

STRUCTURAL SYSTEM / MATERIAL EFFICIENCY / EMBODIED CARBON

Flat slab vs beam and post

Reconsidering the structural system reduced material use, construction cost and embodied carbon.

The appointment involved optimising a reinforced-concrete beam-and-slab design prepared by others for a 31-storey residential tower. An alternative flat-slab system with structural walls was assessed to reduce material demand, construction cost and embodied carbon.

RM4.74m

Estimated direct savings of at least RM4.74 million.

≈5%

Of the estimated total construction cost.

28%

Less estimated embodied carbon, without cement replacement.

01 / THE STARTING POINT

A tower with room for a different approach

The development comprises a 31-storey tower on a four-storey podium and two basement levels. The study reports a total floor area of 29,020 m². Structural optimisation was undertaken for the tower; the basement was excluded.

Structural model from the original study.
Project identity withheld.



02 / THE INTERVENTION

Reconsidering the structural system

ORIGINAL DESIGN / BY OTHERS

Beam and slab

A conventional reinforced-concrete system formed the starting point for the comparison.

OPTIMISED ALTERNATIVE

Flat slabs with structural walls

The optimised system reduced concrete and reinforcement quantities, with corresponding reductions in estimated cost and embodied carbon.

03 / THE COMPARISON

Less material. Lower embodied carbon.

The original and optimised designs are compared on the same study basis. Each pair of bars uses a common scale.

Concrete

Original 43,200 t

Optimised 32,834 t

10,366 t less
approximately 24%

Reinforcement

Original 1,670 t

Optimised 1,001 t

Approximately 670 t less
40%

Embodied carbon

Original 9,624 tCO_{2e}

Optimised 6,898 tCO_{2e}

2,726 tCO_{2e} less
28%

04 / THE VALUE

Savings with further potential

RM1.39m

Estimated concrete saving

+ RM3.35m

Estimated reinforcement saving

= RM4.74m

Combined direct saving

The estimate excludes potential additional savings from simpler formwork, reduced foundation demand and a shorter construction programme. These benefits were identified but were not included in the reported RM4.74 million. The carbon reduction came from using less material, without assuming cement replacement.

STUDY BASIS / 2023

Concrete RM320/m³; reinforcement RM5,000/t. Estimated total construction cost RM94 million, approximately RM300/ft². Quantities and savings are historical comparative design estimates. Reinforcement saving is rounded to approximately 670 t in the source; the displayed quantities differ by 669 t.

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