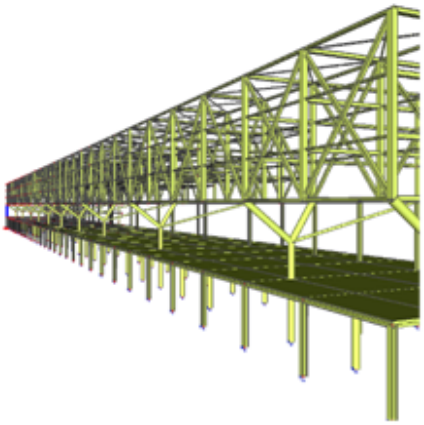
Structural Design of North Side of Breda Central Station

Introduction

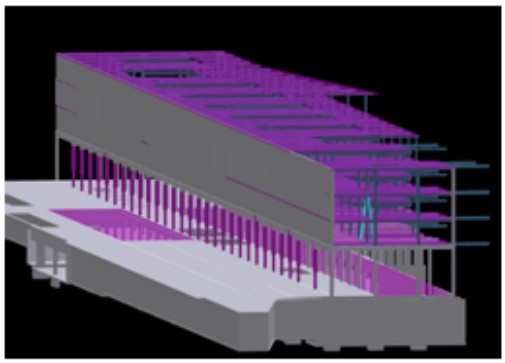
The topology of the Breda CS has the image of the whole station complex under one single roof. The architectural design meets the needs for a public transport where large open space can be found in most area. However, the bus terminal on the north side at level 1 has many columns and low ceiling height. This master's thesis aims to reduce the rows of columns on the bus terminal and creative more open space for the public in a structural way. The north side of Breda CS has the dimension of 180m long, 27.5m wide and 23m high.

Research Process

1. Several widely used structural stabilizing systems and floor systems in the Netherlands for multi-storey buildings have been firstly studied.
2. With the PoR and the goal of this thesis, 5 structural alternatives have been designed for the north side of Breda CS. The results of selection comes out that the truss structure is the most suitable structural concept to design.
3. The slim floor system had been selected and the pattern of the truss was determined by the pattern optimization and unit check. On the bus terminal the tree column structure was designed to save more columns besides supporting the above trusses. The geometry of the tree column structure was determined by form finding to an optimal. Frame structure was chosen for the underground due to its functional requirements.



New Structure



Current Structure

Result & Conclusion

With the results of the final structure from SCIA ESA PT, conclusions can be drawn that the new structure is generally verified effectively and sufficiently. The comparison between the new structure and current designed structure shows that, the number of the columns on the bus terminal has been reduced by 70%, and the structural area has been reduced by 75%. In addition, despite the offices with truss structure is 40% heavier, the weight of the whole structure has been saved to 1/3 of the current one by using steel instead of concrete.

In conclusion, the new design reduces the number of the columns on the bus terminal and creates more open space for the public successfully. And the more flexible space makes it possible for future renovation. Moreover, getting rid of the deep concrete beams by steel structure also reduces the ceiling height at bus level.

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