Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke
Band: 5 (1981)
Heft: C-16: Structures in Great Britain

Artikel: Central Milton Keynes shopping building (England)
Autor: Smith, W.F.
DOI: https://doi.org/10.5169/seals-16971

10. Central Milton Keynes Shopping Building (England)

Client: Milton Keynes Development Corporation
Architect: Derek Walker and R.S. Mosscrop
Steelwork Contractor: Boulton and Paul Limited
Construction: 1975-1979

General description

The overall size of the building is 714 m by 144 m. The longitudinal axis runs approximately South West to North East. Designed to contain shops for the Milton Keynes Development Corporation.

The building is steel framed, three storeys high for shops in the central part of the development, and two storeys high for the shops around the perimeter. There are two principal longitudinal high internal arcades which have full height exposed stanchions with glazing on both sides. These arcades form covered "streets" each about 700 m long.

Shoppers gain access at ground-floor level only and delivery vehicles are confined to a service road at first-floor level.

Every 90 m along the North and South elevations there are steel framed covered ways or "portes cochères" which act as links for pedestrians. The portes cochères lead to North-South cross route entrances which are joined within the building to the high arcades. Car parks are provided all around the building.

An elevated in situ concrete road, which is part of the city centre road system, runs North to South through the centre of the shopping building.

The shop floor areas have precast concrete ribbed floors one way spanning simply supported between steel beams of the main frame, except where large holes are required where in situ concrete is used. The service roads at first floor have continuous in situ reinforced concrete slabs acting compositely with the supporting steel beams.

The foundations under all stanchions are mass concrete pads with cast-in holding down bolts.

There is a covered hall which has external trusses above the roof, carried by exposed steel stanchions rising within the hall. The roof structure hangs from the external trusses.

The building is clad with specially designed glazing frames made from standard steel rolled sections which were fabricated and assembled to as fine a limit as could possibly be achieved. Lining up of the frames on the elevations required the use of a laser level.

Stanchions in the public area walkways are clad with steel plates with concrete infill. Fireproofing of steelwork generally utilises vermiculite/cement spray or rigid vermiculite/cement panels.

Protective paintwork on the exposed steel members comprises primer and finishing coats of cream clorinated rubber.

The approach to the design of the building and the use of steel

At an early stage it was decided to give maximum future flexibility by the use of one way spanning precast units for the shop floors which do not act compositely with the steelwork.

Ease of erection and lateral stability was obtained by the use of rigid frames designed as two storey vertical towers. These frames were used mainly as one bay or a maximum of three, a simply supported frame was used between successive rigid ones. All stanchions were designed as pinned at the base and founded on mass concrete pads.

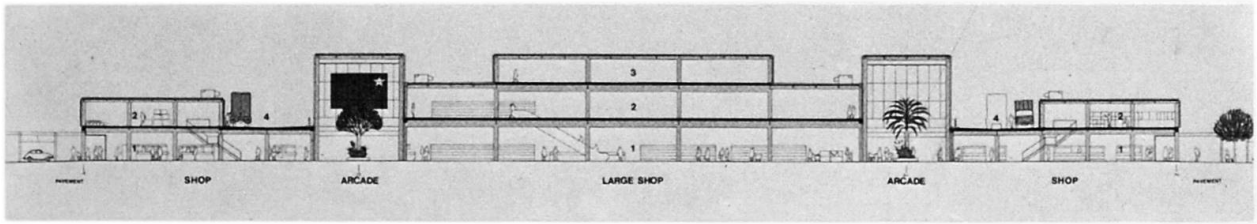
Rigid joints were made by bolting end plates on the beams to the stanchions with grade 8.8 bolts. Transverse beams were non-load-bearing and not in contact with the concrete floor. The exception being where staircases occurred.

The central area shops adjacent to the service road are three storey on a 12×6 m grid, the third storey being added as a pinned feet portal. The perimeter shopping framework is on a 6×6 m grid and is two stories high.

Roof steelwork consists of universal section steel beams and purlins to which is attached steel metal decks giving lateral stability to the beams. The span of this decking is 3 m. The steelwork to the single storey service road is on a 6×6 m grid and is two bays wide. The reinforced concrete road slab acts compositely with the steel supporting beams.

The stanchions and beams are designed as continuous frameworks in both directions, all connections being made with friction grip bolts.

A computer was used extensively for the analysis of the building and service road frame.



Cross sectional drawing

The exposed stanchions in the arcades and the hall are a particular feature. Close tolerances for straightness of members were specified plus an additional requirement for the centre of the outward exposed face of the stanchions to be ±3 mm from true position at 1.5 m above finished floor, i.e. at eye level. It was found necessary to make the steel billets, from which the covered hall an arcade stanchions were rolled, by the "upward teeming" process to minimise the slag inclusions and thereby achieve the surface finish standard demanded. Grade 50C steel was used. Great care was required by the steelwork fabricator over the standards of finished members.

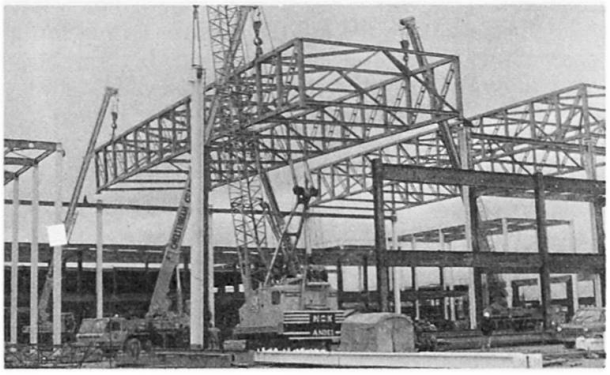
Because the arcade and hall stanchions are a possible fire hazard they only support the roof and not the shop structures behind. Therefore a second stanchion is placed adjacent, which is fire protected. The two stanchions are structurally connected so that assistance against wind loading is obtained from the rigid frames. The stanchions in the arcades are not connected to those of the service road, except at base level, to minimise transmission of traffic vibration.

The external roof trusses for the hall were each delivered to site in three sections. They were assembled in pairs at ground level. All connections to the trusses and in the bracing were fully shop or site welded to ensure a seal against corrosion. Each pair of trusses was hoisted by four cranes. Three of the four supporting stanchions were previously erected and the fourth was placed in position by crane while the trusses were held aloft. Standard bridge bearings are used to carry the trusses and there are also bearings incorporated where the roof beams are carried by the truss hanger so that differential movement can occur.

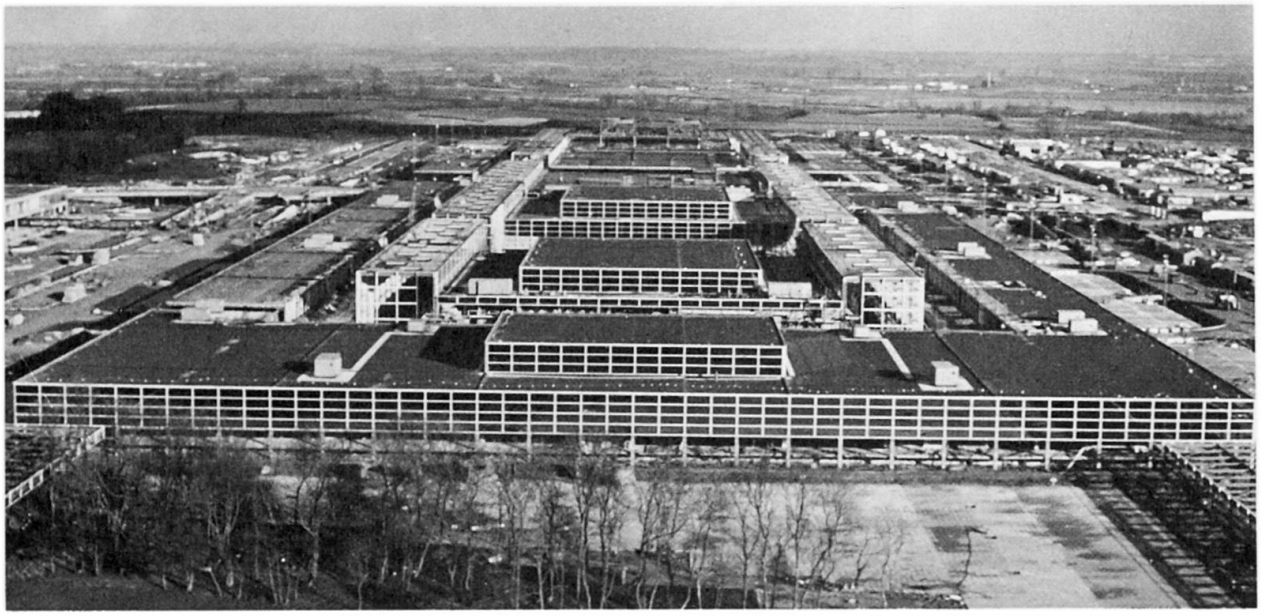
Expansion joints are provided throughout the building at regular intervals. Laminated rubber bearings are used to support the steel beams at first and second floor levels. For the roof beams, where loads are light but movements greater, a specially developed nylon bearing pad was used.

(W. F. Smith)

Precast floor units being lowered onto steel frame



Erection of exposed trusses to the hall



Aerial view of construction site for shopping building (Oct. 1977)