and some adjustment of the top strand locations.
**T Beam for Solid Slab Construction**

### Beam Range From T1 To T2

<table>
<thead>
<tr>
<th>Section</th>
<th>Depth (mm)</th>
<th>Area (mm²)</th>
<th>Ht. centred over Flange (mm)</th>
<th>Section modulus - (mm³ x 10⁶)</th>
<th>Second Moment of Area (mm⁴ x 10⁹)</th>
<th>Approximate self-weight (kN/m)</th>
<th>Web Height H (mm)</th>
<th>Flange Height F (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>380</td>
<td>98000</td>
<td>139.9</td>
<td>5.18</td>
<td>8.89</td>
<td>1.2443</td>
<td>2.45</td>
<td>85</td>
</tr>
<tr>
<td>T2</td>
<td>425</td>
<td>105000</td>
<td>160.0</td>
<td>6.76</td>
<td>10.98</td>
<td>1.7572</td>
<td>2.66</td>
<td>95</td>
</tr>
<tr>
<td>T3</td>
<td>515</td>
<td>114250</td>
<td>196.0</td>
<td>9.57</td>
<td>16.55</td>
<td>3.2440</td>
<td>2.86</td>
<td>125</td>
</tr>
<tr>
<td>T4</td>
<td>575</td>
<td>122475</td>
<td>220.0</td>
<td>11.92</td>
<td>19.23</td>
<td>4.2310</td>
<td>3.06</td>
<td>145</td>
</tr>
<tr>
<td>T5</td>
<td>615</td>
<td>130675</td>
<td>243.6</td>
<td>14.30</td>
<td>21.81</td>
<td>5.3720</td>
<td>3.37</td>
<td>185</td>
</tr>
<tr>
<td>T6</td>
<td>655</td>
<td>138875</td>
<td>266.7</td>
<td>16.73</td>
<td>24.36</td>
<td>6.4995</td>
<td>3.67</td>
<td>240</td>
</tr>
<tr>
<td>T7</td>
<td>695</td>
<td>147075</td>
<td>289.5</td>
<td>19.20</td>
<td>26.91</td>
<td>7.7878</td>
<td>3.98</td>
<td>240</td>
</tr>
<tr>
<td>T8</td>
<td>735</td>
<td>155275</td>
<td>311.9</td>
<td>21.74</td>
<td>29.48</td>
<td>9.1995</td>
<td>4.29</td>
<td>240</td>
</tr>
<tr>
<td>T9</td>
<td>775</td>
<td>163475</td>
<td>334.2</td>
<td>24.33</td>
<td>32.10</td>
<td>10.726</td>
<td>4.60</td>
<td>240</td>
</tr>
<tr>
<td>T10</td>
<td>815</td>
<td>171675</td>
<td>356.2</td>
<td>26.99</td>
<td>34.77</td>
<td>12.385</td>
<td>4.92</td>
<td>240</td>
</tr>
</tbody>
</table>

### Beam Range From T3 To T10

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

- Traffic loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 510mm centres
- C40/50 Insitu infill solid slab deck to 125mm over the beam
- C50/60 precast concrete grade @ 28 days with up to C32/40 @ transfer - see ▶
- C57/70 precast concrete grade @ 28 days with up to C46/55 @ transfer - see ▶

Note:
- The above figures are for actual beam length
- The clear span will be 1m less than the above figures
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures
- Longer spans can be achieved by propping the beams while pouring the insitu concrete

**T Beam Showing All Possible Strand Locations**

This Option Will Give 40mm Cover With 12.9mm Dia. Strand & B8 Links Only

**T Beam Showing All Possible Strand Locations**

This Option Will Give 35mm Cover With 12.9mm Dia. Strand & B8 Links Only

**Note:** The centre strand @ 115mm must not be used along with the 2nr inner strands @ 90mm.

The centre strand @ 115mm must not be used along with the 2nr inner strands @ 90mm.

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

- Traffic loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 510mm centres
- C40/50 Insitu infill solid slab deck to 125mm over the beam
- C50/60 precast concrete grade @ 28 days with up to C32/40 @ transfer - see ▶
- C57/70 precast concrete grade @ 28 days with up to C46/55 @ transfer - see ▶

Note:
- The above figures are for actual beam length
- The clear span will be 1m less than the above figures
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures
- Longer spans can be achieved by propping the beams while pouring the insitu concrete

**Note:** The centre strand @ 115mm must not be used along with the 2nr inner strands @ 90mm.

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

- Traffic loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 510mm centres
- C40/50 Insitu infill solid slab deck to 125mm over the beam
- C50/60 precast concrete grade @ 28 days with up to C32/40 @ transfer - see ▶
- C57/70 precast concrete grade @ 28 days with up to C46/55 @ transfer - see ▶

Note:
- The above figures are for actual beam length
- The clear span will be 1m less than the above figures
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures
- Longer spans can be achieved by propping the beams while pouring the insitu concrete
## TB Beam for Solid Slab Construction

**Section**

<table>
<thead>
<tr>
<th>Section</th>
<th>Depth (mm)</th>
<th>Area (mm²)</th>
<th>Ht. centroid over top fibre (Yc) (mm)</th>
<th>Section modulus - mm³ x 10⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td>375</td>
<td>99875</td>
<td>4.85</td>
<td>1.1599</td>
</tr>
<tr>
<td>TB2</td>
<td>425</td>
<td>110125</td>
<td>4.84</td>
<td>1.8116</td>
</tr>
<tr>
<td>TB3</td>
<td>475</td>
<td>120375</td>
<td>8.97</td>
<td>2.6010</td>
</tr>
<tr>
<td>TB4</td>
<td>525</td>
<td>130625</td>
<td>11.23</td>
<td>3.5408</td>
</tr>
<tr>
<td>TB5</td>
<td>575</td>
<td>140875</td>
<td>11.69</td>
<td>4.3514</td>
</tr>
<tr>
<td>TB6</td>
<td>625</td>
<td>151125</td>
<td>14.73</td>
<td>5.6705</td>
</tr>
<tr>
<td>TB7</td>
<td>675</td>
<td>161375</td>
<td>27.80</td>
<td>7.1732</td>
</tr>
<tr>
<td>TB8</td>
<td>725</td>
<td>171625</td>
<td>23.74</td>
<td>8.9212</td>
</tr>
<tr>
<td>TB9</td>
<td>775</td>
<td>181875</td>
<td>33.04</td>
<td>10.6620</td>
</tr>
<tr>
<td>TB10</td>
<td>825</td>
<td>192125</td>
<td>41.65</td>
<td>13.0080</td>
</tr>
</tbody>
</table>

**Second Moment of Area**

<table>
<thead>
<tr>
<th>Section</th>
<th>Second Moment of Area (mm⁴ x 10⁹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td>1.1599</td>
</tr>
<tr>
<td>TB2</td>
<td>1.8116</td>
</tr>
<tr>
<td>TB3</td>
<td>2.6010</td>
</tr>
<tr>
<td>TB4</td>
<td>3.5408</td>
</tr>
<tr>
<td>TB5</td>
<td>4.3514</td>
</tr>
<tr>
<td>TB6</td>
<td>5.6705</td>
</tr>
<tr>
<td>TB7</td>
<td>7.1732</td>
</tr>
<tr>
<td>TB8</td>
<td>8.9212</td>
</tr>
<tr>
<td>TB9</td>
<td>10.6620</td>
</tr>
<tr>
<td>TB10</td>
<td>13.0080</td>
</tr>
</tbody>
</table>

**Web Height**

<table>
<thead>
<tr>
<th>Section</th>
<th>Web Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td>85</td>
</tr>
<tr>
<td>TB2</td>
<td>85</td>
</tr>
<tr>
<td>TB3</td>
<td>85</td>
</tr>
<tr>
<td>TB4</td>
<td>85</td>
</tr>
<tr>
<td>TB5</td>
<td>240</td>
</tr>
<tr>
<td>TB6</td>
<td>240</td>
</tr>
<tr>
<td>TB7</td>
<td>240</td>
</tr>
<tr>
<td>TB8</td>
<td>240</td>
</tr>
<tr>
<td>TB9</td>
<td>240</td>
</tr>
<tr>
<td>TB10</td>
<td>240</td>
</tr>
</tbody>
</table>

**Flange Height**

<table>
<thead>
<tr>
<th>Section</th>
<th>Flange Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td>40</td>
</tr>
<tr>
<td>TB2</td>
<td>90</td>
</tr>
<tr>
<td>TB3</td>
<td>140</td>
</tr>
<tr>
<td>TB4</td>
<td>190</td>
</tr>
<tr>
<td>TB5</td>
<td>240</td>
</tr>
<tr>
<td>TB6</td>
<td>240</td>
</tr>
<tr>
<td>TB7</td>
<td>240</td>
</tr>
<tr>
<td>TB8</td>
<td>240</td>
</tr>
<tr>
<td>TB9</td>
<td>240</td>
</tr>
<tr>
<td>TB10</td>
<td>240</td>
</tr>
</tbody>
</table>

**Beam Range**

- TB1 to TB4
- TB5 to TB10

**Design & Developed by Banagher Precast Concrete**

### Notes:
- Traffic loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 510mm centres
- C40/50 Insitu infill solid slab deck to 125mm over the beam
- C50/60 precast concrete grade @ 28 days with up to C32/40 @ transfer - see B8 LINK
- C57/70 precast concrete grade @ 28 days with up to C45/55 @ transfer - see B8 LINK

**Approximate self-weight**

<table>
<thead>
<tr>
<th>Metric</th>
<th>kg/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td>2.50</td>
</tr>
<tr>
<td>TB2</td>
<td>2.75</td>
</tr>
<tr>
<td>TB3</td>
<td>3.01</td>
</tr>
<tr>
<td>TB4</td>
<td>3.27</td>
</tr>
<tr>
<td>TB5</td>
<td>3.13</td>
</tr>
<tr>
<td>TB6</td>
<td>3.39</td>
</tr>
<tr>
<td>TB7</td>
<td>3.65</td>
</tr>
<tr>
<td>TB8</td>
<td>3.90</td>
</tr>
<tr>
<td>TB9</td>
<td>4.16</td>
</tr>
<tr>
<td>TB10</td>
<td>4.42</td>
</tr>
</tbody>
</table>

**B8 LINK**

- C50/60 precast concrete grade @ 28 days with up to C32/40 @ transfer - see B8 LINK
- C57/70 precast concrete grade @ 28 days with up to C45/55 @ transfer - see B8 LINK

**Flange Height**

<table>
<thead>
<tr>
<th>Metric</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td>40</td>
</tr>
<tr>
<td>TB2</td>
<td>90</td>
</tr>
<tr>
<td>TB3</td>
<td>140</td>
</tr>
<tr>
<td>TB4</td>
<td>190</td>
</tr>
<tr>
<td>TB5</td>
<td>240</td>
</tr>
<tr>
<td>TB6</td>
<td>240</td>
</tr>
<tr>
<td>TB7</td>
<td>240</td>
</tr>
<tr>
<td>TB8</td>
<td>240</td>
</tr>
<tr>
<td>TB9</td>
<td>240</td>
</tr>
<tr>
<td>TB10</td>
<td>240</td>
</tr>
</tbody>
</table>

**Web Height**

<table>
<thead>
<tr>
<th>Metric</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td>85</td>
</tr>
<tr>
<td>TB2</td>
<td>85</td>
</tr>
<tr>
<td>TB3</td>
<td>85</td>
</tr>
<tr>
<td>TB4</td>
<td>85</td>
</tr>
<tr>
<td>TB5</td>
<td>240</td>
</tr>
<tr>
<td>TB6</td>
<td>240</td>
</tr>
<tr>
<td>TB7</td>
<td>240</td>
</tr>
<tr>
<td>TB8</td>
<td>240</td>
</tr>
<tr>
<td>TB9</td>
<td>240</td>
</tr>
<tr>
<td>TB10</td>
<td>240</td>
</tr>
</tbody>
</table>

**Top & Bottom Fibres Zt & Zb**

- Top Fibre Zt: 4.85, 6.84, 8.97, 11.23, 11.69, 14.73, 17.85, 21.04, 24.34, 27.74
TY & TYE Edge Beam for Beam and Slab Construction

TY-BEAMS BEAM & SLAB SPAN CHART - BASED ON ACTUAL BEAM LENGTH AND 1200mm BEAM SPACING

<table>
<thead>
<tr>
<th>TY3</th>
<th>TY4</th>
<th>TY5</th>
<th>TY6</th>
<th>TY7</th>
<th>TY8</th>
<th>TY9</th>
<th>TY10</th>
<th>TY11</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>700</td>
<td>800</td>
<td>900</td>
<td>1000</td>
<td>1100</td>
<td>1200</td>
<td>1300</td>
<td>1400</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>1200</td>
<td>1000</td>
<td>800</td>
<td>600</td>
<td>400</td>
<td>200</td>
<td>100</td>
<td>50</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: For a 12.9mm diameter strand layout please see appendix A

S10 LINK B10 LINK

S10 LINK B10 LINK

TY Beam Showing All Possible Strand Locations for 15.7mm diameter strands

TYE Beam Showing All Possible Strand Locations for 15.7mm diameter strands

The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

- Traffic loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- Beams spaced at 1.2m centres
- C45/50 to 60mm slab over beam

Alternative Spacings & Spans:

- To determine the required beam spacing for a given beam length "L" and beam size use the following formula where L = beam length for a 1.2m spacing from the above chart, S = 1.2L/Lg

- In order to keep control of deck slab moments, beam interface shear links and to use standard 50/20 ribbed FRC shutter BPC recommends a general maximum beam spacing in mm of 1300+D where D= beam depth.

Beams spacings greater than this may be used but the permanent shutter will have to be either 75mm deep ribbed FRC or prestressed wide slab with a corresponding increase in deck slab thickness over the beam up to 250mm.

- If using prestressed 75mm wide slab permanent shutter the outside beam face shutter rebates will have to be increased in size from the standard 40mm wide x 70mm deep to 60mm wide x 75mm deep.

Section | Depth (mm) | Area (mm²) | Hr centroid over soffit (mm) | Dist centroid to vertical face (mm) | Section modulus - (mm³ x 10⁶) | Moment of Area (mm⁴ x 10⁻⁸) | Aproximate self-weight (kN/m) | Top Flange Width
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TY3</td>
<td>500</td>
<td>208650</td>
<td>173.11</td>
<td>-</td>
<td>10.863</td>
<td>26.477</td>
<td>3.5489</td>
<td>5.201</td>
</tr>
<tr>
<td>TY4</td>
<td>550</td>
<td>221460</td>
<td>193.6</td>
<td>-</td>
<td>13.96</td>
<td>25.69</td>
<td>4.9742</td>
<td>5.537</td>
</tr>
<tr>
<td>TY5</td>
<td>600</td>
<td>233880</td>
<td>216.0</td>
<td>-</td>
<td>17.71</td>
<td>31.48</td>
<td>6.7981</td>
<td>5.997</td>
</tr>
<tr>
<td>TY6</td>
<td>650</td>
<td>251320</td>
<td>242.0</td>
<td>-</td>
<td>22.13</td>
<td>37.74</td>
<td>9.0670</td>
<td>6.283</td>
</tr>
<tr>
<td>TY7</td>
<td>700</td>
<td>267770</td>
<td>266.1</td>
<td>-</td>
<td>27.24</td>
<td>44.41</td>
<td>11.819</td>
<td>6.949</td>
</tr>
<tr>
<td>TY8</td>
<td>750</td>
<td>285230</td>
<td>293.4</td>
<td>-</td>
<td>33.06</td>
<td>51.44</td>
<td>15.095</td>
<td>7.311</td>
</tr>
<tr>
<td>TY9</td>
<td>800</td>
<td>303710</td>
<td>322.0</td>
<td>-</td>
<td>39.61</td>
<td>58.8</td>
<td>18.935</td>
<td>7.593</td>
</tr>
<tr>
<td>TY10</td>
<td>850</td>
<td>323210</td>
<td>351.7</td>
<td>-</td>
<td>46.91</td>
<td>66.47</td>
<td>23.375</td>
<td>8.080</td>
</tr>
<tr>
<td>TY11</td>
<td>900</td>
<td>343710</td>
<td>382.24</td>
<td>-</td>
<td>54.96</td>
<td>74.44</td>
<td>28.454</td>
<td>8.593</td>
</tr>
<tr>
<td>TY12</td>
<td>500</td>
<td>291210</td>
<td>222.9</td>
<td>304.1</td>
<td>21.87</td>
<td>27.19</td>
<td>6.0398</td>
<td>7.28</td>
</tr>
<tr>
<td>TY13</td>
<td>550</td>
<td>311670</td>
<td>246.8</td>
<td>300.0</td>
<td>28.87</td>
<td>33.01</td>
<td>8.1459</td>
<td>7.92</td>
</tr>
<tr>
<td>TY14</td>
<td>600</td>
<td>332630</td>
<td>271.3</td>
<td>296.9</td>
<td>32.48</td>
<td>39.34</td>
<td>10.674</td>
<td>8.57</td>
</tr>
<tr>
<td>TY15</td>
<td>650</td>
<td>369100</td>
<td>296.4</td>
<td>294.5</td>
<td>38.70</td>
<td>46.17</td>
<td>13.845</td>
<td>9.23</td>
</tr>
<tr>
<td>TY16</td>
<td>700</td>
<td>396075</td>
<td>321.9</td>
<td>292.8</td>
<td>45.55</td>
<td>53.50</td>
<td>17.222</td>
<td>9.80</td>
</tr>
<tr>
<td>TY17</td>
<td>750</td>
<td>423550</td>
<td>347.8</td>
<td>291.6</td>
<td>53.02</td>
<td>61.31</td>
<td>21.325</td>
<td>10.19</td>
</tr>
<tr>
<td>TY18</td>
<td>800</td>
<td>451540</td>
<td>374.0</td>
<td>290.8</td>
<td>61.13</td>
<td>69.62</td>
<td>26.039</td>
<td>11.29</td>
</tr>
<tr>
<td>TY19</td>
<td>850</td>
<td>480040</td>
<td>400.6</td>
<td>290.4</td>
<td>69.89</td>
<td>78.61</td>
<td>31.408</td>
<td>12.00</td>
</tr>
<tr>
<td>TY20</td>
<td>900</td>
<td>509040</td>
<td>427.4</td>
<td>290.3</td>
<td>79.30</td>
<td>87.69</td>
<td>37.476</td>
<td>12.73</td>
</tr>
</tbody>
</table>

TYE11

TY & TYE Edge Beam for Beam and Slab Construction

TYE Beam Showing All Possible Strand Locations for 15.7mm diameter strands

Note: TY11 and TYE11 shown above, for all other TY beam links please contact the technical department.
## TY & TYE Edge Beam for Solid Slab Construction

### TY & TYE Beams SOLID SLAB SPAN CHART - BASED ON ACTUAL BEAM LENGTH

**Note:**
- C20/25 precast concrete grade @ 28 days with up to C25/30 @ transfer - see Table 1.
- C25/30 precast concrete grade @ 28 days with up to C25/30 @ transfer - see Table 1.
- C30/37 precast concrete grade @ 28 days with up to C30/37 @ transfer - see Table 1.
- The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.

### Traffic Loading as per Eurocode 1
- Design to Eurocode 2
- Simply supported bridge beam structure
- I beams spaced at 76.5mm centres
- C40/50 insitu slab beam with solid slab deck to 150mm over the beam

### Note:
- The above figures are for actual beam length
- The clear span will be 1m less than the above figures
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures
- The span to support centres will be perhaps 500mm greater than the above figures
- Longer spans can be achieved by propping the beams while pouring the insitu concrete
- This table also covers TYE-Beams, but please note that when dealing with TYE-Beams the predressing force should be centred on the lateral (transverse) centroid Xc.

### Second Moment of Area

<table>
<thead>
<tr>
<th>Section</th>
<th>Depth</th>
<th>Area</th>
<th>Top Flange over soffit Yc (mm)</th>
<th>Bottom Flange over soffit Yc (mm)</th>
<th>2I = (mm^4 x 10^9)</th>
<th>Approximate self-weight (kN/m)</th>
<th>Top Flange breadth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TY1</td>
<td>400</td>
<td>369</td>
<td>14.86</td>
<td>1.961</td>
<td>4.72</td>
<td>217.5</td>
<td>760</td>
</tr>
<tr>
<td>TY2</td>
<td>450</td>
<td>201</td>
<td>16.14</td>
<td>2.001</td>
<td>5.00</td>
<td>237.7</td>
<td>760</td>
</tr>
<tr>
<td>TY3</td>
<td>500</td>
<td>212</td>
<td>17.35</td>
<td>2.061</td>
<td>5.31</td>
<td>256.8</td>
<td>760</td>
</tr>
<tr>
<td>TY4</td>
<td>550</td>
<td>223</td>
<td>18.60</td>
<td>2.121</td>
<td>5.65</td>
<td>278.5</td>
<td>760</td>
</tr>
<tr>
<td>TY5</td>
<td>600</td>
<td>234</td>
<td>19.85</td>
<td>2.182</td>
<td>6.00</td>
<td>298.6</td>
<td>760</td>
</tr>
<tr>
<td>TY6</td>
<td>650</td>
<td>245</td>
<td>21.10</td>
<td>2.242</td>
<td>6.40</td>
<td>318.9</td>
<td>760</td>
</tr>
<tr>
<td>TY7</td>
<td>700</td>
<td>256</td>
<td>22.35</td>
<td>2.303</td>
<td>6.81</td>
<td>339.2</td>
<td>760</td>
</tr>
<tr>
<td>TY8</td>
<td>750</td>
<td>267</td>
<td>23.60</td>
<td>2.364</td>
<td>7.24</td>
<td>359.5</td>
<td>760</td>
</tr>
<tr>
<td>TY9</td>
<td>800</td>
<td>278</td>
<td>24.85</td>
<td>2.425</td>
<td>7.67</td>
<td>379.8</td>
<td>760</td>
</tr>
<tr>
<td>TY10</td>
<td>850</td>
<td>289</td>
<td>26.10</td>
<td>2.486</td>
<td>8.19</td>
<td>400.0</td>
<td>760</td>
</tr>
<tr>
<td>TY11</td>
<td>900</td>
<td>299</td>
<td>27.40</td>
<td>2.547</td>
<td>8.71</td>
<td>420.3</td>
<td>760</td>
</tr>
</tbody>
</table>

### Full TY Beam Range

**TY & TYE Edge Beam for Solid Slab Construction**

**TY & TYE Edge Beam for Solid Slab Construction**

### TY Beam Showing All Possible Strand Locations for 15.7mm diameter strands

(TY11 and TYE11 shown above, for all other TY beam links please contact the technical department)
### U & SU Beam

**Beam and Slab Span Chart - Based on Actual Beam Length and 2000mm Beam Spacing**

**Concretes:**
- C50/60 precast concrete grade @ 28 days with up to C32/40 @ transfer
- C57/70 precast concrete grade @ 28 days with up to C45/55 @ transfer
- SU11 & SU12 = C57/70 precast concrete grade @ 28 days with up to C45/55 @ transfer

**General Application:**
- Covers general applications from 1600mm to 2400mm c/c.

**Beams:**
- U700
- U600
- U12
- U11
- U10
- U9, U8, U7

**Depth Variations:**
- Yc varies

**Area Approximate Self-weight (kN/m):**
- Beam top: 6400
- Beam bottom: 6000

**Second Moment of Area (mm⁴ x 10⁹):**
- Beam top: 206.04
- Beam bottom: 225.89

**Beam Top Dimensions:**
- Overall Width: 1398.4
- Inner Width: 754.0

**Beam Bottom Dimensions:**
- Overall Width: 1398.4
- Inner Width: 754.0

**Note:**
- The above figures are for actual beam length
- The clear span will be 1m less than the figures given above
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures
- The pier to abutment centres will be perhaps 500mm greater than the above figures

**Alternative Spacings & Spans:**
- To determine the beam length "L g" for a given beam length "L" above using the formula: 20L g/L w = 2L/L w
- To determine the required beam spacing for a given beam length "L g" and beam size use the following formula: S = 2(L g/L w)²
- To determine the beam length "L g" for a given beam spacing "S" other than 2m: L g = L(S/2)²
- In order to keep control of deck slab moments, beam interface shear links and to use standard 50/20 ribbed FRC shutter RPC recommends a general maximum beam spacing in mm of 2200+0.28D where D = beam depth.

**Applications:**
- Simply supported bridge beam structure
- Design to Eurocode 1
- Traffic loading as per Eurocode 1
- C40/50 Insitu deck slab 200mm over beam
- C50/60 Insitu deck slab 200mm over beam
- SU11 & SU12 = C57/70 precast concrete grade @ 28 days with up to C45/55 @ transfer

**Notes:**
- Beam spacings greater than this may be used but the permanent shutter will have to be either 75mm deep ribbed FRC or prestressed wide slab with a corresponding increase in deck slab thickness over the beam up to 250mm.
- If using prestressed 75mm wide slab permanent shutter the outside beam face shutter rebates will have to be increased in size from the standard 40mm wide x 50mm deep to 60mm wide x 75mm deep. This also requires the shear links to be narrowed and some adjustment of the top strand locations.

---

<table>
<thead>
<tr>
<th>Section</th>
<th>Depth</th>
<th>Area</th>
<th>Ht. centroid above soffit</th>
<th>Section modulus - (mm³ x 10⁶)</th>
<th>Second Moment of Area - (mm⁴ x 10⁹)</th>
<th>Approximate Self-weight (kN/m)</th>
<th>Beam Top Dimensions</th>
<th>Overall Width</th>
<th>Beam Bottom Dimensions</th>
<th>Overall Width</th>
<th>Beam Bottom Width</th>
<th>Beam Top Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>U700</td>
<td>680</td>
<td>224.4</td>
<td>33.2</td>
<td>116.74</td>
<td>9.43</td>
<td>1118.4</td>
<td>600.0</td>
<td>194.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U600</td>
<td>700</td>
<td>298.0</td>
<td>47.4</td>
<td>192.63</td>
<td>10.79</td>
<td>1286.4</td>
<td>600.0</td>
<td>208.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1</td>
<td>900</td>
<td>50950</td>
<td>83.2</td>
<td>64195</td>
<td>12.74</td>
<td>1438.0</td>
<td>558.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U2</td>
<td>1000</td>
<td>442.7</td>
<td>101.3</td>
<td>66345</td>
<td>14.38</td>
<td>1554.0</td>
<td>596.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U3</td>
<td>1100</td>
<td>489.5</td>
<td>120.6</td>
<td>75228</td>
<td>16.42</td>
<td>1686.0</td>
<td>614.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U4</td>
<td>1200</td>
<td>536.7</td>
<td>141.3</td>
<td>83501</td>
<td>18.26</td>
<td>1824.0</td>
<td>642.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U5</td>
<td>1300</td>
<td>584.7</td>
<td>164.8</td>
<td>99990</td>
<td>20.12</td>
<td>1976.0</td>
<td>670.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U6</td>
<td>1400</td>
<td>63770</td>
<td>193.5</td>
<td>1170.10</td>
<td>21.93</td>
<td>2134.0</td>
<td>692.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U7</td>
<td>1500</td>
<td>692.8</td>
<td>226.7</td>
<td>1372.10</td>
<td>23.76</td>
<td>2336.0</td>
<td>712.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U8</td>
<td>1600</td>
<td>75270</td>
<td>259.2</td>
<td>1634.10</td>
<td>25.50</td>
<td>2577.0</td>
<td>732.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U9</td>
<td>1700</td>
<td>813.7</td>
<td>291.5</td>
<td>1916.10</td>
<td>27.15</td>
<td>2859.0</td>
<td>752.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U10</td>
<td>1800</td>
<td>874.4</td>
<td>324.4</td>
<td>2206.10</td>
<td>28.70</td>
<td>3181.0</td>
<td>774.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U11</td>
<td>1900</td>
<td>936.2</td>
<td>357.2</td>
<td>2520.10</td>
<td>30.25</td>
<td>3557.0</td>
<td>796.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U12</td>
<td>2000</td>
<td>1000</td>
<td>390.1</td>
<td>2880.10</td>
<td>31.79</td>
<td>3973.0</td>
<td>818.0</td>
<td>242.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Diagram:**
- U & SU Beam - Beam and Slab Span Chart - Based on Actual Beam Length and 2000mm Beam Spacing
- Covers general applications from 1600mm to 2400mm c/c's

---

**Image:**
- U & SU Beam - Beam and Slab Span Chart - Based on Actual Beam Length and 2000mm Beam Spacing

---

**Notes:**
- Beam design and selection will be guided by the overall width and depth of the structure.
- The above span table is for guideline purposes only and is based on the below criteria, please contact Banagher Precast Concrete with job specific information for a more accurate evaluation.
**U & SU Beam**

**Note:**
The above shows the preferable strand positions available for U beams in Banagher Precast Concrete. The below shows how many strand positions are available at a given height over the soffit, please be aware that you must match the below data with the above diagram to get the correct design strand and their locations.

- **U Beams showing all strand locations:**
  - U12 - 1600
  - U11 - 1500
  - U10 - 1400
  - U9 - 1300
  - U8 - 1200
  - U7 - 1100
  - U5 - 1000
  - U3 - 900

- **SU Beams showing all strand locations:**
  - SU12 - 1600
  - SU11 - 1500
  - SU10 - 1400
  - SU9 - 1300
  - SU8 - 1200
  - SU7 - 1100
  - SU5 - 1000
  - SU3 - 900

18 @ 60mm over soffit
8 @ 110mm over soffit
8 @ 160mm over soffit
6 @ 210mm over soffit
2 @ 340mm over soffit
2 @ 380mm over soffit
2 @ 430mm over soffit
2 @ 480mm over soffit
2 @ 530mm over soffit
2 @ 580mm over soffit
2 @ 630mm over soffit
2 @ 680mm over soffit
2 @ 730mm over soffit
2 @ 760mm over soffit
2 @ 800mm over soffit
2 @ 850mm over soffit
2 @ 900mm over soffit
2 @ 950mm over soffit
4 @ 1000mm over soffit
4 @ 1050mm over soffit
4 @ 1100mm over soffit
4 @ 1150mm over soffit
4 @ 1200mm over soffit
4 @ 1250mm over soffit
4 @ 1300mm over soffit
4 @ 1350mm over soffit
4 @ 1400mm over soffit
4 @ 1450mm over soffit
4 @ 1500mm over soffit
4 @ 1550mm over soffit
4 @ 1600mm over soffit

**U Beam Range From U3 - U12**

**Full SU Beam Range**

**U Beam Range For U600, U700 & U1 Beam**
Building Information Modelling (BIM)
Banagher Precast Concrete are operating in BIM – we can produce drawings in 3D to Autodesk Revit 2014. The BIM concept envisages virtual construction of a project prior to its actual physical construction, in order to reduce uncertainty, improve safety, work out problems, and simulate and analyse potential impacts. Banagher Precast Concrete can input critical information into the model before beginning construction, resulting in a more efficient end product.

PRECAST CONCRETE SPECIALISTS

PRECAST CONCRETE SPECIALISTS
W Beam

Section Through W11 Beam Showing Strand Location

Prestressing Strand Parameters

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>Cross sectional area (mm²)</th>
<th>Ultimate strength (MPa)</th>
<th>% Ultimate strength applied (%)</th>
<th>Cracthenit value of maxi Force (kN)</th>
<th>Initial force applied (kN)</th>
<th>Initial prestress applied (MPa)</th>
<th>Elastic modulus (GPa)</th>
<th>Relaxation of strand (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.7</td>
<td>1.60</td>
<td>1.660</td>
<td>75</td>
<td>2.79</td>
<td>204.25</td>
<td>19.95</td>
<td>200</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Note: This is the strand and link arrangement for a W11 beam based on certain design criteria. Please contact a member of the Banagher Precast Concrete bridge design team for further information on general strand and link arrangements for all W-beams.

Full W Beam Range

Please see our design manual for a full set of calculations on this beam.

Section Showing Transverse Holes & Scabbling Details

Elevation Showing Transverse Holes & Scabbling Details

Note: Hatched area to be scabbled as shown.

Transverse Holes

Line of Scabbling

Transverse Holes

Line of Scabbling

Note: Denotes fully bonded strand

Denotes partially debonded strand

26mm O.D. Weephole

12 no. debonded both ends

Debonding both ends

Debonding symmetrical about centreline

Initial Prestressing Force = 12973500 N

Eccentricity = 283.4 mm

Moment = 3677000000 Nmm
**Y & YE Edge Beam**

**Y Beam Showing All Possible Strand Locations**

**YE Beam Showing All Possible Strand Locations**

---

**Y-Beam - Beam and Slab Span Chart - Based on Actual Beam Length and 1200mm Beam Spacing**

**Coverage General Applications from 800mm to 1600mm Centres**

<table>
<thead>
<tr>
<th>Metres</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>30</th>
<th>31</th>
<th>32</th>
<th>33</th>
<th>34</th>
<th>35</th>
<th>36</th>
<th>37</th>
<th>38</th>
<th>39</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td>700</td>
<td>30140</td>
<td>255.0</td>
<td>24.88</td>
<td>43.42</td>
<td>11.63</td>
<td>7.3</td>
<td>198.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>800</td>
<td>340830</td>
<td>298.4</td>
<td>35.07</td>
<td>58.96</td>
<td>17.93</td>
<td>8.52</td>
<td>227.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y3</td>
<td>900</td>
<td>374420</td>
<td>346.8</td>
<td>47.95</td>
<td>76.51</td>
<td>26.53</td>
<td>9.36</td>
<td>255.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y4</td>
<td>1000</td>
<td>410880</td>
<td>399.3</td>
<td>63.63</td>
<td>95.72</td>
<td>38.22</td>
<td>19.27</td>
<td>284.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y5</td>
<td>1100</td>
<td>450230</td>
<td>455.2</td>
<td>82.19</td>
<td>116.40</td>
<td>52.99</td>
<td>11.26</td>
<td>313.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y6</td>
<td>1200</td>
<td>492460</td>
<td>514.0</td>
<td>103.73</td>
<td>138.45</td>
<td>71.16</td>
<td>12.31</td>
<td>342.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y7</td>
<td>1300</td>
<td>537580</td>
<td>575.0</td>
<td>128.35</td>
<td>161.83</td>
<td>91.05</td>
<td>13.44</td>
<td>371.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y8</td>
<td>1400</td>
<td>585580</td>
<td>637.8</td>
<td>156.12</td>
<td>186.36</td>
<td>118.90</td>
<td>14.64</td>
<td>400.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE1</td>
<td>700</td>
<td>412760</td>
<td>315.0</td>
<td>44.43</td>
<td>54.31</td>
<td>17.10</td>
<td>10.43</td>
<td>474.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE2</td>
<td>800</td>
<td>470100</td>
<td>363.4</td>
<td>59.28</td>
<td>71.21</td>
<td>25.87</td>
<td>11.75</td>
<td>488.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE3</td>
<td>900</td>
<td>524800</td>
<td>413.8</td>
<td>76.61</td>
<td>90.18</td>
<td>37.28</td>
<td>13.11</td>
<td>509.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE4</td>
<td>1000</td>
<td>580100</td>
<td>464.6</td>
<td>96.45</td>
<td>111.15</td>
<td>51.61</td>
<td>14.10</td>
<td>517.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE5</td>
<td>1100</td>
<td>637300</td>
<td>516.8</td>
<td>118.85</td>
<td>134.13</td>
<td>69.31</td>
<td>15.93</td>
<td>531.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE6</td>
<td>1200</td>
<td>695920</td>
<td>569.8</td>
<td>143.86</td>
<td>155.10</td>
<td>90.85</td>
<td>17.40</td>
<td>546.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE7</td>
<td>1300</td>
<td>755990</td>
<td>623.6</td>
<td>171.55</td>
<td>186.08</td>
<td>116.04</td>
<td>18.90</td>
<td>560.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YE8</td>
<td>1400</td>
<td>817480</td>
<td>678.0</td>
<td>201.98</td>
<td>215.10</td>
<td>145.83</td>
<td>20.44</td>
<td>575.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- The above figures are for actual beam length.
- The clear span will be 1m less than the above figures.
- The centre to centre of bearing in a simply supported structure will be 500mm less than the above figures.
- The beam spacing in mm of 1350+0.28D for Y-beams where D= beam depth.
- Beam spacings greater than this may be used but the permanent shutter will either have to be 75mm deep ribbed FRC or prestressed wide slab with a corresponding increase in deck slab thickness over the beam up to 250mm.
- If using prestressed 75mm wide slab permanent shutter the outside beam face shutter rebates will have to be increased in size from the standard 40mm wide x 50mm deep to 60mm wide x 75mm deep. This also requires the shear links to be narrowed and some adjustment of the top strand locations.
Fibre Reinforced Concrete Permanent Shutter

Introduction

FRC is a flat or ribbed product designed to facilitate the pouring of in-situ deck slabs between prestressed bridge beams. The shutter is designed to carry the immature concrete and associated construction loadings. It is intended that the shutter will be left in place following completion of the bridge. Banagher Precast Concrete FRC shutter is made from 50N self-compacting concrete with 5 kg/m³ of synthetic fibre and glass fibre reinforced polymer bars. These products were chosen for their structural properties and long-lasting durability. Specifications for all of the components can be sought from Banagher Precast Concrete.

Design loads:
- Live load – 1.5 kN/m²
- Dead load – Thickness of in-situ slab * 24 kN/m³

Material Safety Data

- Cutting altering of FRC panels may cause structural failure and is not permitted without written approval from Banagher Precast Concrete Ltd.
- FRC should always be placed with arrows/rips directed transversely across the span – see figure.
- FRC products must not be subjected to excessive point loads (live load not to exceed 150 Kg/m²)
- FRC Products should be inspected for damage.
- All surfaces to receive FRC should be cleaned to remove all loose material and inspected for damage.

The bearing should be no less than 25mm at each side of the FRC, and must be level with the underside of the FRC. See figure.
- FRC product must not be subject to shock loading.
- Spacers should always be placed on the beams, not the FRC.
- Concrete must not be heaped on the FRC.
- Material must not be stacked or elements must not be propped on the FRC.
- Storage of materials on deck must be supported by beams not FRC.

Material Safety Data

Material safety data

WARNING

Load Span Tables

<table>
<thead>
<tr>
<th>Product</th>
<th>Maximum Span (mm)</th>
<th>Max deck thickness including FRC shutter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30mm Flat</td>
<td>750</td>
<td>300</td>
</tr>
<tr>
<td>50/20</td>
<td>1350</td>
<td>300</td>
</tr>
<tr>
<td>75/20</td>
<td>1800</td>
<td>300</td>
</tr>
</tbody>
</table>
Precast Parapet, Coping and Edge Beam Details

More and more contractors are using the option of factory manufactured concrete cast on or individually cast parapets, copings and edge beams. Banagher Precast Concrete parapets, copings and edge beams can be any profile, we do carry standard sizes and we would offer these first but bespoke sizes can also be catered for.

Cast on parapets, copings and edge beams are typically precast onto our standard range of prestressed bridge beams as a secondary process which can be seen here and on the next five pages.

Banagher Precast Concrete also design holding down details for contractors so that the use of precast parapets, copings and edge beams can be used on site. They make for a better finished product and a much safer product as straight away the contractor has edge protection and they also act as formwork for the deck pour.
Precast Parapet, Coping and Edge Beam Details

Typical advantages of precast concrete parapets, copings and edge beams:
1. Factory produced
2. Ensure a quick erection process
3. Alternative finishes and profiles available to suit local conditions
4. Can take cast in items for light fixings and crash barrier systems.

Banagher Precast Concrete manufacture parapets like below for use over Railways where a steeple top is required to prevent people being able to stand on top of the parapet. These units can have an F4 finish on both faces or a U4 finish on one.

Section Through TY Beam Showing Cast on Precast Coping
(This Detail Can Also Be Used With The MY & Y Beam)

Section Through TY Beam Showing Precast Parapet
(This Detail Can Also Be Used With The MYE & YE Beam)
Banagher Precast Concrete can offer pattern profiled finishes, exposed aggregate finishes, brick sandwich panels and as shown below curved panels as well. Whatever your criteria please give our technical team a call for a precast solution.

There are many forms of connection details for the parapet to the deck. Banagher Precast Concrete pride themselves on offering the client the best and most user friendly solution for on site conditions. A precast seating and a stitch detail can help in the temporary case and give the client edge protection at an early stage allowing work on the deck to start straight away.
Lifting and Handling Details

U and W Beams

W Beam manufacture is identical to U Beam manufacture but due to the larger section, extra care must be taken in lifting and stacking of W Beams. The units are manufactured with two sets of lifting anchors (see Fig. 1). The lifting anchors positioned closest to the ends are used at the manufacturing yard and should not be used on site, except in special agreed circumstances. The site lifting anchors are positioned further in along the beam. The location and Lifting Angle for these positions are noted on the relevant production drawing.

When lifting the beams at the production yard, a spreader beam is used. This spreader beam has been manufactured, tested and certified for this specific task and lifts straight up causing no inward or outward stress to the beam. This system is used for lifting the beam from the production line into storage. Typical support arrangement for temporary storage is shown in Fig. 3. The beam must be supported under the end lifting anchor and the supports should provide sufficient ground clearance to avoid any bearing along its length. Bearing should only take place at these two points; no further bearing should be provided along the length of the beam. Support should be provided either across the full width of the W Beam soffit (see Fig. 4a) or directly under the two webs (see Fig. 4b) and NOT be positioned along the centre line of the beam (see Fig. 4c). When transporting to site a temporary brace is positioned between the two site lifting anchors (Fig. 2). This is an adjustable steel frame that is easily fixed and removed when the beam is in position. The brace must remain in place when lifting on site and slings can be attached as normal. Once the beam has been landed on its support this brace can be removed easily and returned to the yard. Site work may commence.

All Other Beams

Strands to be splayed in beam to provide anchorage

15.7mm superstrand to be used for lifting

Specified characteristics

Breaking load = 279kn

3 No. Strand each end

Direction of site lift

Min. Lift angle

45°

Prestressed Bridge Beam Lifting Details

Support Point

Support Point

Fig 1. Section

Fig 2. Elevation

Fig 3. Section

Fig 4a. Section

Fig 4b. Section

Fig 4c. Section

Notes:

- D Shackle to be used for lifting
- D Shackle to be used when lifting on site
- Nominal 50mm pin to be used
- Temp. lifting brace positioned between webs at lifting anchor locations
- Direction of site lift
- Min. Lift angle
- Site lifting anchor
- Yard lifting anchor
- 15.7mm superstrand to be used for lifting anchors
- Breaking load = 279kn
- 4 No. Strand each end

Prestressed Bridge Edge Beam Lifting Details

Support Point

Support Point

Fig 1. Section

Fig 2. Elevation

Fig 3. Section

Fig 4a. Section

Fig 4b. Section

Fig 4c. Section

Notes:

- D Shackle to be used for lifting
- D Shackle to be used when lifting on site
- Nominal 50mm pin to be used
- Temp. lifting brace positioned between webs at lifting anchor locations
- Direction of site lift
- Min. Lift angle
- Site lifting anchor
- Yard lifting anchor
- 15.7mm superstrand to be used for lifting anchors
- Breaking load = 279kn
- 4 No. Strand each end

Prestressed Bridge Edge Beam Lifting Details
Delivery and Installation

Transportation to Site:

In almost all cases it is the responsibility of Banagher Precast Concrete to deliver the bridge beams to site. The handling of the units on site, preparation of suitable access roads, craneage and further site operations is the responsibility of the contractor. Banagher Precast Concrete are on hand to advise in relation to any of the points above.

The precast beams are delivered to site on special vehicles with the load supported and restrained appropriately. On site, the access road to the point of unloading must be appropriate for road vehicles, i.e. adequate hardstanding to be provided for by the main contractor.

Roadways with crossfalls or corners with severe changes of level should be avoided as these may impose torsional stresses on the beams. The unloading area should be on level ground and appropriate space for turning should be available.

Handling and Erection on Site:

Lifting and handling operations must be reviewed by a competent person. Cranes should be positioned such that the erection of the beams can take place safely, within the safe working load and radius of the crane. Beam weights for lifting are given on the Banagher Precast Concrete production drawings. The angle of lift is also defined on the drawings. Bridge beam lifts are often critical with respect to road or rail closures, it is recommended therefore that the crane has some additional capacity. The contractor should allow for an additional 10% of weight to that on the production drawings, if necessary, Banagher Precast Concrete can weigh the beams. The bridge beams have lifting strands cast in, these again are identified clearly on the production drawings. It is up to the crane supplier to provide all of the lifting gear.

Bridge beams should be placed in position as soon as they are delivered to site but often this is not possible as large numbers of beams may take days to be delivered in full if the haulier doesn’t have adequate numbers of trailers, therefore it may be required to store a number of beams until all of the beams have been delivered and then can be placed at the same time. Storage areas should be cordoned off and beams should be supported on timber skids with appropriate foundation strips, Banagher Precast Concrete are available to liaise on the type and size of timbers that need to be used, often these timbers will be on the delivery wagon and can be kept and used on site. Tall beams should be stabilised with props and all beams should be supported only under the lifting points as shown in our section on "Lifting and Handling Details" in this brochure.

Appendix A

TY & TYE Edge Beam for Solid Slab Construction

TY & TYE Edge Beam for Beam and Slab Construction

TY Beam Showing all possible strand locations for 12.9mm diameter strand

TYE Beam Showing all possible strand locations for 12.9mm diameter strand

TY Beam Showing all possible strand locations for 12.9mm diameter strand

TYE Beam Showing all possible strand locations for 12.9mm diameter strand

(TY11 and TYE11 shown above, for all other TY beam links please contact the technical department)
For a copy of the Bridge Beam Design Manual please contact our technical department.