

2.3.2 RAIL BRIDGES

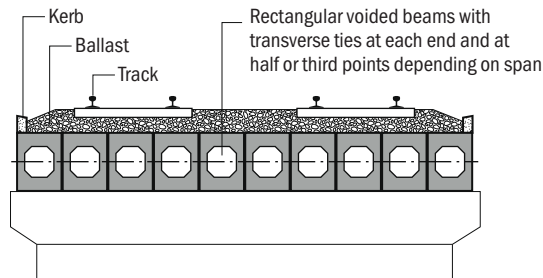
2.3.2.2 RECTANGULAR VOIDED BEAMS

GENERAL DESCRIPTION

Railway bridge superstructures are designed mostly as ballast-top, non-composite structures in the span range 4 to 25 m. Precast voided beams provide economical sections for the construction of these bridges, up to about 22 metres. A transverse tie design is required in most bridges in order to ensure that the members will not be spread apart by the application of imposed actions. It is common to have a single tie at mid-depth of beams for spans to 13 m and a double tie for spans greater than 13 m (see *Section Properties*). Tie systems vary depending on the requirements of the relevant state rail authority.

Voided beams are provided with either circular or rectangular voids to reduce self weight and increase structural efficiency.

TYPICAL ARRANGEMENT



COMPONENT DETAILS

Component types and depths vary according to load/span requirements and rail gauge, with profiles depending on the respective rail authority.

A typical series consists of 710-mm-wide beams with a depth range from 650 mm to 1300 mm as detailed in *Standard Sections* below.

Current design philosophy employs fully-prestressed designs using only prestressing strands, which are debonded locally as required at each end to control concrete stresses to within acceptable design limits at transfer of prestress.

Two strands are always placed near the top of the section to support the stirrups within the beams and to assist in control of concrete stress at time of transfer of prestress.

Concrete is Special Class concrete, strength grade S50. Strength at transfer of prestress is commonly specified as 35 MPa.

SECTION PROPERTIES

Type	Depth (mm)	A (mm ²)	I _x (mm ⁴)	Y _b (mm)	Z _t (mm ³)	Z _b (mm ³)	Mass (kg/m)	Span (m)	Transverse tie configurations
Beam 1	650	339 040	15.055 x 10 ⁹	325	46.32 x 10 ⁶	46.32 x 10 ⁶	881	4-7	• • •
Beam 2	750	341 160	22.047 x 10 ⁹	375	58.79 x 10 ⁶	58.79 x 10 ⁶	887	5-8	• • • •
Beam 3	850	365 000	30.998 x 10 ⁹	425	72.94 x 10 ⁶	72.94 x 10 ⁶	950	7-10	• • • • •
Beam 4	950	436 000	45.391 x 10 ⁹	475	95.56 x 10 ⁶	95.56 x 10 ⁶	1134	9-13	• • • • • •
Beam 5	1100	472 000	67.333 x 10 ⁹	550	122.40 x 10 ⁶	122.40 x 10 ⁶	1227	12-16	• • • • • • •
Beam 6	1200	496 000	84.887 x 10 ⁹	600	141.50 x 10 ⁶	141.50 x 10 ⁶	1290	15-18	• • • • • • • •
Beam 7	1300	615 000	115.196 x 10 ⁹	650	177.22 x 10 ⁶	177.22 x 10 ⁶	1600	17-22	• • • • • • • • •

STANDARD SECTIONS

