



Government Conference Centre Rehabilitation

John G. Cooke & Associates Ltd.

Canadian Consulting Engineering Awards 2020 – Entry Binder



Project Introduction

Ottawa's landmark Union Station was constructed between 1902 and 1912 to house Ottawa's central railway station. Located in the Ottawa downtown core, at 2 Rideau Street, it is situated a short distance from Parliament Hill and across the street from the iconic Fairmont Chateau Laurier Hotel. In the early 1960s, the train tracks and train sheds were removed and replaced with Colonel By Drive. The building sat vacant for quite some time, until it was revived when it underwent renovations in the early 1970s. A south addition was added with a unique geodetic canopy structure. The former Union Station had officially been adapted into the Government Conference Centre, which it remained until this rehabilitation project started in 2014.



▲ 1911 (Ottawa Archives)



▲ West Elevation - 2014 Existing Condition (PCL)



1958

Project description, technical excellence & innovation

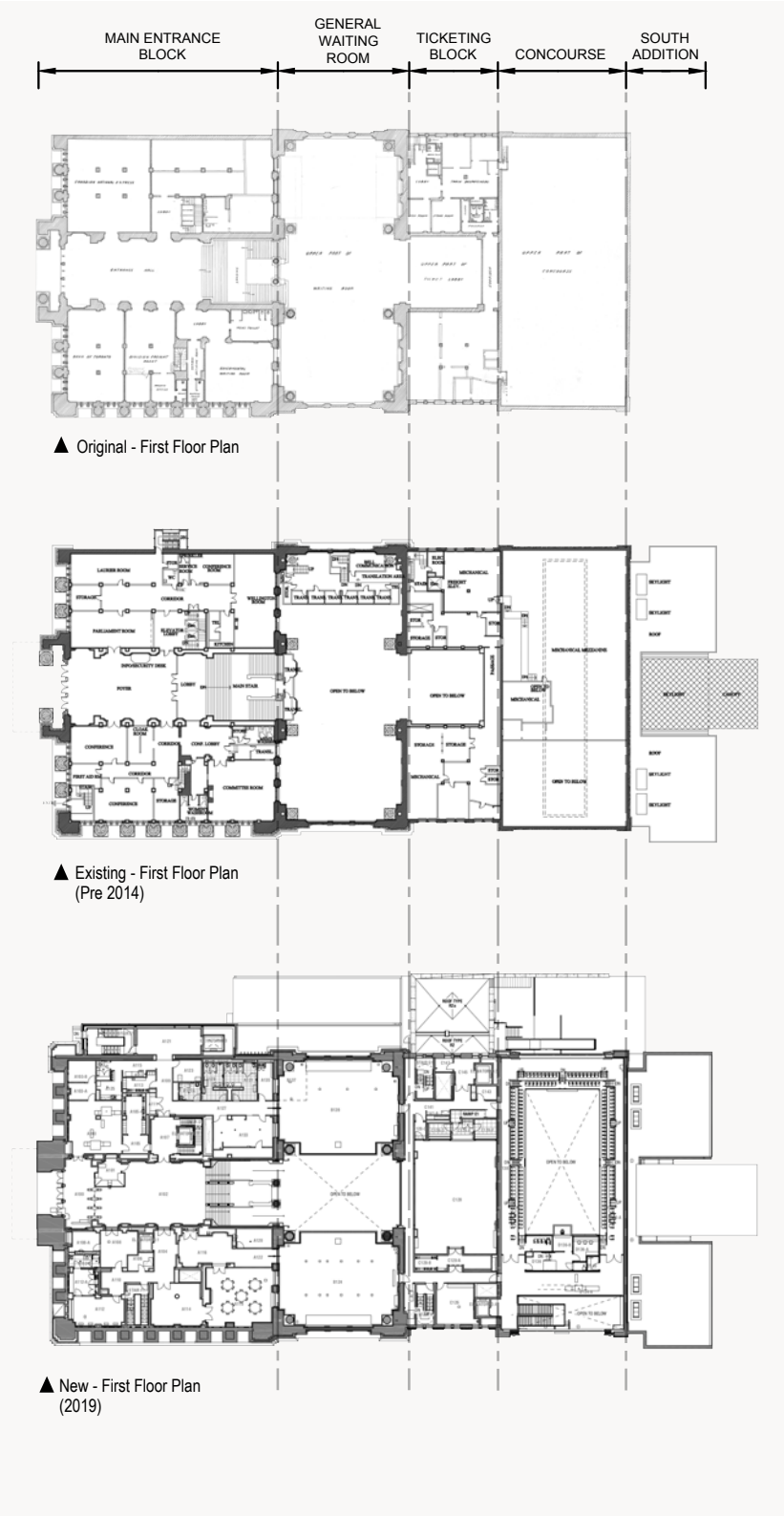
Supplementary useable floor space was a critical requirement for this new functional program, which had to be resolved almost entirely within the building footprint.

With a large amount of high heritage finishes, there was a constant tension between two opposing objectives; to preserve historic finishes as far as possible and to meet current code requirements.

Along with the design of a new East Addition, structural upgrades within existing building blocks were as follows:

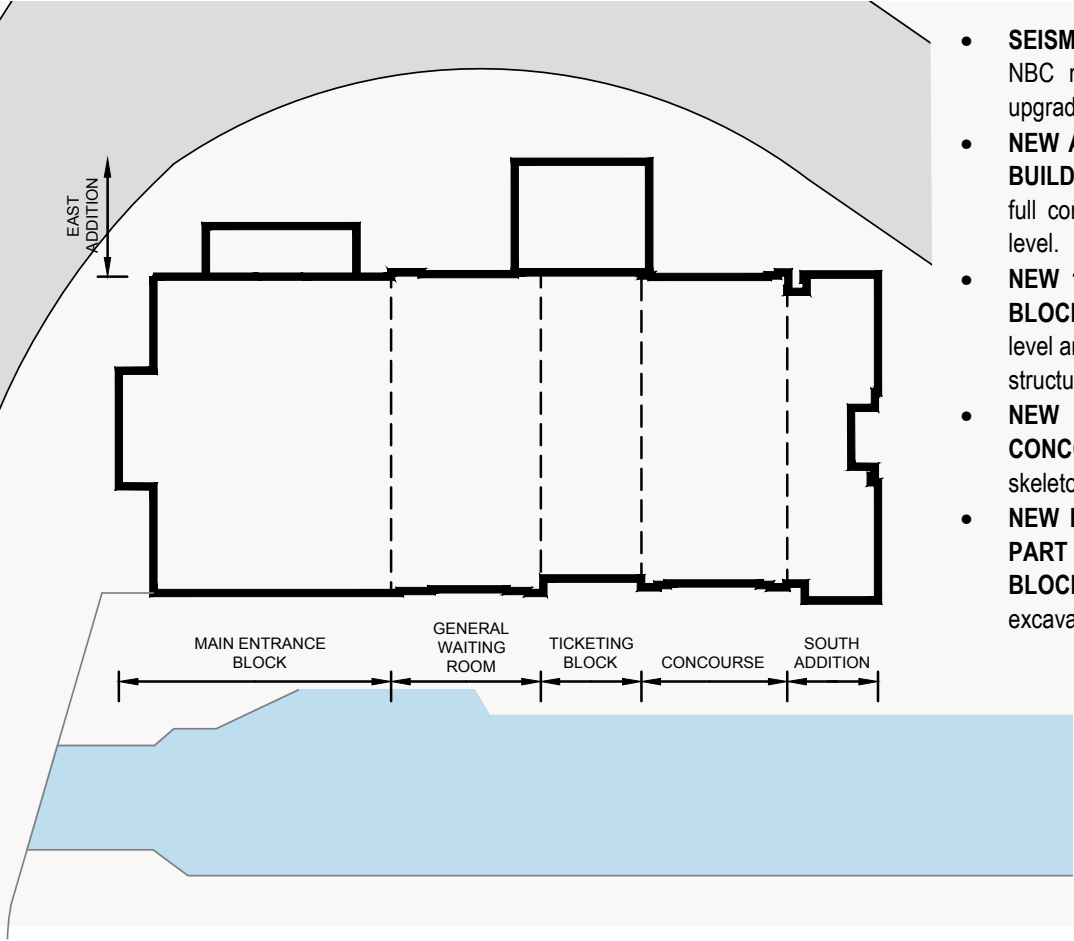
- Seismic upgrade of existing building to 75% of NBCC, integrating existing stone/brick masonry walls as lateral resisting elements. Using masonry walls as shear walls instead of simply gravity walls, allowed for cost effective space savings. This significantly reduced the number of new concrete shear walls necessary. The building was modelled in ETABS modelling software, using materials and properties determined from in-situ materials testing and investigations. This model was key in allowing for quick coordination and timely revisions throughout.
- Upgrading high heritage main floor plates from underside of slab was an excellent use of space and allowed high heritage floor finishes to remain untouched.
- Additional usable floor space was accomplished by designing new first floor level structures within the GWR Block, at both ends of the block. New structures had to be completely independent from existing building, to ensure solutions were completely reversible, within this high heritage space. Steel moment frames were used to laterally support these two steel framed floor plates.
- A new multi-level floor structure was constructed within the Concourse Block.
- Within the Ticketing Block, the existing structure was demolished which enabled the full basement excavation in this area. During the excavation, the shoring for the existing perimeter walls could not bear on grade. Permanent beams from the new 1st and 2nd floor levels were designed to also perform as shoring beams for perimeter masonry during demolition, significantly saving the project on shoring costs.
- Structural solutions focused on reinforcing the existing building elements, to minimize the space required for new structural elements. Existing beams and columns were reinforced to the fullest extent possible where increased capacity was required. Minimal intervention approach was priority, invasive solutions were a last resort.

Existing Building Structures:



- **Main Entrance Block (MEB) and Ticketing Block (TB):**
Structural steel roof, Structural steel floor beams, supporting concrete slabs. Columns or multi-wythe brick masonry walls support the steel beams. Concrete foundation bearing on rock; MEB: 5 STORIES, TB: 3 STORIES
- **General Waiting Room (GWR):**
Structural steel roof trusses span the full width of this block. The trusses bear on structural steel columns that are embedded into large multi-wythe brick piers along the north and south walls. All walls sit on concrete foundation bearing on rock; GWR: 4 STORIES.
- **Concourse (CONC):**
Structural steel roof trusses span the full width of this block. The trusses bear on structural steel columns that are embedded into the multi-wythe brick wall along the north wall of the CONC block. Along the South wall, the trusses bear on a huge structural steel truss that spans the full length of this block. All walls and columns sit on concrete foundations bearing on rock; CONC: 2 STORIES.
- **South Addition (SA):**
Structural steel skeleton, with conventional lateral resisting system. It is presumed that the unreinforced CMU along with the pre-cast panel façade acted as the lateral resisting system; 1 STOREY.

Structural Mandate



- **SEISMIC UPGRADE** to a minimum of 60% NBC requirements. Project was able to upgrade to 75%.
- **NEW ADDITION ALONG EAST SIDE OF BUILDING.** Structural steel skeleton, with full concrete structure below the 1st floor level.
- **NEW 1ST FLOOR LEVEL WITHIN GWR BLOCK.** These two sections of first floor level are completely reversible independent structures within the building.
- **NEW 1ST FLOOR LEVEL WITHIN CONCOURSE BLOCK.** Structural steel skeleton.
- **NEW FULL LEVEL BASEMENT WITHIN PART OF GWR AND FULL TICKETING BLOCK.** This required extensive rock excavation.



▲ Senate Chamber - Concourse (JCAL 2017)

Level of complexity and project challenges

The structural design under a Construction Management (CM) model project was challenging; the contractor was building the project as the design was still progressing. Due to this extremely compressed schedule, the architectural and structural demolition scopes were not complete before the new structural work was issued for construction. This led to a high number of existing conditions that were uncovered during the demolition scope, which in turn, required details and various areas to be re-designed within a limited time frame, to respect the schedule.

The team worked closely with the CM and Consultants to ensure that changes to details due to existing site conditions were expeditiously revised. Structural items were always on the critical path due to the fact that the structure leads everything.

Within the Ticketing Block, integrating the design of the temporary shoring necessary to support the perimeter masonry walls within the permanent floor structure was a substantial cost and time savings for the project. The absence of shoring structure interferences, when excavating for the basement was absolutely critical. The excavation of the full basement areas also needed to be underpinned and waterproofed prior to the Rideau Canal water level being raised for tourist attractions, and groundwater rise in the spring. This put additional pressure on the design process.



▲ General Waiting Room - New Structure (JCAL 2017)

Meeting Client's Needs

The client's main project objectives were:

- Seismic upgrade.
- Maximize amount of new usable floor space.
- Since the building has so much original heritage finishes within it, keeping as much as viable was a priority. Within Ottawa, this building claims to have the most original heritage finishes, second only to East Block on Parliament Hill.

Seismically, a hybrid of the existing masonry shear walls along with new concrete shear walls was constructed. Masonry conservation was required for the seismic upgrade, as well as for long term building maintenance. When integrating the existing masonry shear walls into the floor plates, to tie diaphragms together, grouted anchors were used as they are the most appropriate and technically advanced anchor, when considering load capacity versus compatibility with weaker masonry materials. This hybrid seismic design minimized the amount of new structure that was a required to meet code.

New floor plates were designed within the existing building, along with excavation/underpinning within the basement of two blocks. These strategies maximized usable floor space available within the existing building footprint.

Heritage finishes were retained in all high heritage areas. This meant creating independent structures for new floor plate designs, so that both heritage and functional program objectives were achieved. At a few locations, where structural beams needed to bear on the existing walls, the structure was designed to pocket through the finishes at as few locations as possible. Where heritage floor finishes remained, structural reinforcing was completed from the underside of existing structures.



▲ Ticketing Block - Shoring Exterior Walls (JCAL 2017)



▲ Ticketing Block - Excavation of New Full Basement (JCAL 2017)



▲ Ticketing Block - New Concrete Shear Walls (JCAL 2017)



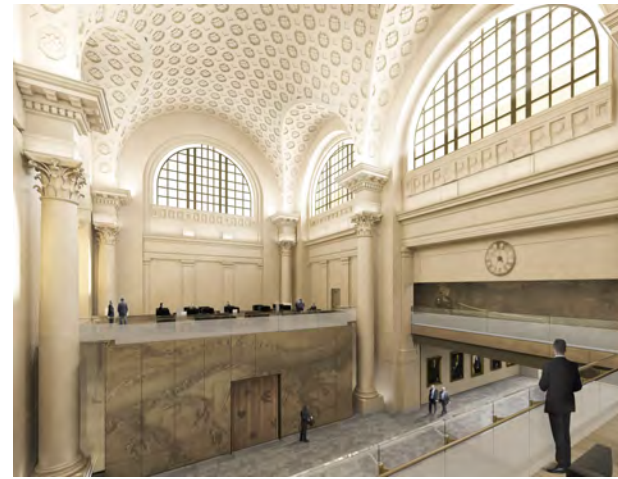
▲ Concourse - New Structure (JCAL 2017)

Environmental Benefits

Rehabilitation of an existing structure is a sustainable decision. The environmental impacts of re-using a structure that has performed well over its lifetime are far smaller than demolishing it and constructing an entirely new building.

Sustainable design strategies were achieved throughout the project, these included:

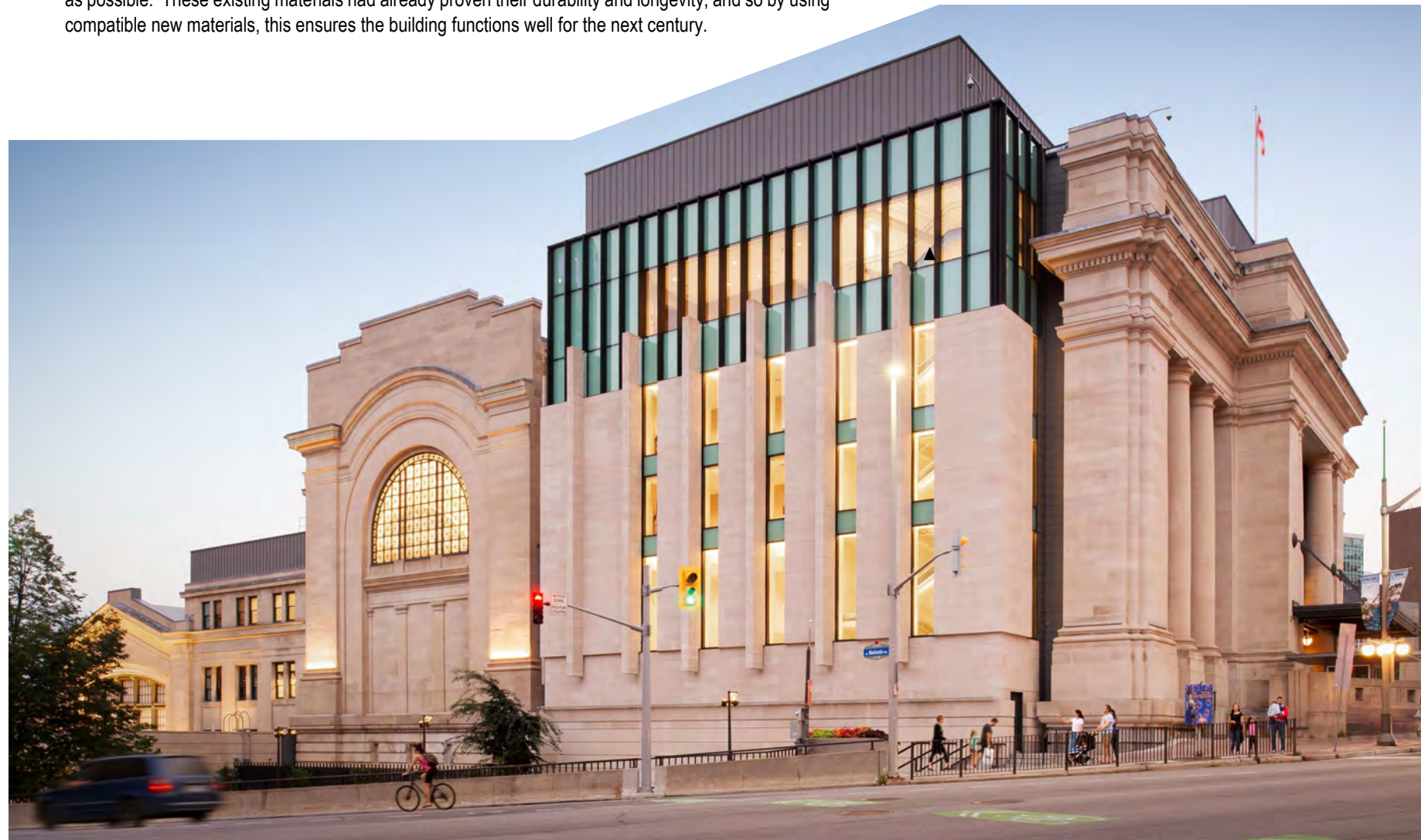
- Salvaging existing stones/brick for reuse elsewhere on the project.
- When determining design solutions, always looking at the existing building structures with an eye to upgrade them – not replace them.
- A minimal intervention approach to structural design is also the most sustainable design approach, as the least amount of new materials are introduced to the project.
- Shoring design was incorporated into the permanent building structure where feasible, effectively halving the amount of new material introduced to the project in these areas.
- New floor plates within the existing building structure reduced the size of the new addition, maximizing the use of the existing building structures and limiting the requirement for the size of the new addition.
- The new materials that were used were all as similar and compatible with the existing building materials as possible. These existing materials had already proven their durability and longevity, and so by using compatible new materials, this ensures the building functions well for the next century.



▲ General Waiting Room - Render (DSAI/KWC)



▲ Main Entrance Block - High Heritage Area (JCAL 2019)



▲ East Elevation (JCAL 2020)

Social and/or Economical Benefits

The Senate of Canada occupied the new space in early 2019. This project spanning over four years had a positive economic impact on the local economy, as its construction cost came in around 200 million dollars. Upwards of 200 tradespeople of various disciplines contributed their skills to bring the rehabilitation project to a successful completion, not to mention the endless number of suppliers who produced the materials required for this project.

The conservation and rehabilitation of this building is a fantastic example of how much character and history a heritage building can provide to a city and country's narrative. It is truly a service to the downtown core to save these heritage buildings and repurpose them for current needs. The repurposing of this existing heritage building adds to the richness and variety of the streetscape, as well as the history of the City of Ottawa.

This project has brought this building full circle, where it initially was a huge part of the community, it has now been brought back into public access, by having regular guided tours available in both official languages. This is the first time in over 55 years that the building will be accessible to the public.