

Project:	<i>Kings Place, London</i>
Client:	<i>Parabola Land</i>
Architect:	<i>Dixon Jones</i>
Structural Engineer:	<i>Arup</i>
Main Contractor:	<i>Sir Robert McAlpine</i>

Project Description:

Kings Place combines outstanding Grade A offices with a major new music and arts venue in a rejuvenated Kings Cross area of London. This project combines many important aspects of sustainability in terms of mixed-use and adaptable floor plans, energy efficiency, minimum fire protection costs and rapid construction.

The Kings Cross area is going through a major economic and social transformation, in advance of the station becoming London's most important transport 'hub' of the Channel Tunnel Rail Link.

Kings Place, on the neighbouring York Road, provides seven floors of office space, a 420-seat concert hall, art galleries and restaurants that overlook the Regents Canal. This landmark building was conceived by architects Dixon Jones to be an important statement of mixed social and commercial use, funded from public and private sources.



The 'flexible use' structure was designed by Arup as an eight storey steel-composite frame over three basement levels. The primary structure consists of 12 m span fabricated beams with multiple, circular web openings and supporting a 130 m deep composite slab.

A major part of the design was the novel fire engineering strategy based on SCI design guidance and observations from the BRE Cardington, full-scale fire tests on a composite frame. Arup Fire carried out a finite element analysis of the structure at elevated temperatures in both standard ISO fire tests and natural fires.

These analyses demonstrated that the required structural performance of the floor in fire could be achieved by optimising the fire protection to the beams. The specified fire resistance of 90 minutes was achieved by off-site application of intumescent coatings only on the beams connecting directly to the columns, and other beams were left unprotected. The columns were protected by two layers of boards.

The basement levels house the auditorium and other recital facilities for London Sinfonietta and the Orchestra of the Age of Enlightenment. The first three office levels are pre-let to the Guardian newspaper.

A rotunda building is attached to the main building and provides panoramic views of Regents Canal. The cladding is highly glazed with a limestone façade on one side. The glass panels are suspended from roof level by steel fins and cables.

From a sustainability point of view, the structure and services were designed for mixed public and commercial use and had to be flexible and adaptable to current and future uses. The lightness of the structure was also important in order to minimise foundation costs and the close proximity to the Regents Canal and the busy York Road meant that site logistics were also an important issue. For this reason, it was decided to off-load the steel components onto a barge, away from site, and to organise the pieces in the correct sequence for erection on site.

The long-span fabricated beams are typically 600 mm deep and comprise multiple 375 mm deep openings. The composite slab is 130 mm deep and uses a 50 mm deep re-entrant deck profile. It is reinforced according to fire engineering principles which permit development of membrane effects in fire



Intumescent coating applied to beams



Columns at top floor

The primary and secondary beams connecting to the columns are protected by 1.6 mm thick intumescent coating that was applied off-site to speed up the construction process. The coating is applied in a single layer and in order to optimise the use of coating materials, the load ratio acting on these beams in fire conditions was reduced by designing slightly heavier steel sections.

This holistic design approach meant that the secondary beams not connecting to the columns could be left unprotected. This was justified using a finite element model in which the properties of the steel and concrete were modified for the elevated temperatures in both a standard fire (ISO 834) and natural fire concept using the fire load and ventilation conditions established for the building use. This necessitated providing reinforcing bars in the ribs of the decking locally over the fire protected beams. The strategy led to a nominal 30 minutes reduction in the required fire resistance.

The steelwork was fabricated by Severfield Rowen Structures, who were closely involved in the design process in order to optimise the installation of the steelwork package over the basement levels.

The glazing support and spandrel panel system were also novel in that it was suspended from the 7th floor on steel fins.

Key Sustainability Features

- **Adaptable floor pans to suit a variety of public and private uses, including arts.**
- **Long-span steel structure that spans the auditorium levels.**
- **Cellular beams providing resource efficient, long-spans, minimising the structural depth and enabling flexible service integration within the structural zone.**
- **Rapid construction and reduced local impacts by delivering the pre-fabricated steel components to the site by barge on the adjacent canal.**
- **Sophisticated fire engineering was used to minimise fire protection costs – by eliminating fire protection on many beams and using a single layer intumescent coating applied off-site.**
- **Light weight composite structure reduces loads on three basement levels next to the Regents Canal.**
- **Energy efficiency features including a triple skin, externally ventilated facade, and low-energy displacement ventilation air conditioning.**