

# DURA<sup>®</sup> UNIVERSAL BEAM UB-X650

## Description

**DURA<sup>®</sup> UB-X650** Universal Beam is a newly innovated product suitable especially for **Industrial Building System (IBS)** such as buildings or warehouses construction which required light-weight, long span and durable system. DURA<sup>®</sup> UB-X650 made from the revolutionary composite material of ultra-high performance concrete and high-carbon-high-tensile steel fibres (UHPdC). It is an excellent solution for buildings with long span requirements of up to 22 m without intermediate support.

## Features

- Dura<sup>®</sup> UB-X650 consists of P.C. strands in longitudinal direction and typically prestress to 70~80% of the 'guaranteed' tensile strength of the strands. Strands used are 15.2 mm diameter 7-wire super strands (low relaxation) complying with AS 1311; with a guaranteed tensile load of 250 kN and ultimate breaking load of 270 kN.
- The UHPdC used for the DURA<sup>®</sup> UB-X650 has a characteristic compressive strength range between 120 to 140 MPa, and characteristic flexural strength of 20 MPa.
- DURA<sup>®</sup> UB-X650 eliminates the use of conventional steel reinforcing bars and stirrups (except starter-bars are provided at the end regions for connection purpose). All steel fibres used are made from high carbon steel wires with tensile strength over 2300 MPa.



Figure 1 – Dura<sup>®</sup> UB-X650 used in portal frame.

## Advantages of DURA<sup>®</sup> UB-X650

- DURA<sup>®</sup> UB-X650 is highly durable and impermeable. It is therefore suitable for use even in harsh environments.
- DURA<sup>®</sup> UB-X650 used “un-cracked section” design approach at SLS. Thus it further assures its serviceability and durability.
- DURA<sup>®</sup> UB-X650 is at least 2 times lighter than conventional precast RC beam (see Figure 2). Thus lead to ease of handling/transportation and installation.
- Scaffolding, props or formwork may or may not required over the supports (depends of design).
- Reducing construction site activities, improving safety margins and eliminating in-situ casting work (except sealing of the construction joints and some minor details).
- DURA<sup>®</sup> UB-X650 is guaranteed to be volumetrically stable as they are steam-cured to minimized creep. This process also accelerates all long term shrinkage of the UHPdC.
- DURA<sup>®</sup> UB-X650 frames can be produced to desired length as specified by the designers.
- Due to its high durability, high ductility and high fatigue strength, it provides excellent resistance against impact and abrasion loads.
- Dura<sup>®</sup> UB-X650 supports the 'Green' vision as it is a more environmentally friendly material compare to conventional beam such as RC beam and structural steel beam (see Figure 2).
- Dura<sup>®</sup> UB-X650 used special fiber to provide sufficient resistance in the event of fire.

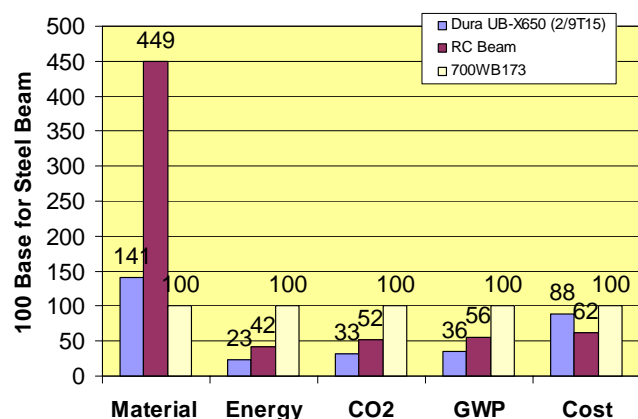


Figure 2 – Cost and environmental impact comparisons.

## DURA<sup>®</sup> UB-X650

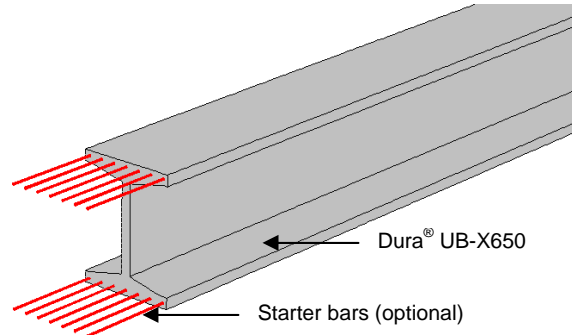
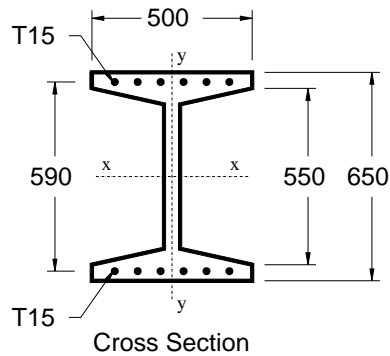


Table 1: Technical Data for DURA<sup>®</sup> UB-X650

		Unit	UB-X650
Self-Weight	G	kg/m	240
Length	L	m	8 ~ 22 ↓
Sectional Area	A <sub>g</sub>	x 10 <sup>3</sup> mm <sup>2</sup>	100
Neutral Axis	y <sub>top</sub>	mm	325
	y <sub>bot</sub>	mm	325
2 <sup>nd</sup> Moment of Inertia	I <sub>xx</sub>	x 10 <sup>9</sup> mm <sup>4</sup>	6.708
	I <sub>yy</sub>	x 10 <sup>9</sup> mm <sup>4</sup>	1.336
Elastic Section Modulus X-X	Z <sub>top,xx</sub>	x 10 <sup>6</sup> mm <sup>3</sup>	20.64
	Z <sub>bot,xx</sub>	x 10 <sup>6</sup> mm <sup>3</sup>	20.64
Torsion Constant	J	x 10 <sup>6</sup> mm <sup>3</sup>	193.83
Warping Constant	I <sub>w</sub>	x 10 <sup>12</sup> mm <sup>3</sup>	110.4

↓ Can be customized

Table 2: Design Capacity of DURA<sup>®</sup> UB-X650

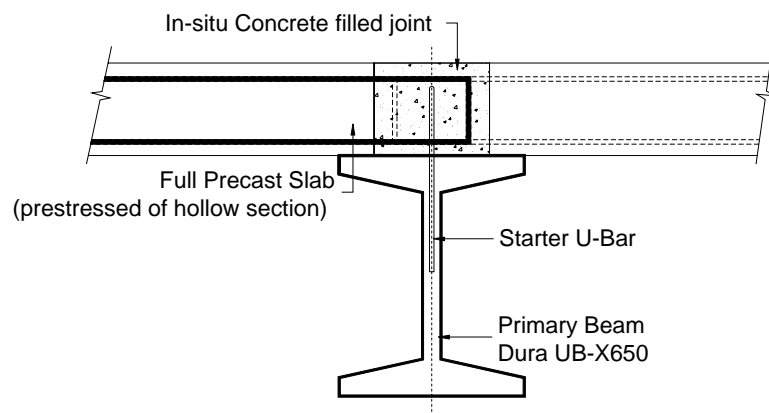
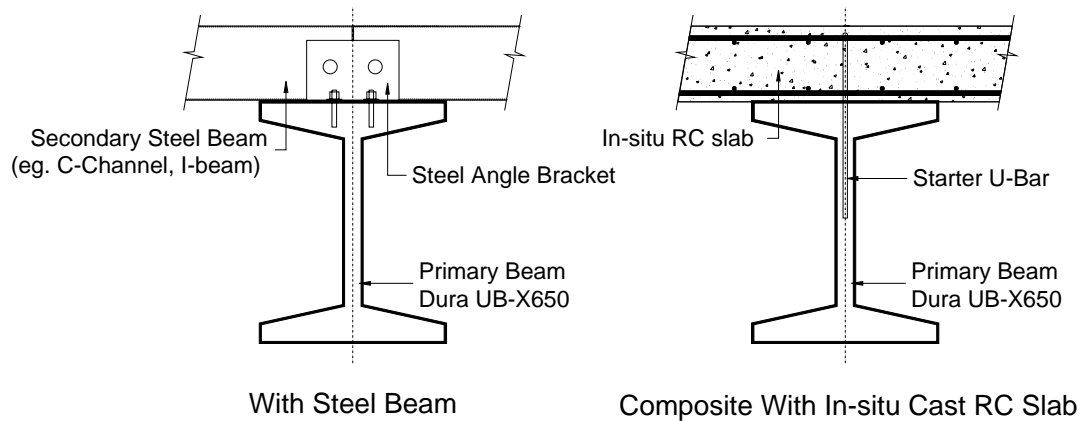
		Unit	UB-X650					
			2/6T15	2/7T15	2/8T15	2/9T15	2/10T15	2/11T15
Top Strands		Nos.	2	2	2	2	2	2
Bottom Strands		Nos.	6	7	8	9	10	11
Cracking Moment	M <sub>cr</sub>	kNm	593	673	743	824	902	970
Ultimate Moment	M <sub>u</sub>	kNm	933	1085	1238	1386	1515	1657
Recommended Design Bending Moment (φ = 0.8) ↑	M*	kNm	746	868	990	1109	1212	1326
Cracking Shear Strength	V <sub>cr</sub>	kN	225	225	225	225	225	225
Ultimate Shear Strength	V <sub>u</sub>	kN	350	350	350	350	350	350
Recommended Design Shear Strength (φ = 0.7) ↑	V*	kN	245	245	245	245	245	245

↑ φ = strength reduction factor as per AS3600-2001

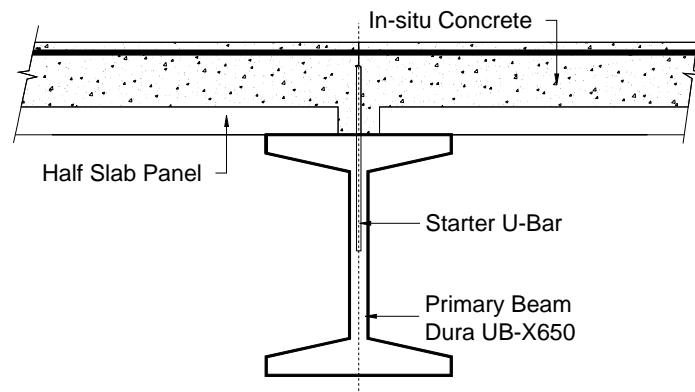
## Applications

Dura<sup>®</sup> UB-X650 can be used in a number of ways such as:

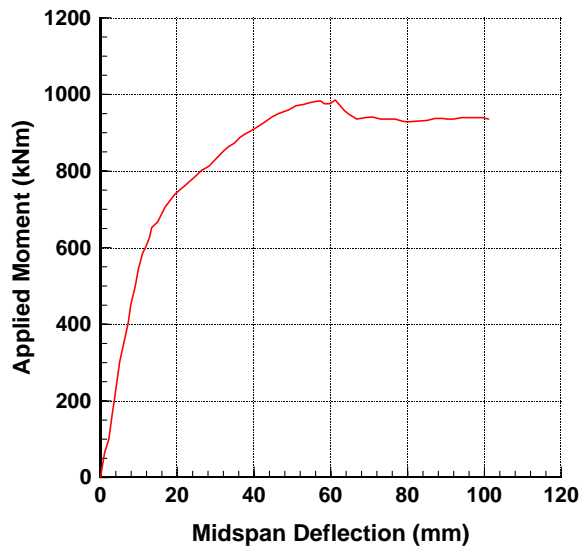
1. composite with steel beams;
2. composite with in-situ cast RC slab ;
3. composite with full precast RC slab; and
4. composite with half precast slab.



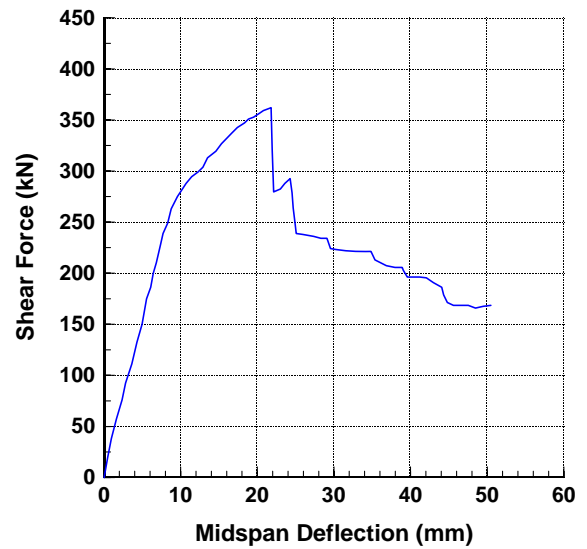
Composite With Full Precast Slab



Composite With Half Precast Slab

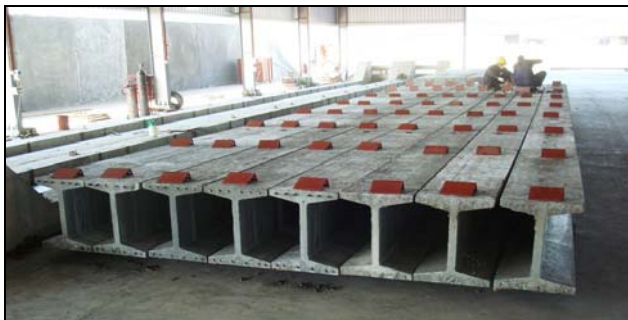


Experimental Flexure Strength of Dura<sup>®</sup> UB-X650 (6/6T15)



Experimental Shear Strength of Dura<sup>®</sup> UB-X650 (6/6T15)

Result certified by SIRIM QAS: J20085040550/(SQAS/CBMT/T.REC/CSL/15)



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