



Structural Case Study Slough Bus Station

Product: Celsius® 355 Circular Hollow Section

Client: Slough Borough Council

Architect: Bblur Architects

Structural Engineer: Buro Happold

Steel Contractor: SH Structures

Main contractor: McLaren

The sleek, sculptural form of Slough bus station provides a memorable first and last impression of Slough. The new station was opened to the public in May 2011 as part of the 'Heart of Slough' regeneration scheme. Tata Steel's lightweight Celsius® 355 Circular Hollow Section was a vital component in the design of the station's sinuous, long-span canopies. In addition to enabling an efficient and visually-striking solution, use of this versatile section also met the demand for a practical construction programme.





Structural Case Study: Slough Bus Station

The challenge

Slough bus station was the first building to be delivered as part of a £400 million regeneration programme in central Slough. The architectural vision for the bus station was to create a piece of functional sculpture that would be a landmark for the town. The station needed to complement neighbouring listed buildings and act as a catalyst for further development in the heart of Slough.

The bus station is sited on a new, key pedestrian route. The new development was to provide a safe, comfortable and clutter-free environment for passengers. Weather protection was required for passengers and for pedestrians using the walkway.

Buildability of the design – in the heart of a busy, public area subject to re-development – was another important consideration. The bus station structures needed to be built safely, cost-effectively and speedily in order to minimise disruption and meet schedule constraints.

The design solution

The bus station design was inspired by the work on light wavelengths undertaken by one-time Slough resident and Astronomer Royal, Sir William Herschel. The differing, wave-shaped forms of the station canopies were conceived to respond to the differing levels of weather protection required by passengers and busses.

Structural engineers, Buro Happold, worked closely with the architect to turn this ambitious and elegant design into a plausible reality. The solution entailed a pair of steel trusses to span the 50 metres from the accommodation block at one end of the station to a single point of support at the other. This support is provided by a random array of circular hollow section columns.

The long-span solution was rationalised into a pair of separate steel trusses comprising Celsius® 355 Circular Hollow Section in



diameters of 193.7mm and 457mm. These were framed out with secondary and tertiary steel members to create the desired wave form. The undulating trusses, forming the 'backbone' of the canopies, vary in height off the ground. The canopies are clad in aluminium shingles to enhance the sense of movement.

Claire Smith, structural engineer at Buro Happold, described the project as exciting and very challenging. She said: "The design challenge was to create this monolithic and seamless structure with its complex geometry.

"Because of its versatility and light weight, we opted to use circular hollow section for the steel skeleton of the canopies. It made it easier to detail the connection for the cladding brackets and achieve the curved geometry. It is also slightly lighter than open section – an important factor because of the self-load in such long-span structures. Although the raw material cost was slightly higher than for an open section, the overall solution was more cost-effective."

Tata Steel's technical advisory service provided support to Buro Happold in analysis of the complex tubular joints required for the main trusses.

"Circular hollow section was used to provide the backbone of the sleek and organic canopies. It allowed us to achieve the aesthetic vision. It was also a practical solution because of its light weight and its suitability for off-site fabrication and accurate on-site installation."

Claire Smith, Buro Happold.

The build solution

The buildability of the long-span, steel canopy structures was an important consideration from the outset of the Slough bus station project. Buro Happold liaised closely with specialist steel contractors, SH Structures. "SH Structures were very responsive," said Claire Smith. "At the scheme design stage we tapped into their expertise to explore how the structures might be built in sections and transported."

Tim Burton of SH Structures said: "This was a great project that we were very keen to secure right from the start. One of the biggest challenges was getting the geometry correct so that the complex cladding would fit accurately and give the sleek final appearance."

Typically for a SH Structures project, the structure was fully modelled using Tekla Structures 3D software. Tim Burton said: "Once modelled, the primary trusses were fabricated at our facility in North Yorkshire. Almost all of our projects are trial-assembled in our works. Slough was no exception, with all the truss sections being fitted together prior to being sent to site."

"This process of creating large sub-assemblies reduced the amount of work to be done on site. It made it safer and quicker to install as well as reducing the amount of road transport needed which has benefits for the environment."

Slough bus station has delighted its operators, First Bus, and has been well received by the travelling public and residents of Slough. The project was a finalist in the 2012 Structural Steel Design Awards



"For geometrically complicated tubular steelwork it is always important to check joint performance early in the design process. Buro Happold utilised our advisory service and used our free tubular joint design software to check the joints and rationalise the member sizes".

Chris Morris, Technical Advisory Engineer, Tata Steel.

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