PRESTRESSED CONCRETE BEAMS

SCIB CONCRETE MANUFACTURING SDN BHD

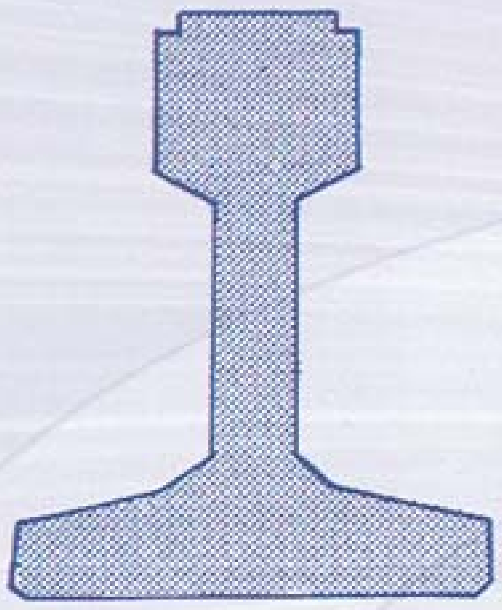
Company No: 554888-U

(A Wholly Owned Subsidiary of Sarawak Concrete Industries Berhad - A Member of Bursa Malaysia Securities Berhad)

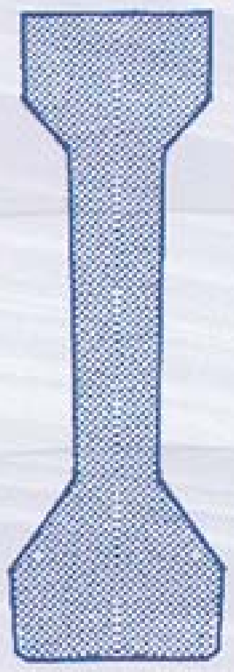
QUALITY SYSTEM
SIRIM
UKAS
024
MS ISO 9001 REG. NO AR 1476
MS ISO 9001 : 2000
Quality Systems - Model for Quality Assurance in Production, Installation and Servicing

SCIB Concrete Manufacturing Sdn Bhd offer designers a choice of 2 pretensioned bridge beam types for use in bridge connection.

These 2 beam types are shown below:



M-Beams



I-Beams

For each beam type, a range of sizes are available as shown in the attached tables.

FEATURES

- SCM Prestressed Bridge Beams are:
  - designed to BS 5400: Part 4: Code of practice for design of Concrete Bridges: 1984.
  - produced using high strength concrete with characteristic strengths of between 45N/mm^2 to 60N/mm^2
  - used for the construction of highway bridges designed to MOT load requirements.

ADVANTAGES OF USING SCM PRESTRESSED BRIDGE BEAMS

- No scaffolding/props/falsework required over rivers or roads
- Reduce construction site activities
- Minimise wet concrete works at site
- Ease of construction
- Minimum interruption to traffic flow
- Cut construction time-beam production in SCM factories proceeds simultaneously with construction work at site
- Obtain high quality factory cast beams with minimal supervision
- No time wasted waiting for beams to gain strength
- Working platform immediately available upon launching of beams
- Future extension of deck easily implemented by addition of prestressed beams

INFORMATION FOR DESIGNERS

• Prestressing strands

12.9mm diameter 7-wire super strands (low relaxation) conforming to BS 5896: 1980 are used.

• 28-day concrete cube strengths

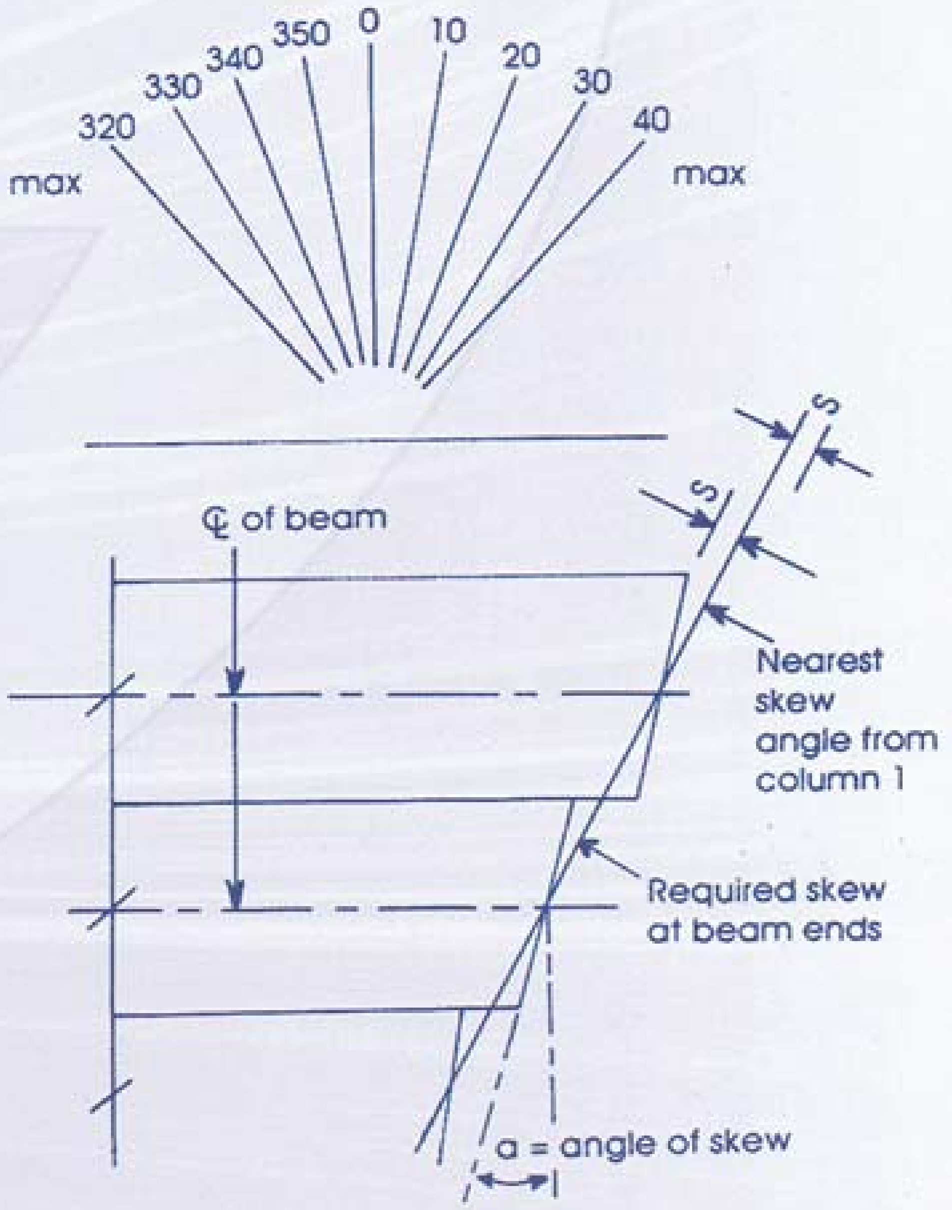
SCM Prestressed Bridge Beams are made with high strength concrete having a 28-day cube strengths of between 45 N/mm^2 and 60 N/mm^2.

• Curing

SCM Prestressed Bridge Beams are cured by covering and maintaining the beams in a wet condition by the application of low pressure steam until the specified transfer cube strength is reached.

- **Stacking**
  Each beam should be stacked on timber bearers placed at about 300mm to 500mm from each beam end.
- **End slots for dowels at fixed end bearings**
  Slots at beam ends can be formed in the bottom flange to accommodate dowel bars at fixed bearing position where required.
- **Beam Lengths and Transportation**
  Subject to design considerations, SCM Prestressed Bridge Beams can be made to lengths (subject to end shortening upon transfer of prestress) required by the designer. Beam lengths should preferably be specified in increments of 50 mm. Maximum beam lengths of up to 30 metres have been successfully transported from SCM factories and launched. Where access to a bridge site may be a problem, it is recommended that a check be made especially when using long (>22m) beams for remote areas. For long beams, it is highly recommended that some top reinforcement (in the form of strands/bars) be placed near the top of the beam in order to facilitate transportation without cracking of the beams.
- **Diaphragm hole sizes and locations**
  Standard sized diaphragm holes (see fig 1) for each beam type are located at regular spacings as shown. Adoption of these standard hole sizes and locations will allow a reduction in production cost of the beams.
- **Skewed Beam End**
  Skewed ends to beams are expensive and should be avoided where possible. Specification of beam ends with the precise angle of skew to suit the bridge alignment generally increases the beam cost. Where skewed ends are necessary, the use of the "rationalised skew angles' shown in the table below will help reduce beam costs with no disadvantage to the designer. The use of the rationalised skew angles below ensures that the mazimum displacement's' of the corners of the beams (see figure below) does not exceed 50 mm for M Beams.
- **Reinforcement in Skewed Beams**
  Only reinforcement in the end zone of the beam should be skewed. All other reinforcement in the body of the beams should be detailed square to the section.

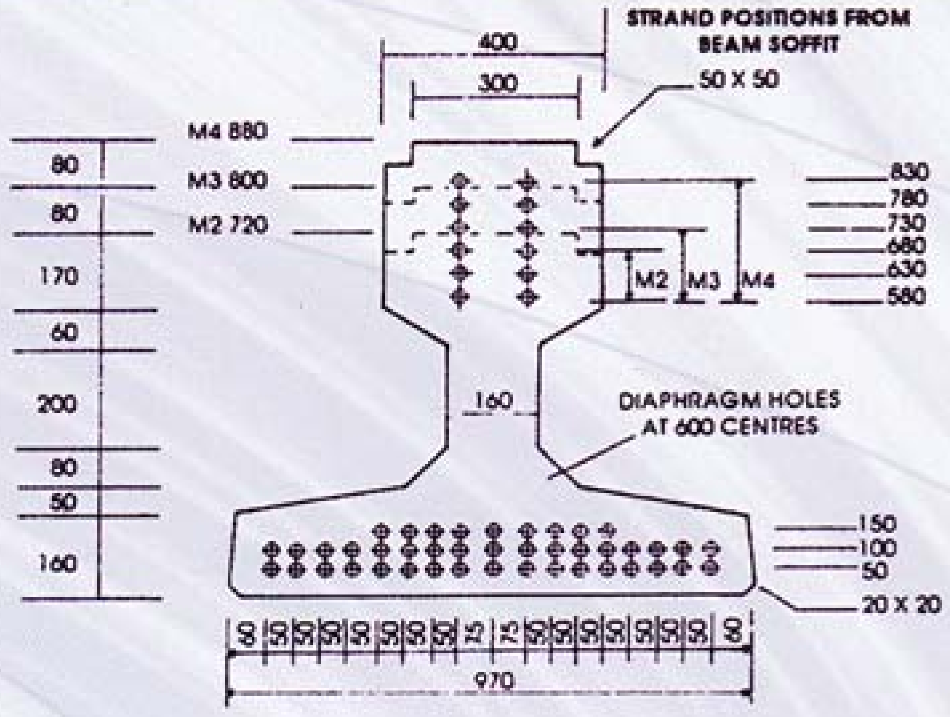
1 Rationalised Skew angle at beam end	2 Maximum 'S' (mm) for intermediate skew angles for M-beams*	3 Skew angle at S max
0°	44	5.0°
10°	45	15.1°
20°	49	25.3°
30°	40	34.0°
37.5°	44	41.5°
45°	50	49.0°
52.5°	50	56.0°
59°		



Example: Actual skew angle = 27.5: Use of Column 3 indicated that a skew angle of 25.3° corresponds to a displacement S of about 50mm. To limit displacement S to below 50mm, use a rationalised skew angle of 30°.

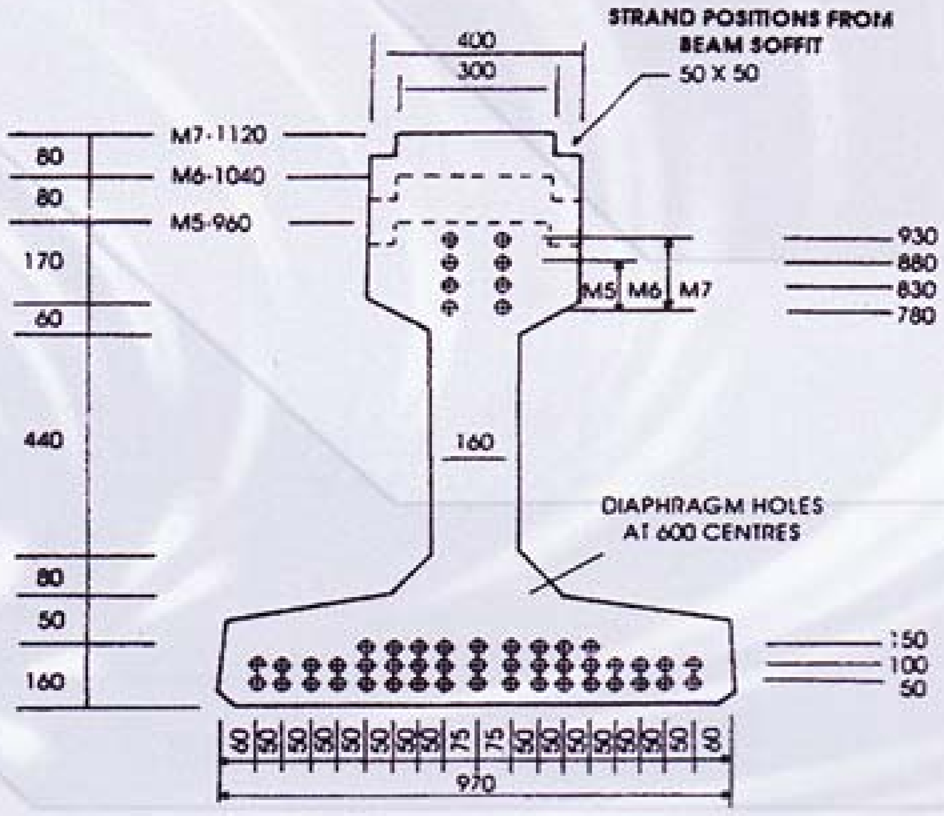
*For Inverted tee beams, the value of 'S' is half that in column 2.

M BEAMS



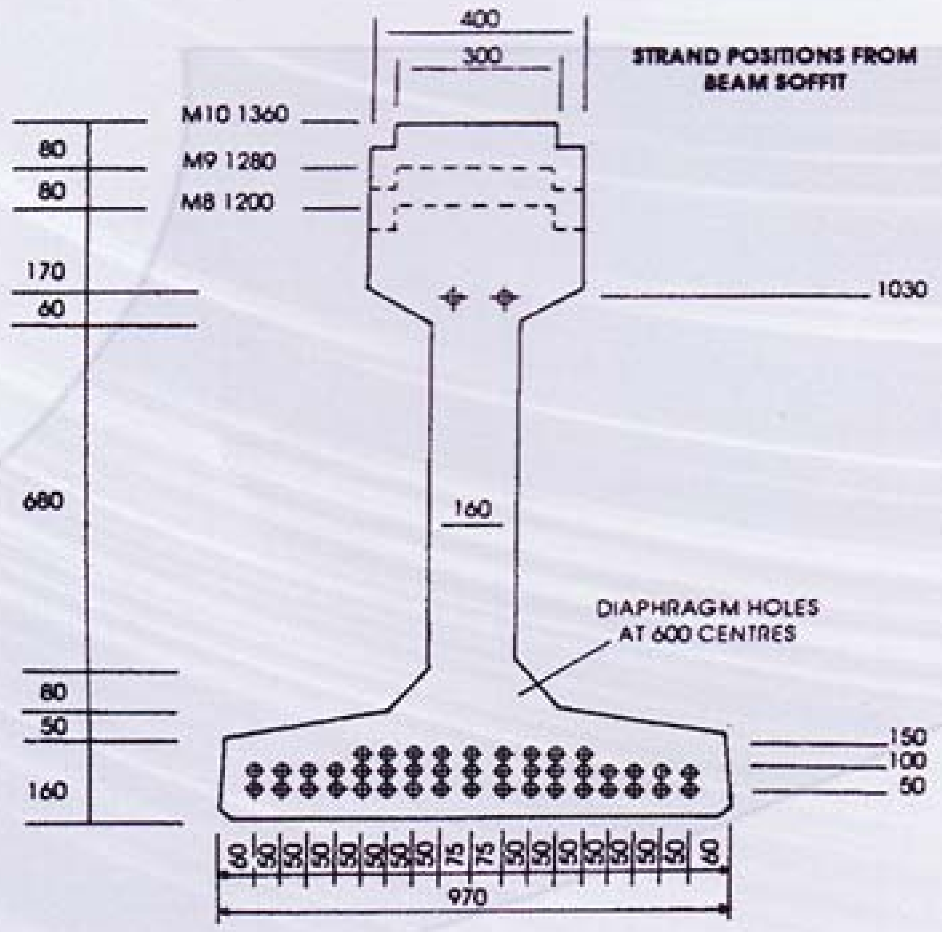
DIMENSIONS AND SECTION PROPERTIES OF M2, M3, M4

M BEAM TYPE / DESCRIPTION		M2	M3	M4
SPAN RANGE	L (m)	16.0 - 18.0	17.5 - 19.5	19.0 - 21.5
DEPTH	D (mm)	720	800	880
WEIGHT	W (kN/m)	7.71	8.49	9.26
SECTIONAL AREA	A (mm^2)	316650	348650	380650
NEUTRAL	Yt (mm)	455	490	527
AXIS	Yb (mm)	265	310	353
MOMENT OF INERTIA	Ixx (mm^4)	16.20×10^9	23.02×10^9	30.94×10^9
SECTION	Zt (mm^3)	35.64×10^6	46.96×10^6	58.77×10^6
MODUL II	Zb (mm^3)	61.04×10^6	74.31×10^6	87.57×10^6



DIMENSIONS AND SECTION PROPERTIES OF M5, M6, M7

M BEAM TYPE / DESCRIPTION		M5	M6	M7
SPAN RANGE	L (m)	20.5 - 22.5	22.0 - 24.0	23.5 - 26.0
DEPTH	D (mm)	960	1040	1120
WEIGHT	W (kN/m)	8.64	9.42	10.20
SECTIONAL AREA	A (mm^2)	355050	387050	419050
NEUTRAL	Yt (mm)	603	631	660
AXIS	Yb (mm)	357	409	460
MOMENT OF INERTIA	Ixx (mm^4)	35.81×10^9	47.56×10^9	60.46×10^9
SECTION	Zt (mm^3)	59.39×10^6	75.39×10^6	91.53×10^6
MODUL II	Zb (mm^3)	100.33×10^6	116.23×10^6	131.54×10^6



DIMENSIONS AND SECTION PROPERTIES OF M8, M9, M10

M BEAM TYPE / DESCRIPTION		M8	M9	M10
SPAN RANGE	L (m)	25.0 - 27.0*	26.5 - 28.5*	28.0 - 29.0*
DEPTH	D (mm)	1200	1280	1360
WEIGHT	W (kN/m)	9.58	10.35	11.13
SECTIONAL AREA	A (mm^2)	393450	425450	457450
NEUTRAL	Yt (mm)	746	768	792
AXIS	Yb (mm)	454	512	568
MOMENT OF INERTIA	Ixx (mm^4)	65.19×10^9	82.98×10^9	101.88×10^9
SECTION	Zt (mm^3)	87.39×10^6	108.09×10^6	128.65×10^6
MODUL II	Zb (mm^3)	143.57×10^6	161.57×10^6	179.36×10^6

* subject to transportation constraints

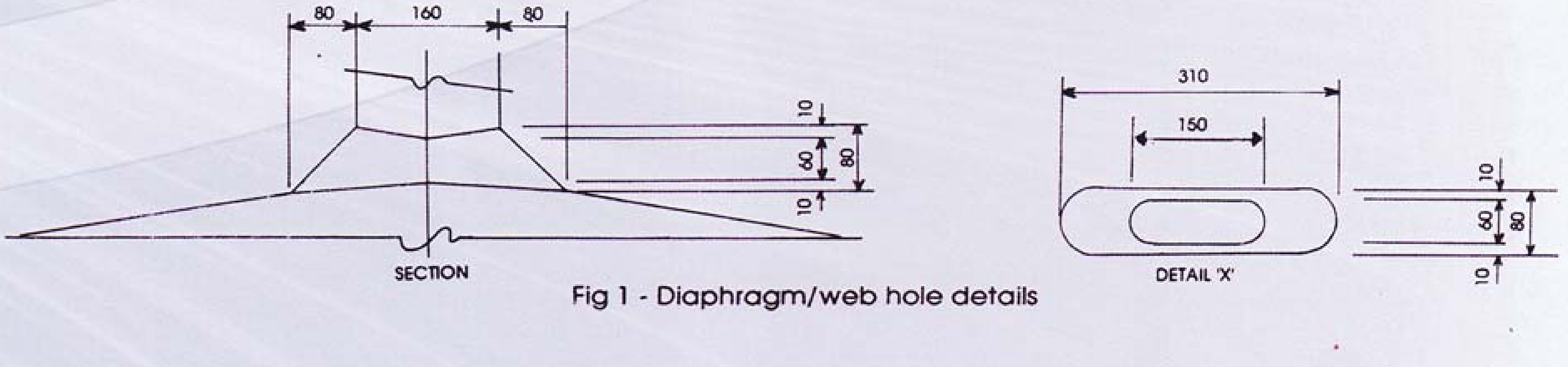


Fig 1 - Diaphragm/web hole details

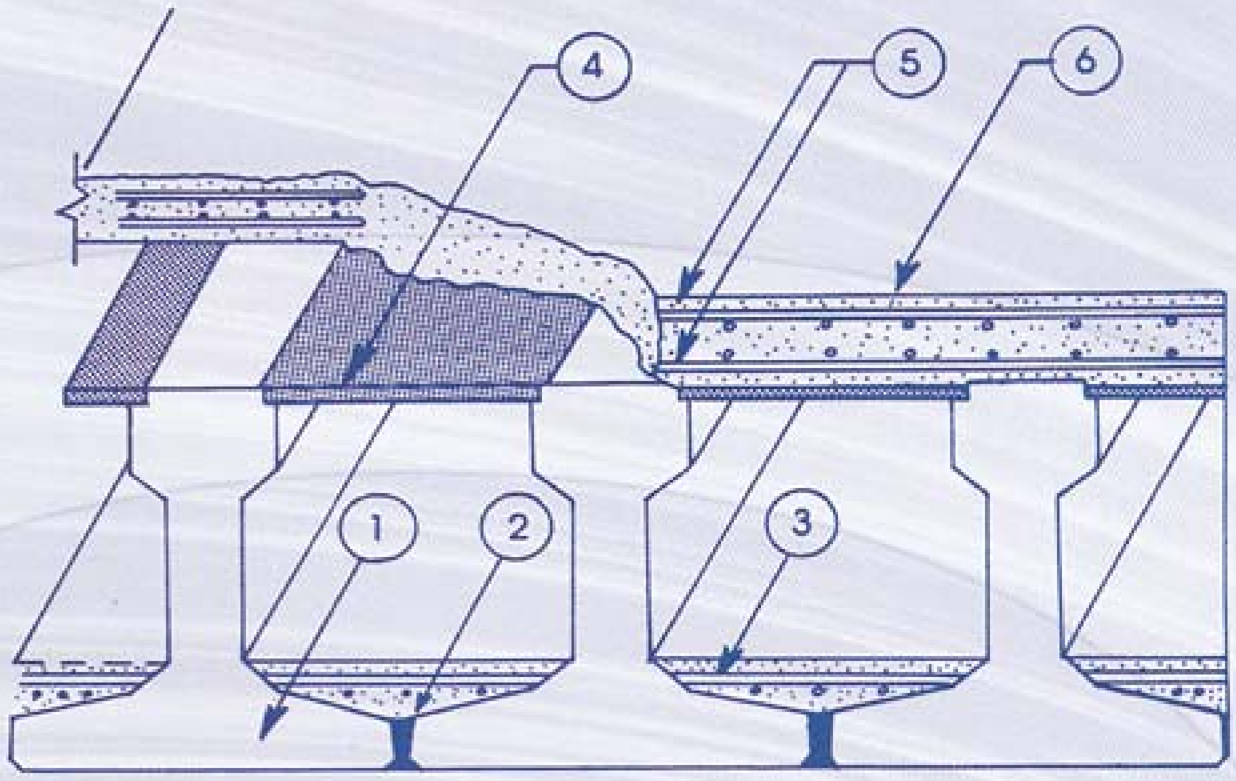
A range of nine M-sections, M2 to M10, are available for use by the bridge engineer to cater for various spans from 16 metres or less up to 28 metres (subject to transportation constraints). Standard web holes (see fig 1 on previous page) provided at 600mm centres when necessary for threading transverse reinforcement through the bottom of the webs.

CONSTRUCTION METHODS FOR M-BEAM BRIDGES

PSEUDO BOX

Contstruction sequence

1. M-beams are launched at 1-metre centres.
2 Fill gap between bottom flanges of adjacent beams.
3. Place reinforcement through web holes & cover reinforcement with a minimum of 50 mm in situ concrete.
4. Place permanent formwork between top flanges of adjacent beams.
5. Place reinforcement for top slab and end diaphragm beams.
6. Cast top slab and end diaphragm beams.

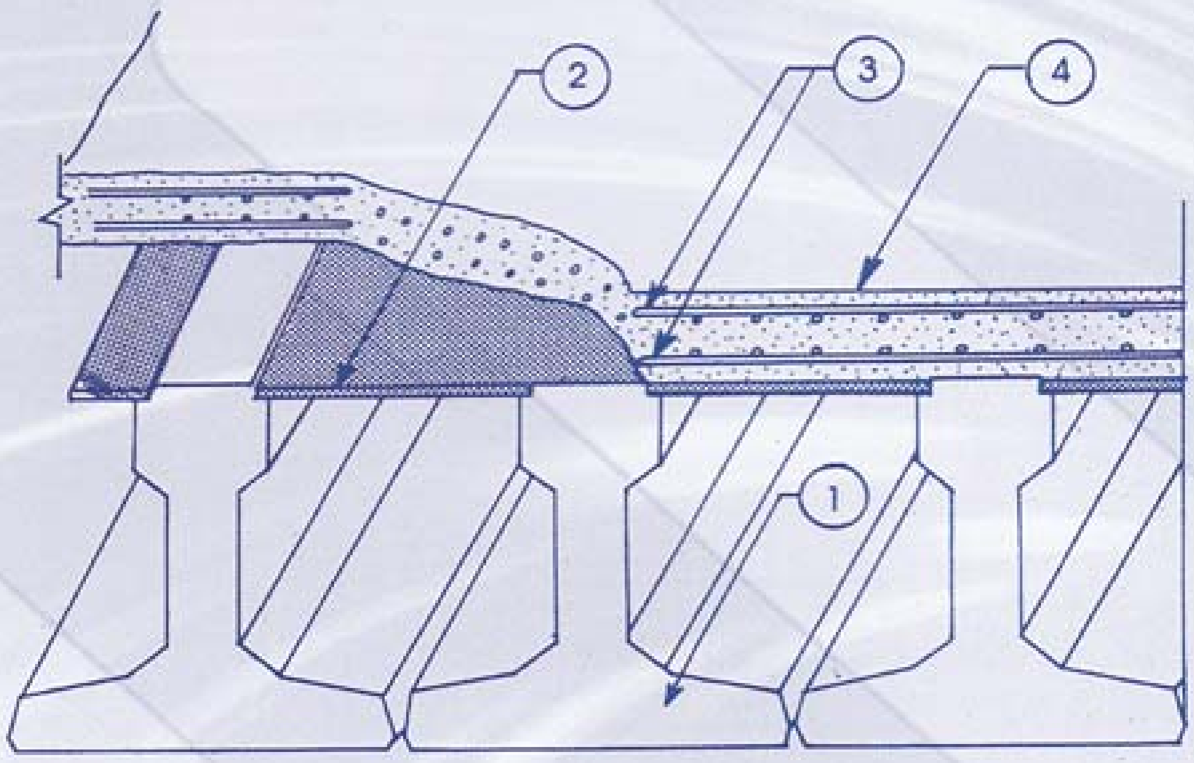


T- BEAM

Construction sequence

1. M-beams are launched at 1-metre centres.
2. Place permanent formwork between top flanges of adjacent beams.
3. Place reinforcement for top slab and end diaphragm beams.
4. Cast top slab and end diaphragm beams.

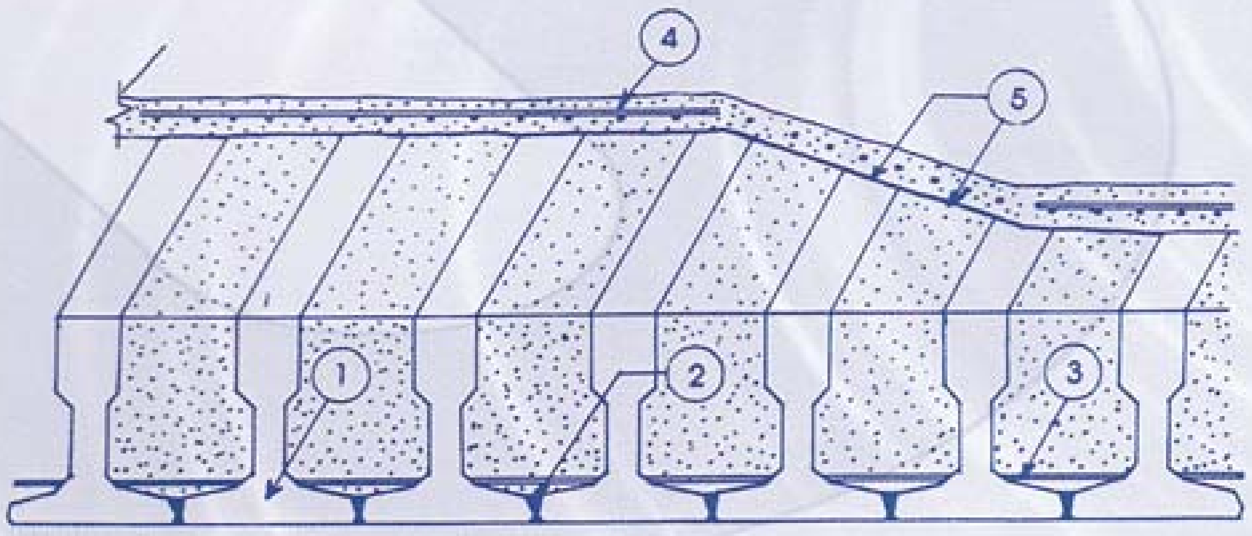
Note: For T-beams construction, web holes are omitted, except at the ends of the M-beam for threading through the end diaphragm beam reinforcement.



SOLID SLAB

Construction sequence

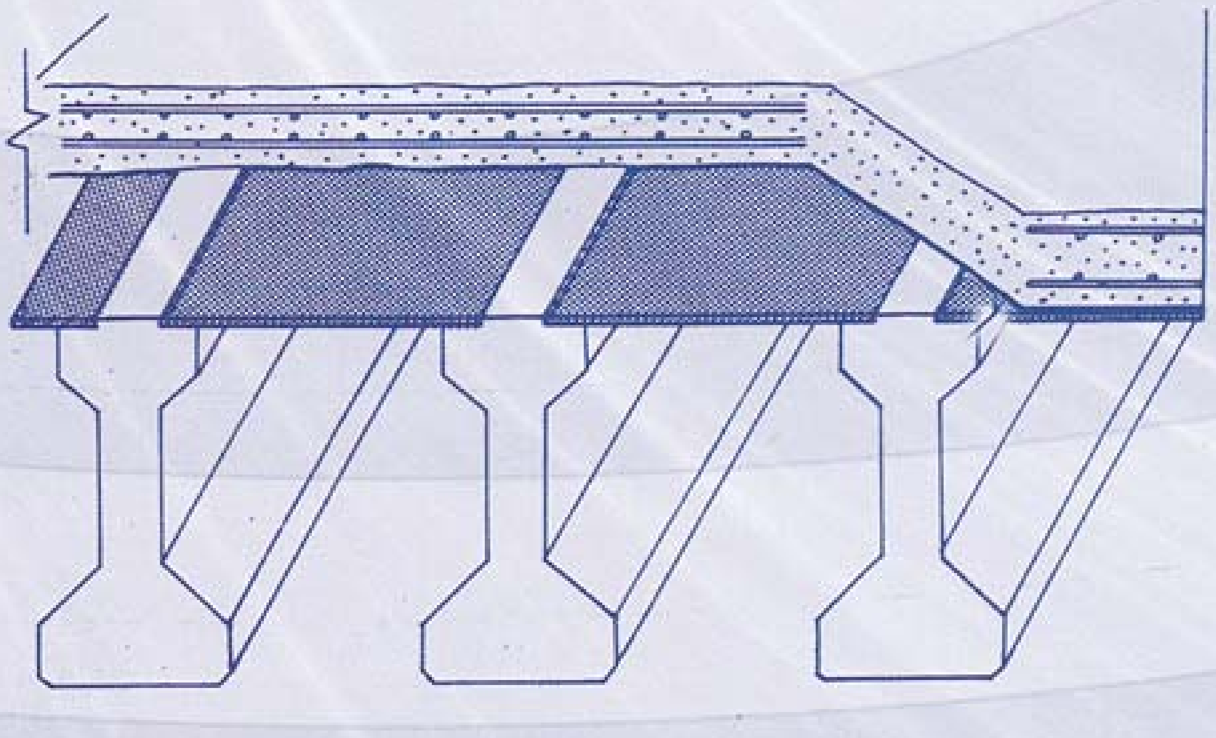
1. Inverted tee beams are laid at 508mm centres
2. Fill gap between bottom flanges of adjacent beams along length of beams
3. Place reinforcement through web holes @ 762mm centres.
4. Place reinforcement for top slab.
5. Cast void between contiguous beams together with top slab.



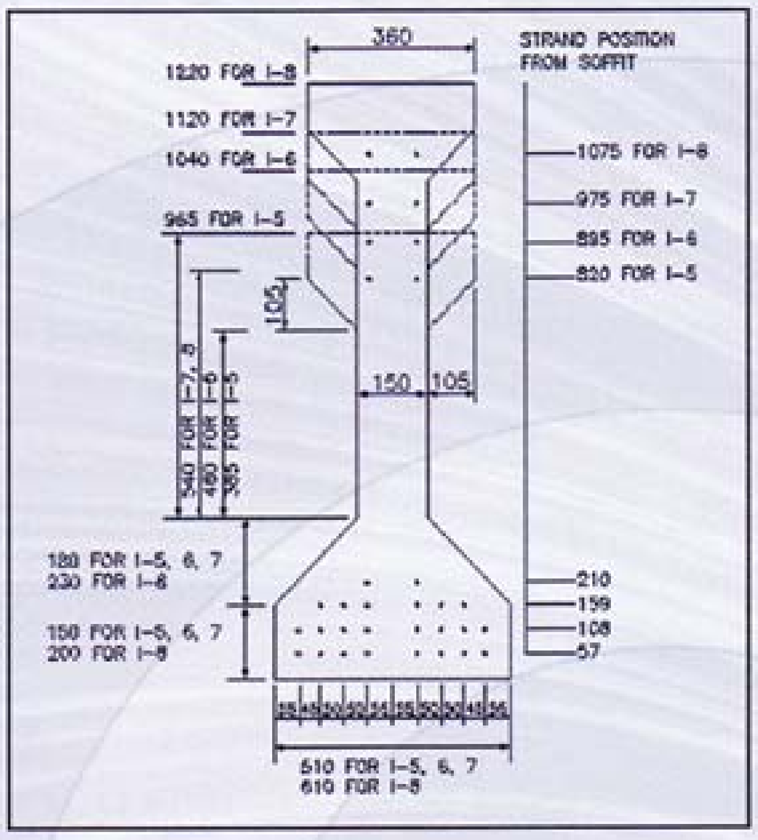
CONSTRUCTION METHODS FOR I-BEAM BRIDGES

Construction sequence

1. I -beams are launched 1.5 metre centres (typical).
2. Soffit formwork is placed at diaphragm beams position.
3. Reinforcement for diaphragm beams is placed.
4. Side formwork for diaphragm beams and soffit formwork for slab is placed.
5. Place reinforcement for top slab.
6. Cast top slab and diaphragm beams.

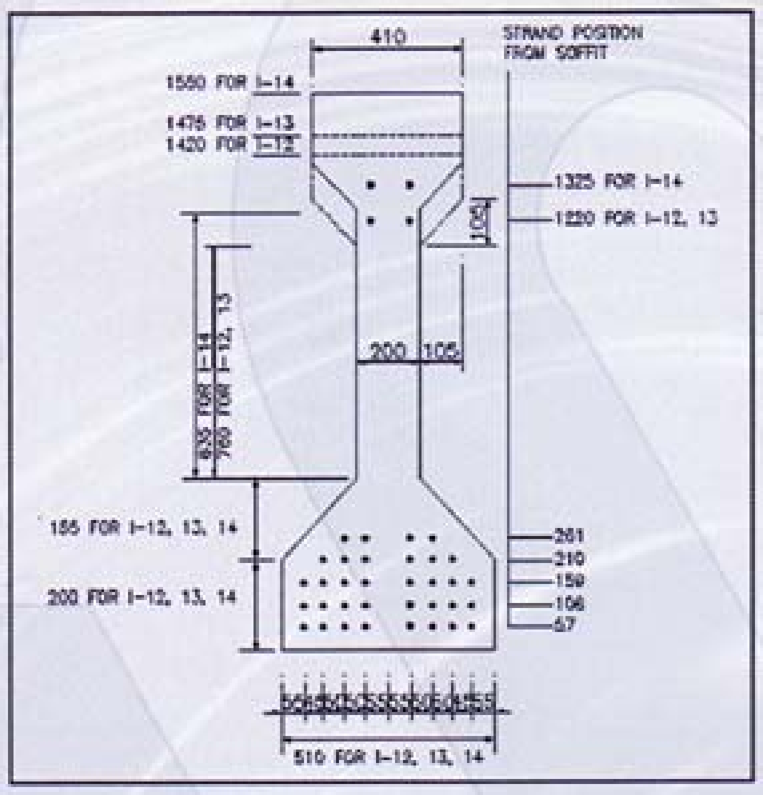


I BEAMS



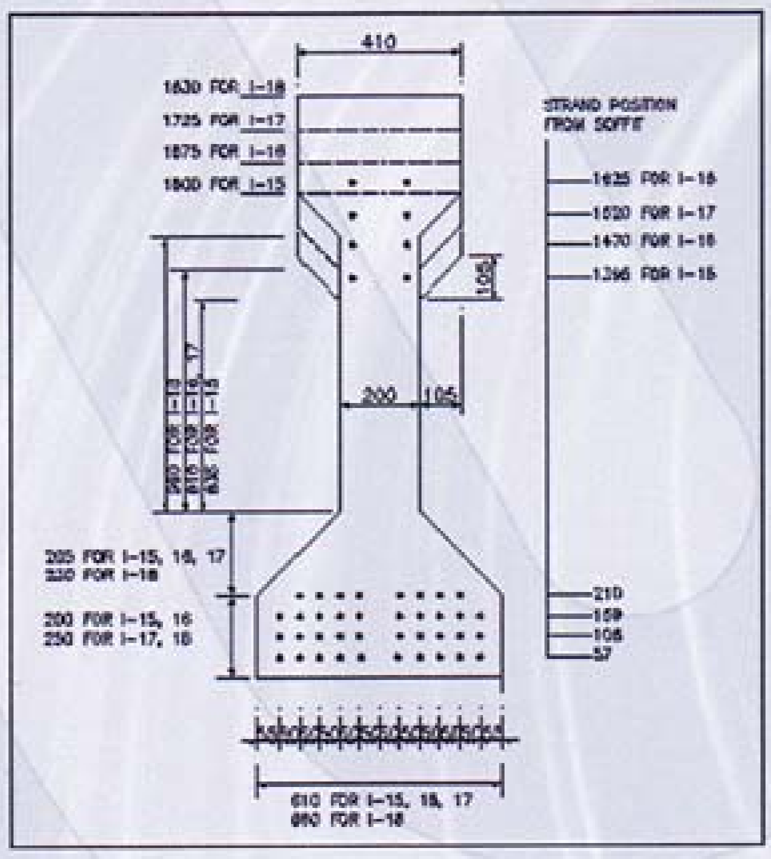
DIMENSIONS AND SECTION PROPERTIES OF I-5, I-6, I-7 & I-8 BEAMS

DESCRIPTION	I BEAM TYPE	I-5	I-6	I-7	I-8
DEPTH	D (mm)	965	1040	1120	1220
WEIGHT	W (kN/m)	6.63	6.91	7.20	8.99
SECTIONAL AREA	A (mm²)	272625	283875	295875	369375
NEUTRAL	Yt (mm)	538	579	623	728
AXIS	Yb (mm)	427	461	497	492
MOMENT OF INERTIA	Ixx (mm⁴)	28.15×10^9	34.46×10^9	42.09×10^9	58.75×10^9
SECTION	Zt (mm³)	52.32×10^6	59.56×10^6	67.67×10^6	80.74×10^6
MODUL II	Zb (mm³)	65.80×10^6	74.76×10^6	84.68×10^6	119.3×10^6



DIMENSIONS AND SECTION PROPERTIES OF I-12, I-13, I-14, I-15 BEAMS

DESCRIPTION	I BEAM TYPE	I-12	I-13	I-14	I-15
DEPTH	D (mm)	1420	1475	1550	1600
WEIGHT	W (kN/m)	10.30	10.84	11.21	12.38
SECTIONAL AREA	A (mm²)	423050	445600	460600	508600
NEUTRAL	Yt (mm)	752	768	806	875
AXIS	Yb (mm)	668	707	744	725
MOMENT OF INERTIA	Ixx (mm⁴)	93.64×10^9	106.61×10^9	122.07×10^9	145.2×10^9
SECTION	Zt (mm³)	124.36×10^6	138.81×10^6	151.34×10^6	166.0×10^6
MODUL II	Zb (mm³)	140.19×10^6	150.79×10^6	164.07×10^6	200.3×10^6



DIMENSIONS AND SECTION PROPERTIES OF I-16, I-17 & I-18 BEAMS

DESCRIPTION	I BEAM TYPE	I-16	I-17	I-18
DEPTH	D (mm)	1675	1725	1830
WEIGHT	W (kN/m)	12.74	13.49	14.57
SECTIONAL AREA	A (mm²)	523600	554100	598475
NEUTRAL	Yt (mm)	915	958	1037
AXIS	Yb (mm)	760	767	793
MOMENT OF INERTIA	Ixx (mm⁴)	164.4×10^9	182.2×10^9	221.9×10^9
SECTION	Zt (mm³)	179.8×10^6	190.2×10^8	214.0×10^6
MODUL II	Zb (mm³)	216.2×10^6	237.5×10^6	279.8×10^6

It is our policy to continously review and improve products and their design. Information in this leaflet is therefore subject to change without notice.

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