DURA® UBG – U Bridge Girder

Description

DURA® UBG – U bridge girders are prefabricated using the revolutionary composite material of ultra-high performance concrete and high-carbon-high-tensile steel fibers (UHPdC). It is an excellent solution for bridge engineers looking for a cost effective, fast construction, light-weight and high-durability option for bridge span range of 16 to 75 meters.

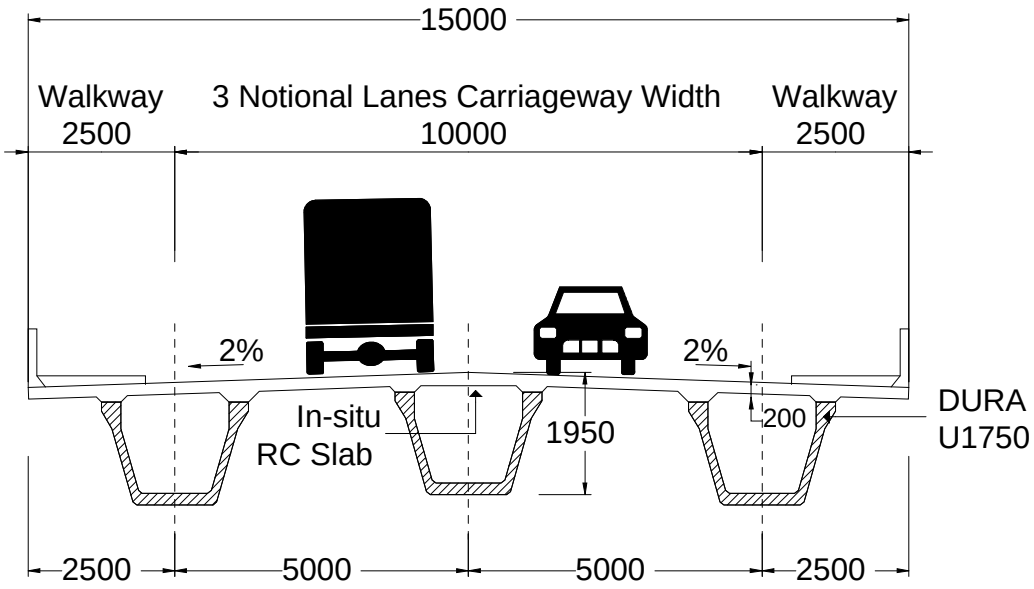
Figure 1 gives an example of a single span bridge with a total bridge span of 40 m and total width of 15 m. The proposed bridge consists of two 2.5 m wide walkways (parapet inclusive). The intermediate portion of the bridge consists of 3 notional lanes carriageway and is 10 m wide. If using Dura method, only **THREE** pieces of **DURA® UBG1750** are needed to composite with a 200 mm thick cast in-situ R.C. slab. The **DURA® UBG1750** are spaces 5 m apart c/c. In contrast, if using conventional method, seven pieces of the super tee girders are needed in order to has similar structural performance.

Features

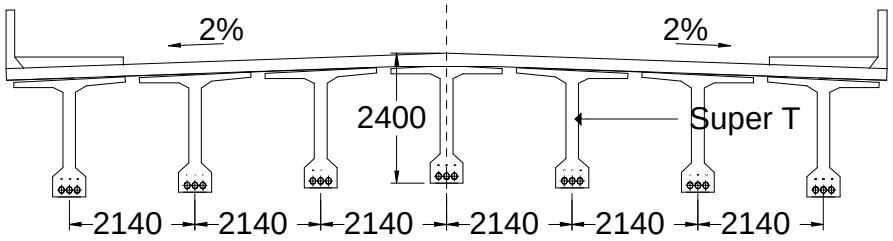
- The UHPdC used for **DURA® UBG** has mean compressive strength 150 MPa and mean flexural strength of 20 MPa.
- **DURA® UBG** eliminate the used of conventional steel reinforcing bars and stirrups, except at regions where jointing detail are required for composite construction. All steel fibers used are made from high carbon steel wires with tensile strength of minimum 2300 MPa.
- Except **DURA® UBG1000** is pretensioned girder, **DURA® UBG1250, UBG1750, UBG2250** and **UBG2750** are assembled using post-tensioning methods on several segmental pieces of the same kind. For example, Figure 2 shows a 40 m span **DURA® UBG1750** generally composed of five segments (i.e three identical 8 m long intermediate segments and two 8 m long anchorage segments). Each 8 m long intermediate segment and each 8 m long anchorage segment weight approximately 17 tones and 20 tones, respectively.

Advantages of DURA® UBG

- The total number of prestressed **DURA® UBG** needed can be halved when compared to conventional designs (refer to Figure 1). Thus, immediate savings for the superstructural cost can be attained;
- At least 20% of immediate savings can be attained for the substructure and foundation cost due to the lighter superstructure (especially on difficult ground condition);
- Indirect cost saving may be realized where shallower bridge beams are needed. Figure 1 shows the conventional super T-girders has a total depth of 2400 mm whereas the DURA® method has a total depth of 1950 mm. The reduction of girder depth can lead to indirect cost saving resulting from minimal cut and fill of the embankment or approach bridge levels.
- DURA® bridge system is at least 5 times more durable than conventional method as the UHPdC used consist significant amount of discrete high strength steel fibers to stitch cracks (if any) and the girders are designed based on uncracked approach at SLS (thus significantly increasing the life span of the infrastructure);
- Ease of handling (due to ultra-light weight when compare to conventional beams) and fast in construction;
- Due to the absence of conventional steel reinforcements, DURA® girders can be designed and produced in much slenderer and efficient sections, with no concern for classical issues such as minimum concrete cover, to prevent corrosion of steel reinforcement;
- No waterproofing needed as DURA® is a highly impermeable material;
- Its natural high quality finish due to the ultra-packed nature of the concrete matrix eliminates the need for painting or protective coating (thus leading to further long term savings in cost). Micro-organism such as mould and algae will also not grow easily on this surface;
- **DURA® UBG** is a highly GREEN product which supports the visionary of sustainable construction by reducing the overall CO_2 emission, primary energy consumption and global warming potential of at least 25%.



DURA METHOD WITH DURA UBG1750



CONVENTIONAL METHOD WITH SUPER TEE GIRDER

Figure 1 – Example of a 15m wide and 40 m single span highway bridge.

Figure 2 – Newly built single span 50m long Titi Bridge using UBG1750.

DURA® UBG

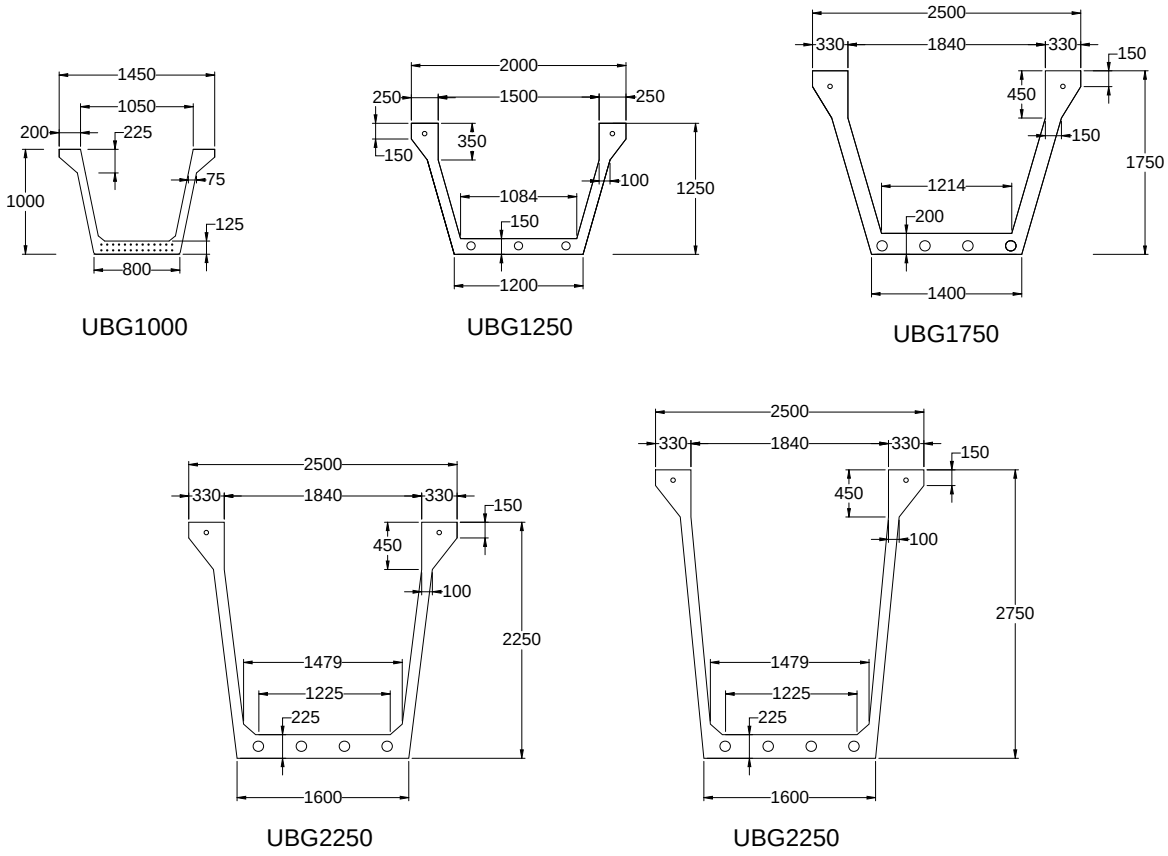


Figure 3 – Cross-sectional detail of DURA® UBG.

Table 1: Technical Data for Prestressed DURA® U Bridge Girders.

		Unit	UBG1000	UBG1250	UBG1750	UBG2250	UBG2750
Prestressing Method			**Pre-Tension**	**Post-Tension**			
Nominal Length	**L**	m	16 ~ 22	23 ~ 36	37 ~ 51	52 ~ 64	65 ~ 75
Nos. of Segment		pcs	1	2 ~ 3	5 ~ 7	8 ~ 10	10 ~ 14
Weight	**W**	kN/m	6.7	11.8	21.2	25	27
Sectional Area	A_g	x 10^3 mm^2	283	517	909.3	971.5	1099
Neutral Axis	y_{top}	mm	589	745	1019	1379	1679
	y_{bot}	mm	411	505	731	871	1071
Moment of Inertia	I_{xx}	x 10^9 mm^4	35.2	102.1	338.1	648.18	1104.36
Section Modulus	Z_{top}	x 10^6 mm^3	59.81	137.13	331.66	470.20	657.75
	Z_{bot}	x 10^6 mm^3	85.55	202.08	462.75	743.78	1031.14
Web Thickness	B_W	mm	150	200	300	200	200
Girder Depth	**D**	mm	1000	1250	1750	2250	2750

Dura Technology Sdn. Bhd. (721531-A)
Lot 304993, Jalan Chepor 11/8, Pusat Seramik Fasa 2, Ulu Chepor, 31200, Chemor, Perak, Malaysia.
T: + (605) 2016813, 2016823 F: + (605) 2016833 W: www.dura.com.my E: dura@dura.com.my