Sustainability Case Study

Ontario Secondary School Teachers' Federation (OSSTF) Headquarters and Multi-Tenant Complex

LOCATION
Toronto, ON

CLIENT
Ontario Secondary School Teachers' Federation (OSSTF)

PROJECT TEAM
Carol Phillips, Partner-in-Charge
Phil Silverstein, Project Manager / Job Captain
Gord Doherty, Contract Administrator
Deya Iskandarova, Architect
Corey Brown, Architect
Cathy McMahon, Architect
Emmanuel Awuah, Architectural Technologist
Jay Zhao, Architect
Chiara Camposilvan, Architect
Kayley Mullings, Senior Interior Designer
Miranda DelPlavignano, Interior Designer
Sean Robbins, BIM Manager

CONTEXT

To have meaningful impact on the urgent climate emergency, building design must not only adapt and innovate but aspire to change the culture and expectations of all those connected to the building. This includes everyone from those involved in the act of building and design, to the end users themselves. Architecture can influence our daily lives and behaviours, and architects, builders, and clients not only have responsibility but also agency in shaping this. Recently, the conversation on sustainability has been shifting from energy to carbon – this is a sound and necessary shift, however, the job of reducing energy consumption is not done yet, and it will be years before the transference to clean grids in our urban centres is realized. Holistic approaches to reducing consumption, and seeking renewables in all aspects of a building, must be considered as industry and infrastructure makes its transition to decarbonizing.

Moriyama Teshima Architects have been working on a number of high-performance buildings that take a multi-pronged approach to achieving sustainable targets. The façades play a significant role in not only the performance of the building, but in making the building operations intuitive for its users and occupants. We feel this is one way of addressing the issue of changing expectations and culture.

One of these projects is the Ontario Secondary School Teachers' Federation (OSSTF) Headquarters and Multi-Tenant Complex. This building is a mass timber structure achieving the highest levels of our municipal targets, well in advance of the 2030 TEDI, TEUI, and GHGI reductions. Key project team members in achieving these are targets are Fast + Epp structural engineers, Transsolar KlimaEngineering, and Introba. The constructors, whose services are instrumental in achieving LEED Platinum, are Eastern Construction, which is project managed by the BTY Group. Kasian Architecture and Interior Design are leading workplace strategy, FORREC is the landscape architect, and Matrix Solutions is the civil engineer.

VIEW OF LEVEL 3 TERRACE

BUILDING DESIGN

The design of the Ontario Secondary School Teachers' Federation Headquarters and Multi-Tenant Complex prioritizes democratic access to light and view as well as access to outdoor space and communal connection to the ravine. The exposed timber environment, beyond the commitment to renewable, carbon sequestering construction, creates an enveloping connection to nature in the daily life of the employees.

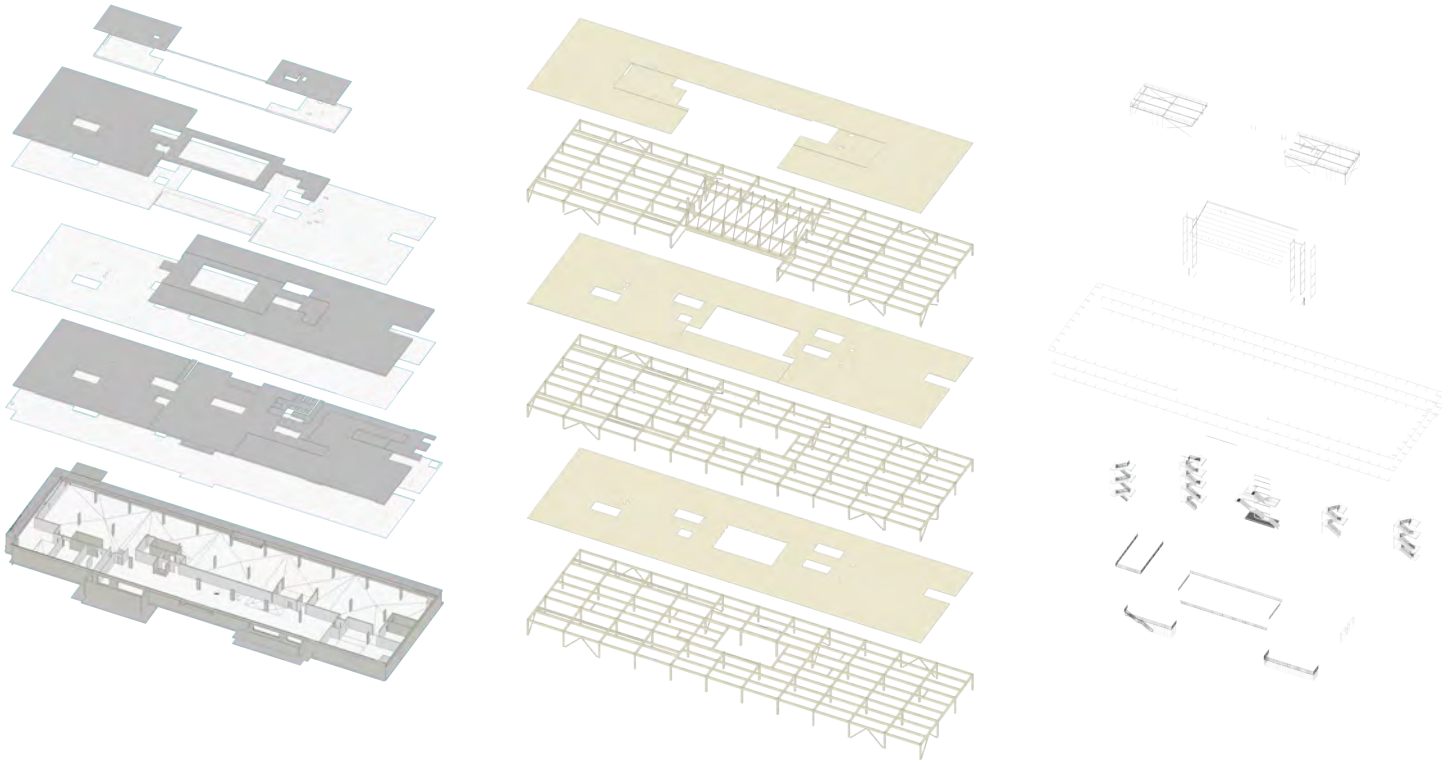
The mass timber structure of the building uses a 9m x 9m grid of glulam columns, beams, and purlins with a cross laminated timber (CLT) infill panel for the general floor system. This is an optimal grid for office layouts and was chosen for its optimization of the timber volume. Flexibility for tenants and future changes is facilitated using a raised floor system that also assists with acoustics and wire control and is a fully integrated underfloor air distribution (UFAD) displacement ventilation system.

The LEED Platinum design achieves significant reductions in energy consumption and a reduction of Green House Gas Emissions. The building systems are comprised of geothermal heat exchange, a passive natural ventilation system used together with a decoupled active mechanical system, and energy generation from the rooftop photo voltaic array. The key player in the building performance is the façade that contributes most significantly to the environment and experience for the building occupants.

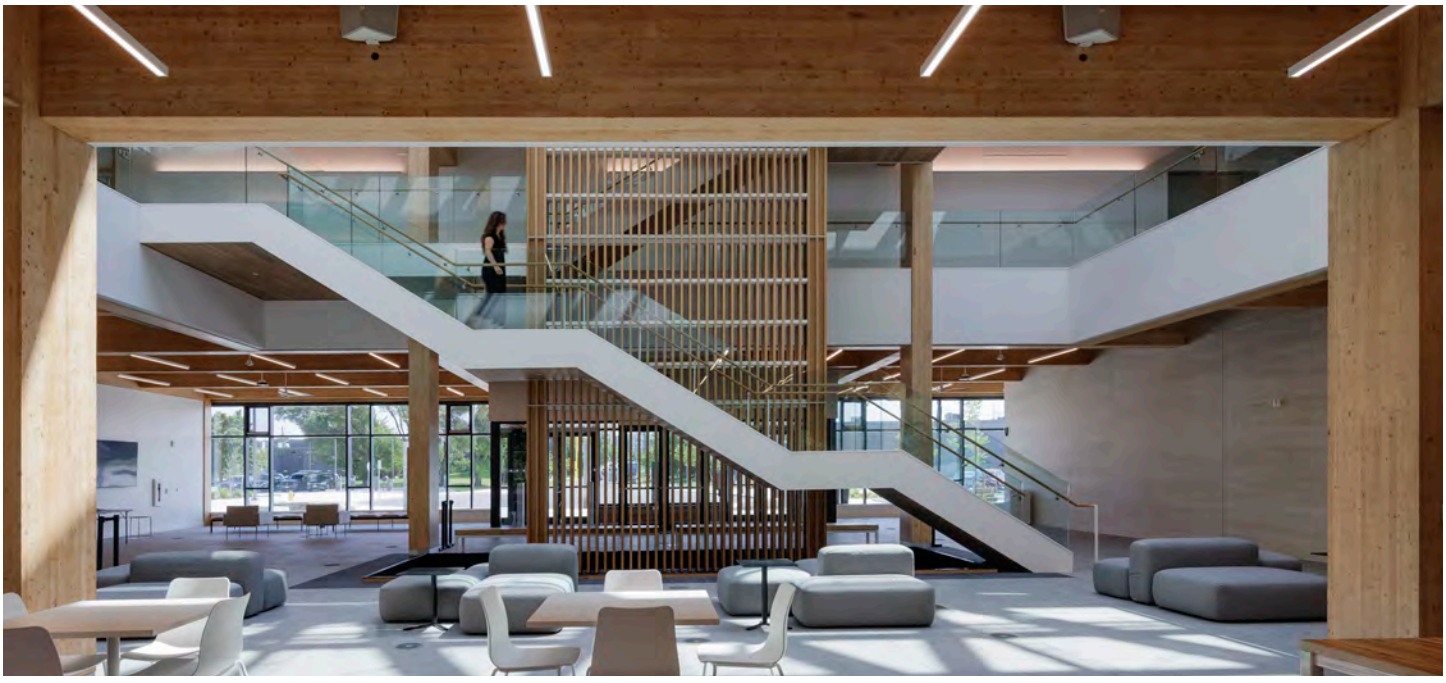
The workplace strategy within the OSSTF offices used the concept of "Right to Light", where open workstations were moved to the perimeter and closed offices to the interior space. The walls between office and open office are fully glazed. This allowed daylight to penetrate 9 metres into both the open and closed office space. Coupled with dimmable lighting, we were able to vastly reduce the energy demand for lighting while providing natural light for all.

An important intervention which took place on site was restoring the ravine edge, which involved removing of invasive species and planting native species, as well as replacing existing turf grass with rainwater gardens and planting beds to encourage biodiversity. On the southwest side of the property, the top of the embankment had collapsed into the ravine. Our team designed a naturalized stabilizing structure to restore the ravine edge, and provided a overland waterflow pathway into the ravine.

VIEW OF CENTRAL ATRIUM AND DIAGRID SKYLIGHT



HYBRID STRUCTURE, CONCRETE BASEMENT, MASS TIMBER WITH STEEL CORES AND CONCRETE TOPPING



VIEW OF LEVEL 1 ATRIUM SPACE

SOLAR PVS AND GREEN ROOF

VIEW OF ENTRY AT DUSK

BUILDING FORM

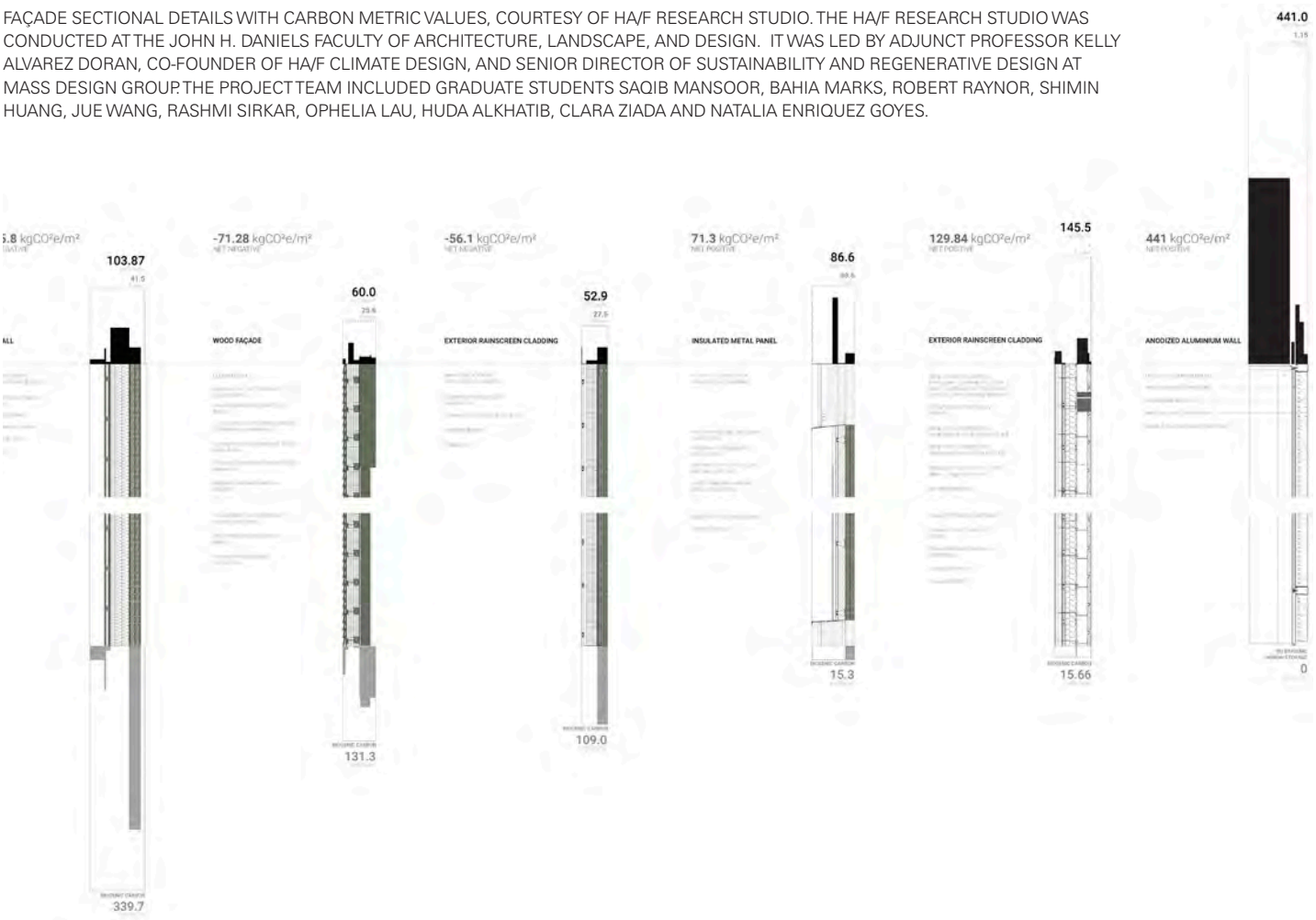
The building is first and foremost an efficient compact form with a well-insulated envelope that is comprised of a CLT backup panel rain screen assembly protected by a metal cladding system. The overall energy modelling performed by Transsolar KlimaEngineering NYC revealed that the key energy drivers for the project were plug loads and lighting loads. This was critical to the design process and resulted in the following envelope decisions:

- Atrium design with a glazed skylight for daylighting deep into the building;
- Atrium design with operable vents and fan assistance to function as a solar chimney for natural ventilation design;
- Operable windows throughout;
- 50% window-to-wall ratio to maximize daylight harvesting;
- Exterior awnings on all façades to mitigate heat gain, reduce solar glare, and to provide unobstructed views to the ravine (depth of awning varies based on sun exposure);
- Underground cistern for rainwater harvesting.

3RD FLOOR WALKWAY AROUND CENTRAL ATRIUM

VIEW OVERLOOKING THE DON VALLEY RAVINE

FAÇADE SECTIONAL DETAILS WITH CARBON METRIC VALUES, COURTESY OF HA/F RESEARCH STUDIO. THE HA/F RESEARCH STUDIO WAS CONDUCTED AT THE JOHN H. DANIELS FACULTY OF ARCHITECTURE, LANDSCAPE, AND DESIGN. IT WAS LED BY ADJUNCT PROFESSOR KELLY ALVAREZ DORAN, CO-FOUNDER OF HA/F CLIMATE DESIGN, AND SENIOR DIRECTOR OF SUSTAINABILITY AND REGENERATIVE DESIGN AT MASS DESIGN GROUP. THE PROJECT TEAM INCLUDED GRADUATE STUDENTS SAQIB MANSOOR, BAHIA MARKS, ROBERT RAYNOR, SHIMIN HUANG, JUE WANG, RASHMI SIRKAR, OPHELIA LAU, HUDA ALKHATIB, CLARA ZIADA AND NATALIA ENRIQUEZ GOYES.



CARBON PERFORMANCE ANALYSIS

The window shade became the principal design expression for this modestly budgeted building. The building is under construction, and as a post-design analysis, it was one of the subjects of a University of Toronto graduate studio research project called Half Studio, under the direction of principal researcher and educator Kelly Doran. The research was to examine the embodied carbon of a number of mass timber buildings across Canada and Europe.

The analysis revealed that while the overall carbon performance of the building was admirable, the construction of the shading device with a steel substructure worked at cross purposes with the timber and contained a significant carbon footprint. While the overall project achieves ambitious targets and commits to renewable resources and significant energy reductions, the modelling and analysis teaches us that we can continually improve as we turn our attention to embodied carbon reductions in the selection of materials and in construction of future buildings.

	TORONTO GREEN STANDARDS V3 TIER 4	OSSTF
TEUI	65 kWh / m^2 / year	67.6 kWh / m^2 / year
TEDI	15 kWh / m^2 / year	38.2 kWh / m^2 / year
AIRTIGHTNESS	No Requirement	0.7 AC/hour (estimated)
GHGI	5 KG $C0_2$ e / m^2 / year	3.4 KG $C0_2$ e / m^2 / year