STRUCTURE OF HYPERMARKETS AND SHOPPING CENTRES IN HUNGARY


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The article is intended to give an overview of the customary structural concepts of buildings designed for hypermarkest and shopping centres purposes[1] in Hungary.

Keywords: structures, prefabrication, structural nods, cast-in-situ concrete

1. INTRODUCTION

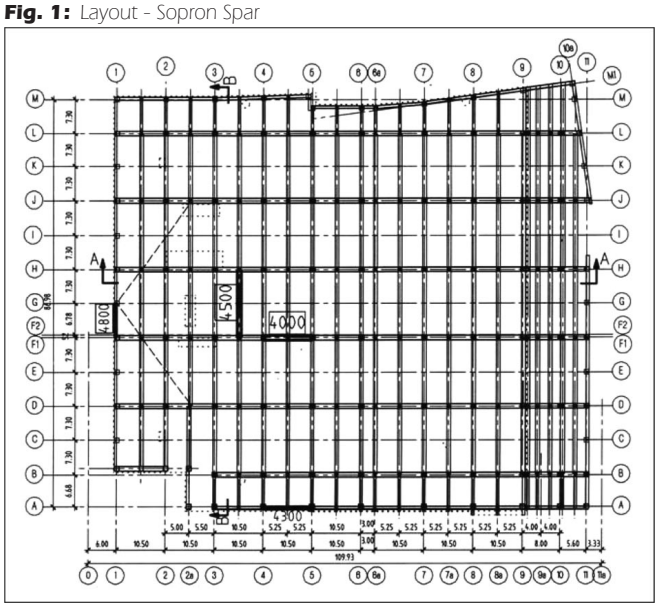
After the change of regime in 1990 the first bigger shopping centre was built in 1995 under the name of Duna Plaza in Budapest. The chosen grid system for the four-storey-building was 8.1 · 10.5 m. The framework of the building was made of a ribbed floor diaphragm system (main beams, secondary beams and slab) placed between the cast-in-situ reinforced concrete stiffening staircase and air engineering shafts. The columns and main beams were made in situ, the secondary beams and slab from prefabricated elements covered by in-situ slab.

Another characteristic building type was used in 1998 by the commercial chain AUCHAN. It had a grid of 12.0 · 18.0 m and a framework which was usually constructed of precast elements. The horizontal stiffness was ensured by the columns clamped into foundation sleeves, while the combined reinforced beams (main and secondary beams with a combination of prestressed and non-pre stressed reinforcements) created the roofing and the support of the HVAC units.

Countless versions of these building types have been executed and designed by the authors since then, respectively.

Some characteristic layouts, sections and nodes of different building types shall be presented in the followings.

Fig. 1: Layout - Sopron Spar



[1] The article regards as hypermarkets the usually single-storey (and single function) buildings, whereas shopping centres are multi-storey (and at the same time multipurpose) buildings.

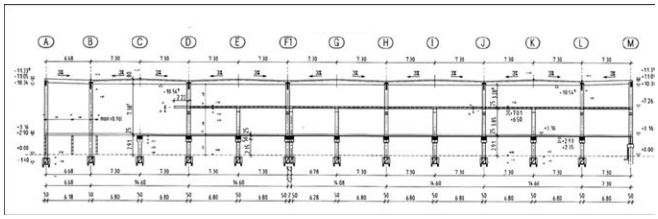


Fig. 2: Typical section - Sopron Spar

2. SOPRON-SPAR DEPARTMENT STORE

Layout dimensions are: 106.60 · 86.98 m (*Fig. 1*), with a 10.50 · 7.30 m grids (*Fig. 2*). Under the entire ground level of the building there is a parking for customers, so the store level is at +3.30 m. At level +7.30 m are the floors of the warehouse and engineering areas (*Fig. 3*).

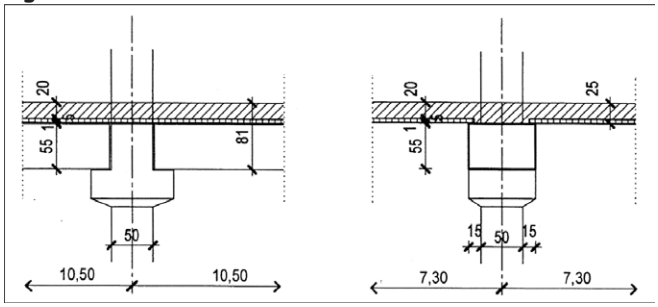
3. ÁRKÁD SHOPPING CENTRES – ECE

The overall dimensions of the shopping centre are 302.0 · 115.5 m, the area being divided by column doubling into four expansion fields. The shopping centre is usually a ground floor plus one storey. On the slab above floor level 1 there is a parking and engine rooms with steel structure. The section between axes A 27-29/A-E is a ground floor plus three-storey building part.

Grid sizes and structural dimensions can already be regarded as standard with ECE. The basic grid is 10.00 · 8.25 m. The only deviation is the grid of the cross-mall which is sized

12.00 · 8.25 m. In case of the longitudinal mall the 10.00 · 16.50 m size is made up of the intertwining of two grids. Next to axis A, along the staircases and engine rooms the 8.25 m

Fig. 3: Floor nodes



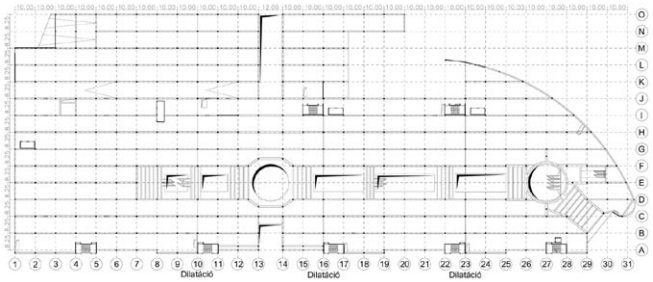


Fig. 4: Layout of the first level floor - Árkád Győr

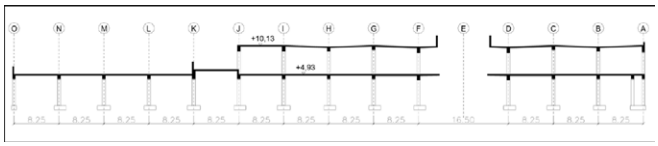


Fig. 5: Cross section

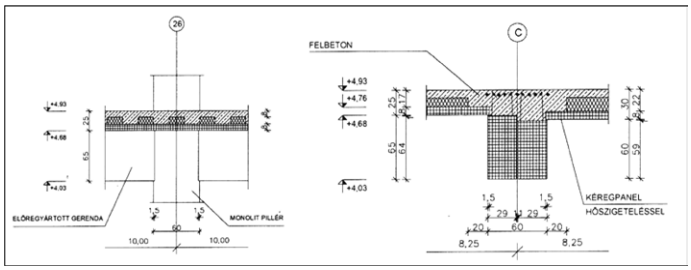


Fig. 6: Typical Sections

grid is extended to 9.75 m (*Fig. 4, Fig. 5, Fig. 6* and *Fig. 7*). According to the ECE standard the live load of the floors below the sales areas is 5.0 kN/m^2. The live load includes also the weight of the mounted partition walls. The weight of the 25 cm thick Ytong partition walls was considered as a separate load. The permanent load of the floor finishing (7 cm cover thickness) together with the suspended engineering cabling and the false ceiling make up 2.4 kN/m^2. The live load of the parking is 3.5 kN/m^2. In parking areas the dead load of the floor finishing is 4.3 kN/m^2 (if the slope is rendered by the framework), respectively 6.6 kN/m^2 (if the slope is formed by a finishing layer). The dimensioning of the reinforced concrete structures was done based on MSZ ENV Hungarian-European Code 1992-1-1:1999.

Fig. 7: Styropor Lightened Floor Planks with Truss

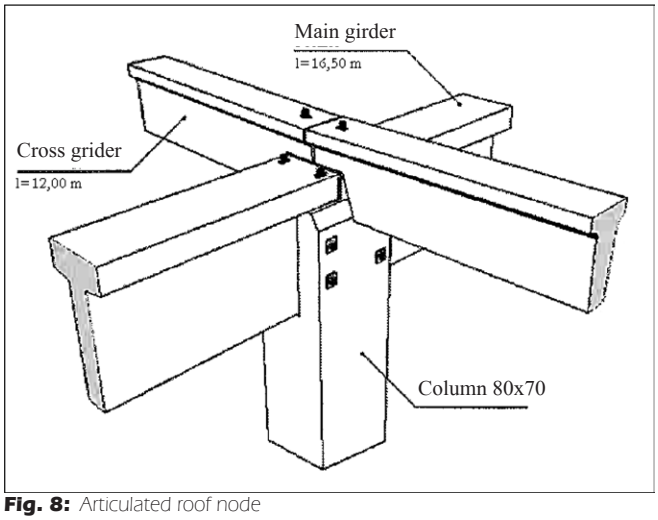


Fig. 8: Articulated roof node

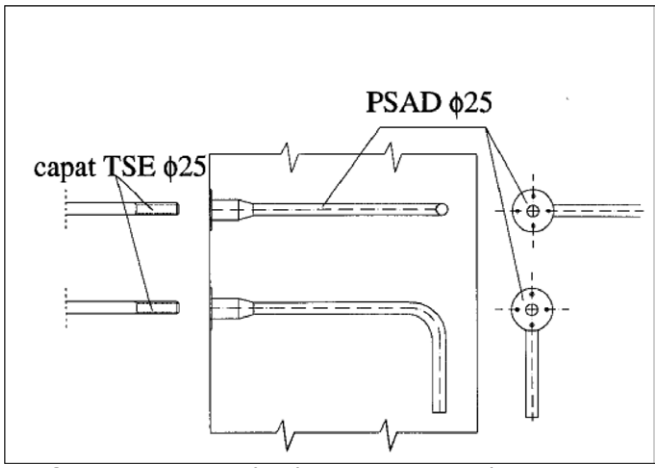


Fig. 9: Monolithic casting of reinforcement connecting fittings

4. CONSIDERATION OF THE SEISMIC EFFECT

The avoidance of seismic risks when using only precast elements requires special node solutions. Some of the solutions applied are listed below.

- For articulated roof nodes a preferred solution is to place main beams into the fork of column caps, respectively fastening them by horizontal screws (two at each beam end) and vertical dowels. These later are fastened by screws and bearing pads (*Fig. 8*).

- On the intermediate floor level at the clamped perimeter nodes special fittings were introduced to lead on the reinforcement (*Fig. 9*).

5. SOLUTION PATTERNS

The typical solution patterns of the frame and floor structures are summarised in *Fig. 10*.

In addition to the node solutions the importance of horizontal building stiffness has to be also emphasized. This is usually done in Hungary by the staircase shear walls and engineering shafts made of cast-in-situ reinforced concrete.

A major aspect is to assure the load distribution role of the floor slab by inserting the necessary quantity of tie reinforcement.

6. REFERENCES

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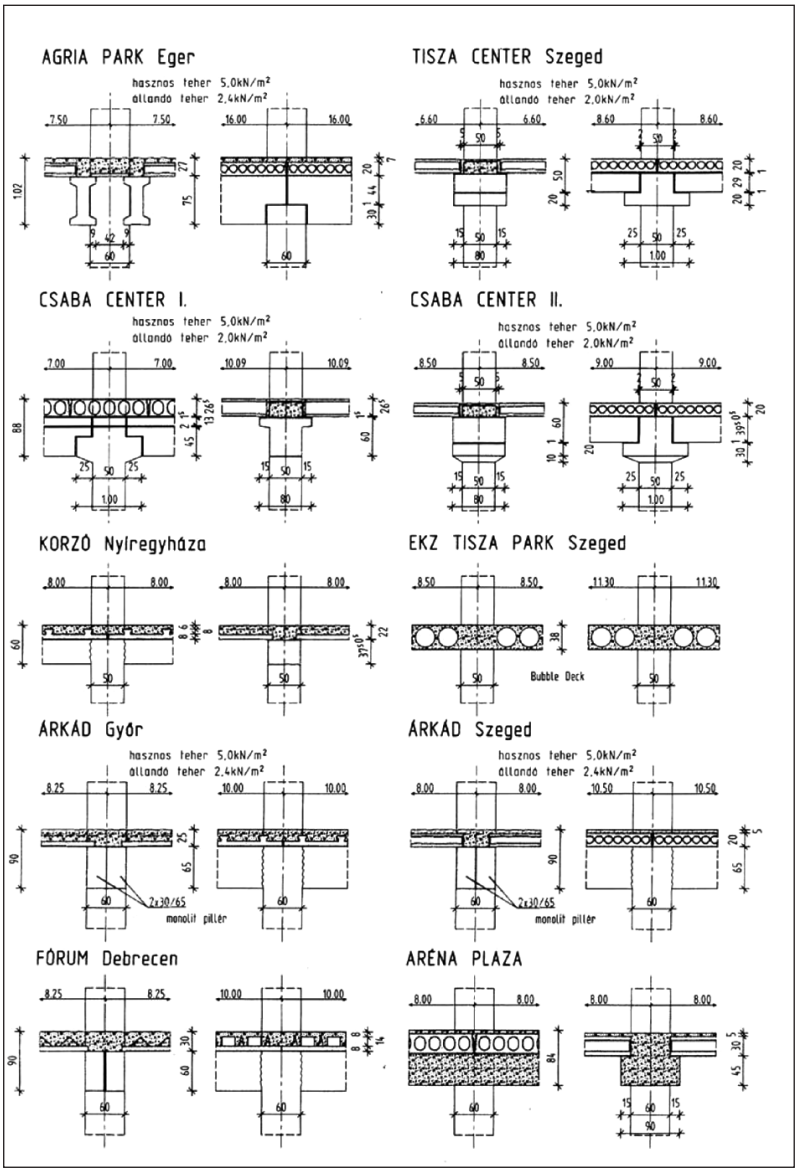

Fig. 10: *Typical structural nodes*

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