

ArcelorMittal Dofasco



Steligence[®]

Office Building

Case Study



Steel has long been integrated into building construction and recognized as a significant material in traditional and modern building design. Steligence® is a research initiative delivering a range of fact based sustainability and cost benefits to architects, engineers, urban planners, real estate developers and construction contractors. Each benefit is individually attractive; together, they create a compelling argument for the use of steel products in construction.

In the case study presented here, a mid-rise office building in the GTA area was virtually designed using steel component construction and contrasted against concrete construction. The functionality of the building did not change; identical use, occupants, size, geographic location were critical in ensuring a responsible comparison. Life Cycle Assessments of the design scenarios were conducted using the ArcelorMittal Steligence® Life Cycle Analysis application tool, winner of the World Steel Association's award for 'Excellence in Life Cycle Assessment', at the 9th annual Steelie Awards in 2018. This award recognises the best use of life cycle thinking for overall environmental improvement in marketing and/or regulatory influence, project application, and new product development. Cost benefits of the steel component design were obtained from Order of Magnitude Estimates by Altus Expert Services, a leading provider of construction cost planning services.

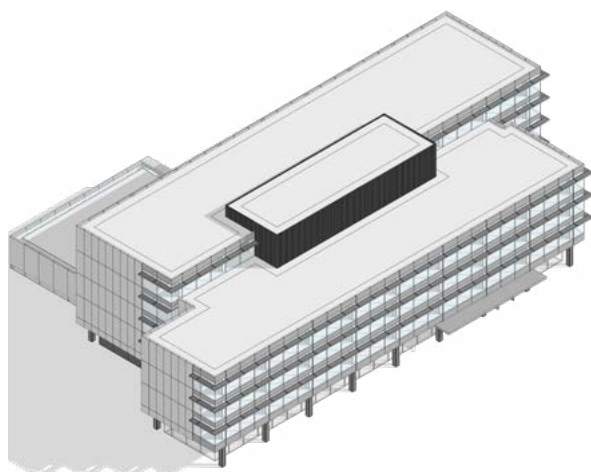
One of the leading key benefits for steel component construction is reduced weight of the building. Weight reduction is significant, as it can influence both sustainability and cost factors. In our virtual office building, the steel solution was 48% lighter than the concrete construction. This reduced weight led to a 27% cost savings on pilings for the building foundations and contributed to multiple environmental impact reductions. In addition to the foundation savings, cost savings were also realized for the roof

system, with 51% cost savings using a steel roof deck over a cast-in-place concrete roof deck. Similarly, composite steel floor deck is 30% more cost effective than cast-in-place concrete. When considering the virtual buildings from a holistic view, encompassing the substructure, superstructure, façade, roof, interior and services, 9% overall cost savings were achieved with our steel design.

Reduction of embodied carbon in buildings, which includes the emissions associated with extraction of raw materials, component manufacturing, transportation and construction site processes, is increasingly important as building operational emissions are reduced. As buildings become increasingly energy efficient, as regions move to low carbon electricity grids, the reduction of embodied carbon can help achieve shorter term emissions reduction targets. In our virtual office building, a 36% reduction in embodied carbon was achieved with the steel component construction. A similar effect was found for other embodied resources, with a 32% reduction in embodied energy consumption and 60% reduction in embodied water consumption.

By using a holistic approach to building construction, Steligence® is allowing us to demonstrate the cost effectiveness and sustainability inherent in steel products for building construction.

Reduced construction costs



Overall: 9% cost savings

Steel Roof Deck: 51% cost savings

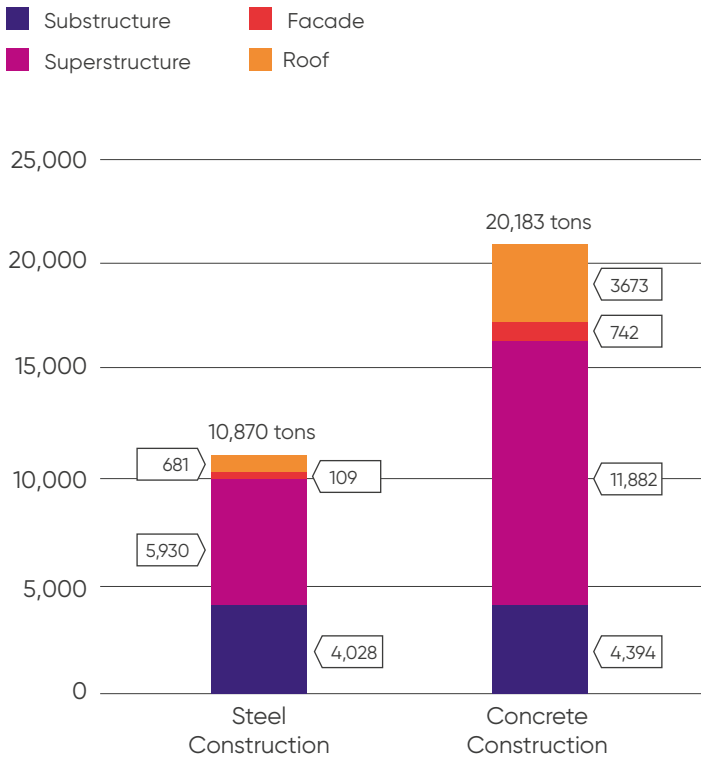
Composite Steel Floor Deck: 30% cost savings

Foundations Pilings: 27% cost savings

The virtual building was designed with a central concrete core containing elevators, egress stairways, washrooms, floor mechanical unit, electrical / communication rooms. The structure is steel with composite floor decking, and steel roof decking with PMR system. The exterior is clad with a mix of curtain wall and steel panel systems. For the contrasted concrete construction, cast in place reinforced concrete slabs and cast in place reinforced columns were used in the design, with precast exterior walls replacing the steel panel systems.

Building Weight (Tons)

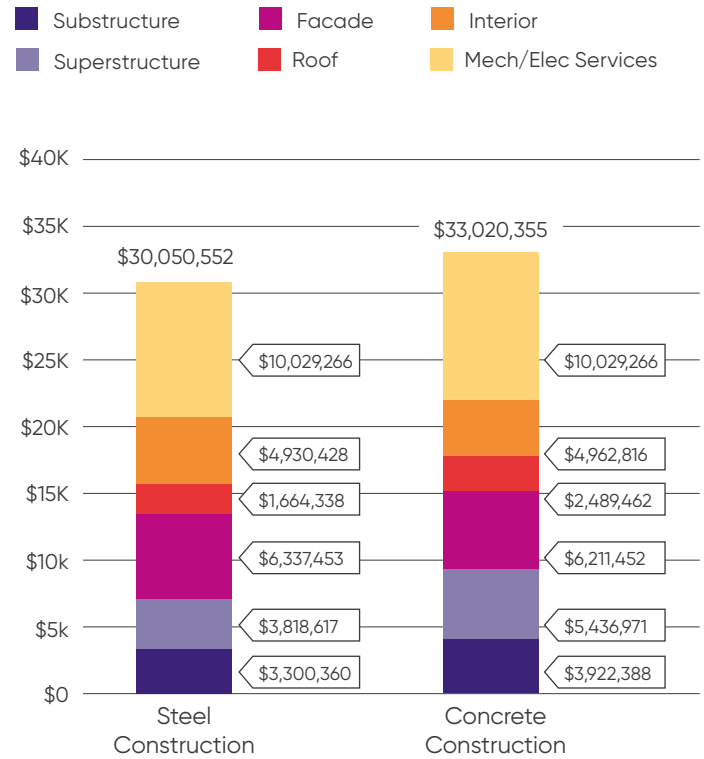
With the reduced weight of the steel design compared to the concrete design, multiple environmental benefits are demonstrated.



Source: ArcelorMittal Steligen® Life Cycle Analysis application tool

Building Cost (\$)

When considering the virtual buildings from a holistic view, the steel design achieved an overall 9% savings in construction costs.



Source: Order of Magnitude Estimates by Altus Expert Services



Building rendering for 5 storey, 13,071 m² (140,695 sf), office building. Target occupancy is 614 people, location GTA.

Lower Environmental Impact

Embodied carbon:
36% reduction

Embodied energy consumption:
32% reduction

Embodied water consumption:
60% reduction

Smarter steels for people and planet

ArcelorMittal is one of the world's largest steel and mining companies. Guided by a philosophy to produce safe, sustainable steel, it is a leading supplier of quality steel products in all major markets including automotive, construction, energy, household appliances and packaging. ArcelorMittal is present in more than 60 countries and has an industrial footprint in more than 20 countries.

With a strong presence in North America, Europe, South America and South Africa, and an emerging presence in China, ArcelorMittal delivers a large scale of products, solutions and services to customers with the same quality focus in all regions. ArcelorMittal is a leader in steel technology, both in the breadth and depth of our product portfolio, and in our ability to supply a range of grades throughout the world. ArcelorMittal is a supplier of choice for all markets, a testament of our commitment to working collaboratively with our customers to engineer advanced steel grades to meet their needs.

Steligen[®] is a global initiative by ArcelorMittal using scientific evidence to show the benefits of steel design in building construction. Using a holistic analysis concept, competitive steel building solutions are identified.

It allows building owners, architects, and engineers a fact based approach to view building construction, for collaboration to build sustainable, more cost-effective buildings.

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