



## New Zagreb Airport terminal – form giving structure

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### Summary

New Zagreb airport terminal is currently being built following the winning design from an international competition called upon by Zagreb City in 2008. Croatian government signed a concessionary agreement with French company Bouygues for the erection of the terminal according to the winning design, granted some minor changes. The awarded design by two architects Branko Kincl and Velimir Neidhardt, and one structural civil engineer Jure Radic, comprises an integral multidimensional approach between the structure, form, urbanism, ecology, functionality and aesthetics.

**Keywords:** airport, Zagreb city, form, architecture, steel space truss, tubular, prestressed slab

### 1. Project data

The conditions from the 2008 winning design were somewhat changed to optimize the cost of the structure, but at no expense to the original architectural and structural concept (Table 1).

Table 1: Terminal technical and economic information

	Competition winning design	Main design (as being built)
Passengers / year	from 5 million (phase 1) up to 8 million (phase 2)	
Layout area (Main building)	155 x 165 m	129.6 x 136.8 m
Pier lengths	353 m (left), 151 m (right)	83 m (left), 40 m (right)
Gross construction area	73.320 m <sup>2</sup>	65.883 m <sup>2</sup>
Number of Levels	Basement, 0, 1-4	0, 1-3
Concrete construction	Monolithic, RC	Monolithic, RC, Prestressed
Steel roof construction	Three-directional Plane Truss	Triangular grid Space Truss
Cost	280 – 300 mil €	236 mil €



Fig. 1: Main design of the terminal building as being built

## 2. Construction

An overview of concrete construction is given in Table 2.

Table 2: Concrete construction elements

Element	Type	Size / thickness	Spans
MAIN BUILDING	Vertical elements	ANTISEISMIC: Concrete cores Shear walls	20, 25, 30, 40 i 50 cm
		Columns	60/60 - 70/70 cm Φ70, Φ80 cm
	Floor slabs	Prestressed concrete monolithic slabs with wide and shallow beams	<b>1<sup>st</sup> floor slab:</b> Beam 160/55 cm Slab 18cm
<b>2<sup>nd</sup> and 3<sup>rd</sup> floor slab:</b> Beam 300/55 cm Slab 25cm			14.4 x 14.4 m
PIERS	Frames	ANTISEISMIC: 3 RC frames longitudinally Transversal RC frames every 7.2 m Shear walls	Columns Φ70 <b>1<sup>st</sup> floor:</b> Edge Beam 70/80 cm 2 <sup>nd</sup> floor: Edge Beam 70/70 cm 50 cm
		Floor slabs	RC monolithic slabs

The roof structure of the main building is a steel space truss structure. Between the space trusses of front facade of the main building and the piers is a dilatation separating space trusses (and also concrete floors). The basic plan-view disposition of the main building comprises triangular grid shapes with each triangle having the base of 3.6 m and the height of 3.6 m. These triangles define the axes of the chord truss members. The grid of the bottom chord is displaced 1.8 m longitudinally and 1.2 m transversely in respect to the top chord (Figure 2). The basic plan layout of the pier space truss is  $\approx 3.6 \times 2.4$  m. Steel space truss is made of tubular circular members with connecting elements and spherical nodes with threaded holes.

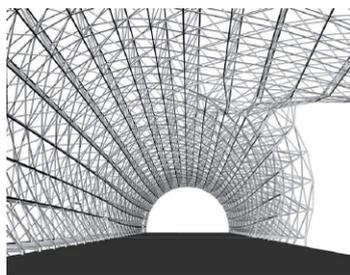


Fig. 7: View of the space truss

## 3. Conclusion and current progress

New Zagreb airport terminal is a perfect blend between architecture, urbanism, environment and construction. The form of the architectural expression is directly derived from the natural conception of the load bearing structure. No elements have been forcibly added to satisfy only one need, but rather to be a part of the multifunctional solution.

The completion of the project is planned for end of 2016.

- [1] KINCL B., NEIDHARDT V., RADIC J., VLASIC A., DRAZIN LOVREC N.: “New Zagreb airport terminal”, Proceedings of the 9<sup>th</sup> Central European Congress on Concrete Engineering, Wroclaw, Poland 2013, p. 146
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