



# Global Centre for Pluralism

**Canadian Consulting Engineering Awards**  
*Buildings*







*The structural team worked with KPMB Architects and a heritage consultant to develop an upgrade solution for the Global Centre for Pluralism located at 330 Sussex Drive.*

## SUMMARY

WSP provided seismic engineering and building envelope upgrade services for 330 Sussex Drive, a classified federal heritage structure and national historic site. Originally constructed for the Dominion Archives, the structure currently houses the Global Centre for Pluralism. The structure's original wing dates to 1906; with a second wing added in 1926. WSP's mandate included masonry wall and terracotta flat-arched floor rehabilitation, seismic retrofit and structural upgrades. The approach achieved joint-to-joint seismic flexibility and envelope durability.

## PROJECT HIGHLIGHTS

### INNOVATION

WSP was charged with the significant task of providing structural engineering and building envelope restoration services to restore, renew and seismically reinforce the historic building at 330 Sussex Drive in Ottawa. Founded by His Highness the Aga Khan in partnership with the Government of Canada, the Global Centre for Pluralism (GCP) is an international research and education institution. The following is a summary of key aspects of engineering innovation:

#### Seismic analysis

The seismic analysis of the unreinforced masonry walls was based on previous experimental research from the University of Alberta, where full-scale testing was used to evaluate the material properties of unreinforced masonry walls. This research was used in combination with in-situ testing of the walls.

### **Masonry walls**

The seismic analysis determined that restoring their structural integrity would allow the existing masonry walls to resist 60 per cent of the required seismic load. Concurrently, a strategy was being developed to restore the masonry walls of the building. The innovative strategy allowed the walls to be restored to their original condition and strength while avoiding the need to disassemble and rebuild entire sections of wall. It was achieved by:

- The depth of the repointing was carefully selected to balance the cost of the restoration with the benefits to the wall performance as a building envelope and a seismic force resisting system.
- Repointing of the exterior mortar joints to a depth enough to restore adequate strength without achieving full rigidity and hence increasing vertical stiffness.
- Maintaining bed joint flexibility allowed the reduction in seismic loads.
- Retrofit pinning using stainless steel helical ties to connect the interior brick and the exterior stone wythes.
- Installation of backup structural steel framing and steel studs to resist out-of-plane lateral loads.

### **Transfer beams**

One of the showcase elements of the GCP is the Dialogue Centre, an open concept design which required the removal of two interior columns. The beam ends were then jacked to remove load from the columns and connected to new steel columns, followed by the removal of the existing columns. This innovative procedure allowed the original floor system to remain undisturbed while adapting the space for a new use.

### **Building insulation**

An insulating strategy was developed using hygrothermal modelling, material testing and computational analysis. A protection and monitoring program was also implemented to measure moisture and corrosion potential of structural steel elements embedded within the wall assembly.





*Our strategy allowed the masonry walls to be restored to their original condition and strength while avoiding the need to disassemble and rebuild entire sections of wall.*

## COMPLEXITY

The project complexities and main challenges involved:

- Addressing previous modifications to the building structures.
- Constructability of the transfer beam. The new steel beam was put in place in a way that minimized floor deflections during installation.
- Out-of-plane wall reinforcing.
- Although the unreinforced masonry walls were restored to achieve sufficient capacity to resist in-plane seismic loads, their out-of-plane capacity was not adequate and required additional reinforcing. This was achieved by installing backup structural steel framing and steel studs at the interior face of the walls. This framing was strategically located with a gap between the steel and the masonry to allow the installation of insulation at the face of the wall and reduce the thermal bridges to the interior. The steel stud framing was also used to support the interior drywall, maximizing the interior usable space.
- Designated Substance Assessments revealed asbestos contamination throughout the existing building. Careful abatement technologies were implemented to carry out the rehabilitation work.
- Original structural steel was non-weldable. This created the need to find solutions for bolted connections only at the 1905 wing.
- Structural steel elements embedded within the masonry walls being vulnerable to corrosion from hygrothermal changes arising from the introduction of interior insulation and new indoor environment.

Effective project management kept the cost in line with the client's expectations, discovered economies of scale and determined methods to deliver on schedule.



*The masonry restoration was an important component of the renovation, as the walls act as both the building envelope and the lateral load resisting system.*

## SOCIAL AND/OR ECONOMIC BENEFITS

### SOCIAL BENEFITS

The Global Centre for Pluralism (GCP) has a very important mission – to serve as a global platform for comparative analysis, education and dialogue about the choices and actions that advance and sustain pluralism.

Through WSP's work, the GCP building in Ottawa has been restored and renovated, extending the life of an important heritage structure while creating a new home to a modern non-profit organization. The GCP is a research and education centre that deepens understanding of the sources of inclusion and exclusion around the world and builds awareness of the benefits of inclusive societies. The Centre frequently hosts lectures, expert roundtables and programming about the benefits of building societies around the world that recognize and value diversity.

A seismic upgrade, a building envelope retrofit and architectural modifications were performed and the structural components of the renovation were designed to meet design standards for life safety while protecting the heritage fabric of the structure.

### ECONOMIC BENEFITS

Recommending an upgrade to meet 60 per cent of the seismic loads in lieu of 100 per cent saved the project significant costs while providing an acceptable level of safety to the building occupants. Sixty percent of the seismic loads represents approximately 10% probability of exceedance in 50 years in lieu of 2% probability of exceedance, which still provides a very acceptable level of risk.

In addition, the detailed analysis of the walls allowed the building to be insulated, reducing energy costs for heating and cooling.





*A steel transfer beam was added to replace two existing columns supporting the terra-cotta floor, creating an open space for the Dialogue Centre.*

## ENVIRONMENTAL BENEFITS

With an innovative insulation strategy, GCP promotes sustainability as well. The heritage masonry was provided with interior spray foam insulation to promote comfort and energy conservation, while respecting durability of the heritage fabric. This unique approach to heritage façades is being monitored to confirm that hygrothermal performance is as expected by design analysis. It is hoped that this information will contribute to industry knowledge pertaining to risks for stone deterioration and corrosion of embedded steel structure and support energy conservation at other heritage buildings. While windows were previously replaced, details employed as part of this project will again facilitate replacement in the near future with a window system that will restore the original architectural character and further improve energy efficiency. Through advanced and careful engineering, this valuable Canadian heritage building has been upgraded to suit its adaptive reuse.



*Successfully opening its doors on May 16, 2017, the Global Centre for Pluralism site is a beautifully restored heritage structure that still embraces its past as it looks to its exciting new future.*

## MEETING CLIENT'S NEEDS

The Global Centre for Pluralism's objective was to create a modern building, compliant with current buildings codes and standards to achieve life safety and economy in operational costs, all while preserving the important historic and heritage value of the building.

### HOW WSP MET THESE GOALS

- Rehabilitation of the masonry walls and terracotta flat arched floors.
- Seismic retrofit. Ottawa is an area of moderate seismic hazard and a seismic upgrade of the structure was desired to meet design standards for life safety.
- Interior renovations including new stairwells and elevators.
- Removal of two existing columns replaced with a new transfer beam to accommodate the new Dialogue Centre.
- Testing, analysis and modelling to evaluate the opportunity to insulate the heritage masonry walls while managing risk for a decrease in durability arising from resulting hygrothermal change.

The focal point of WSP's innovation was creating an integrated engineering seismic and building envelope upgrade solution, which involved:

- The team determining a depth of bed joint repointing deep enough to achieve envelope durability while maintaining beneficial joint-to-joint seismic flexibility.
- The internal renovations that we conducted made way for a new Dialogue Centre – a stunning new backdrop and space for discussion and knowledge exchange that still maintains the heritage character of the original building.

With an official inauguration on May 16, 2017, the Global Centre for Pluralism site is a beautifully restored heritage structure that still embraces its past as it looks to its exciting new future.







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