CUNLIFFE & ASSOCIATES
CONSULTING STRUCTURAL ENGINEERS

October 11, 2022

Via email: kyle.kazda@taggart.ca

Taggart Realty Management,
225 Metcalfe Street, Suite 708
Ottawa, Ontario K2P 1P9

Attention: Mr. K. Kazda, MBA | Real Estate Development Coordinator

Dear Kyle,

**Re: 359 Kent Street Façade Conservation**
**Structural Engineering Feasibility Review**

**Introduction:**

Taggart Realty Management is undertaking a rezoning and official plan amendment application which originally contemplated the demolition of 359 Kent Street. The City of Ottawa has expressed interest in retaining the south and west facades of the building at 359 Kent to preserve its heritage value and as a result Taggart Realty Management (TRM) has requested that methods to incorporate these facades into the new development be considered. Cunliffe & Associates has been retained by TRM to consider the feasibility of retaining these façades in situ.

**Proposed Development:**

The proposed development is a 28-storey tower which includes a 6-storey podium and positioned towards the southwest corner of the property, with a modest setback from the Kent Street façade. The podium of the proposed development integrates the south and west facades of the existing Legion House as depicted in Figure 1. The proposed development requires 4 levels of underground parking extending to the property lines on 3 sides of the development. The new structure will be reinforced concrete, with foundations bearing on sound bedrock.


*Figure 1. South and West Facades of the Legion House (2022).*

The subsurface conditions of the site will require a shoring system to be installed during construction to retain 8 metres (m) of soil overburden, while excavation of an additional 5 m of bedrock is completed to reach the proposed founding elevation for spread footings.

**Existing Conditions:**

The existing Legion House consists of the original 3-storey Legion House, constructed in 1956, and a 3-storey vertical addition completed in 1960. Architectural and Structural drawings for the original three storey Canadian Legion building, dated August 5, 1955, were provided for our review - the foundation plan is presented in Figure 2. The structure is of steel construction with 2 ½" thick concrete slabs supported on open web steel joists, spaced at approximately 24" o/c. The steel wide flange columns and beams are fire protected with concrete cast around the steel.

The structure is supported on relatively large, spread footings. The underside of the footings is below frost level, constructed approximately 5 feet below exterior grade. A 4" thick concrete slab on grade is located immediately above the spread footings and is approximately 3 feet below grade. There is no dedicated lateral load resisting system but resistance to earthquake loading is aided by the infill masonry walls.

Drawings for the three-storey vertical addition, constructed some 3 years after the original, were not available. We carried out a load review for a typical column footing and found that it is likely that the original footings were sized for the vertical addition and that SLS pressures are in the order of 2000 psf. There is no geotechnical report available but required soil pressures seems to be modest and reasonable.

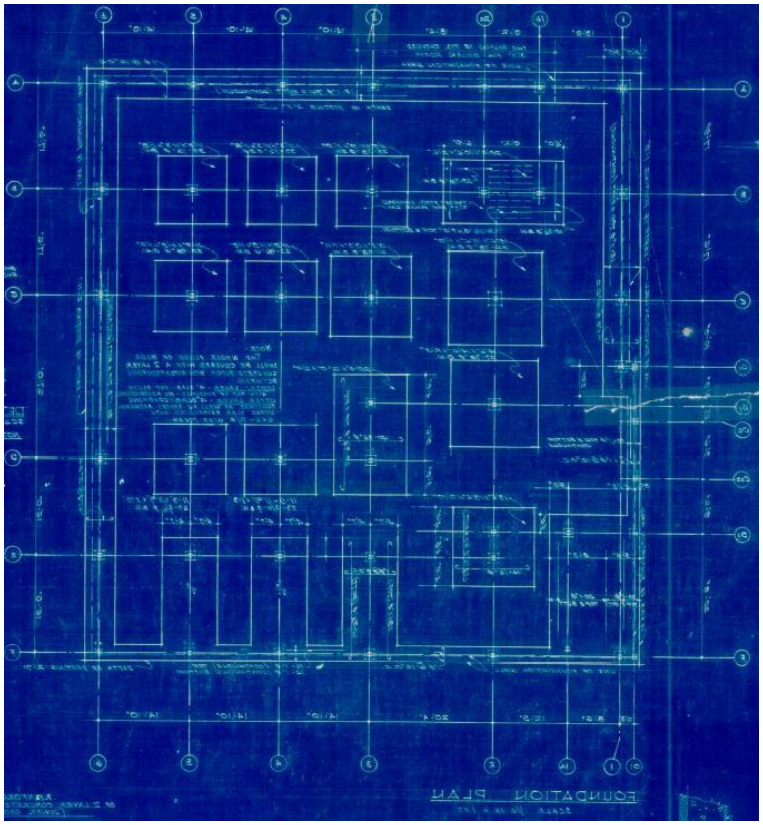


*Figure 2. The Legion House Foundation Plan (1955).*

As shown, at right, in Figure 3, the 4” limestone veneer is supported by steel shelf angles at the suspended floor levels and on the concrete foundation wall, at the base. A concrete block wall is identified as the back-up to the stone veneer and would be relied upon to provide the lateral support to the limestone veneer. There is no indication of insulation or a significant air space, which are important features of cavity wall design.

The concrete masonry wall is only 4” thick at the ventilators but 8” thick, otherwise. The veneer and back-up walls are not bonded to act as one. The ties connecting the stone veneer to the concrete block back-up and the shelf angles are likely to be corroded after 66 years of service life. The condition of these important elements would need to be verified. There is no insulation in the wall and energy efficiency of the perimeter wall system would be very poor.

**Depressed Slab on Grade:**

To improve the accessibility of the building, the depressed lowest floor slab on grade will need to be raised to the current sidewalk level. The slab acts as lateral support for the foundation wall, and its removal will necessitate temporary lateral bracing.

A raised ground floor will create headroom clearance problems, which will need to be addressed in the new structure. A portion of the second-floor structure will need to be removed and this would require that the perimeter column be reinforced in order to deal with the increased unsupported height and concerns with column slenderness effects.

The support for the veneer is considered in the next section.

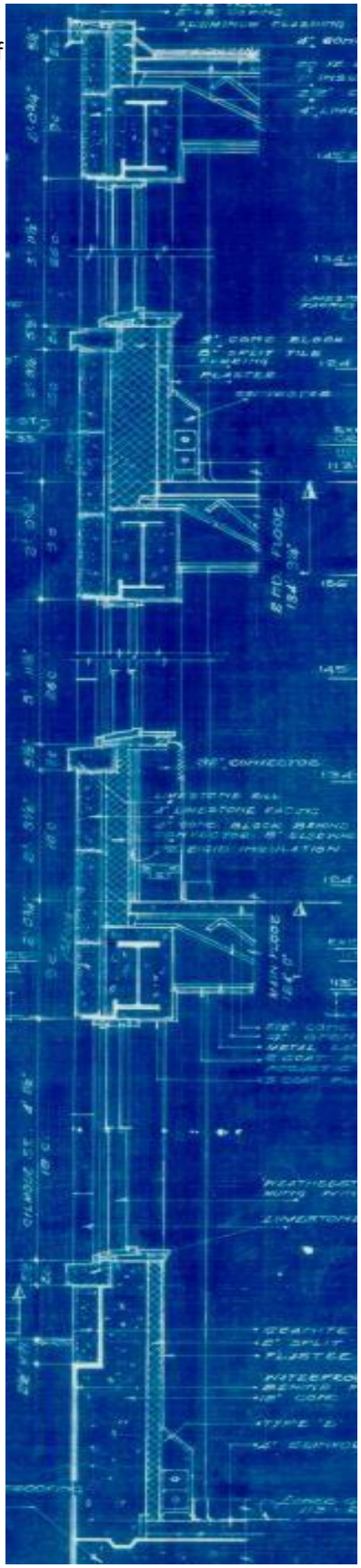


*Figure 3. Wall Section*

**Offset Beams Along Facades of Gridlines 1 and F:**

The existing floor joists bear on an offset beam on the gridlines considered for retention. The joist shoe is connected to an offset beam and the beam is cast in concrete for fire proofing purposes. The veneer and back-up masonry block wall bear on this concrete-encased at each floor and induce torsion on the beam (see Figure 4 for the typical detail). The joists brace the beam and provide resistance to the torsion created by the eccentric masonry loads. Removal of the interior joists will require compensating construction to deal with the eccentric loads and this complicates in situ retention of the facade.

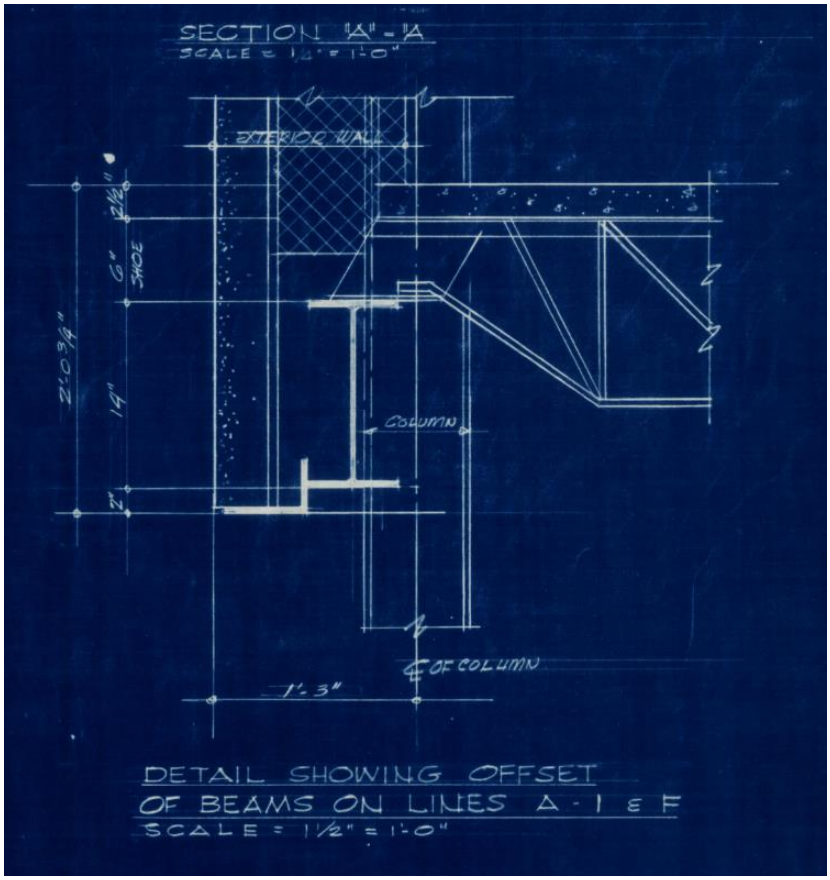



*Figure 4. Typical Off-Set Beam Detail at GL 1 and F.*

**Quality of Masonry Components:**

The lower three-storeys were constructed in 1956, and the following storeys in 1960. The ties connecting the stone veneer to the concrete block back-up and the shelf angles are likely to be corroded after 66 years of service life. The condition of these important elements would need to be verified. Removal and reinstallation of the veneer would permit new stainless steel and galvanized components to be used, extending the life of the conserved façade for many more years. Retention in situ would require selective removals to adequately verify components and could lead to an intensive restoration program with the same effect as complete removal and reinstallation.

**Energy Efficiency:**

As shown in Figure 5, there is no insulation in the cavity wall and as a result the energy efficiency of the perimeter wall system is very poor. The wall is constructed without weeping drains or a weather barrier on the masonry wall, making the assembly an ineffective rainscreen and moisture infiltration could have caused corrosion of the veneer's supporting elements. Retention, in situ, would not aid in reducing emissions or support the 2030 Emissions Reduction Plan (2022).

**Feasibility of Retaining Existing Facades In Situ:**

Conventional façade conservation systems involve a steel superstructure which laterally braces the façade wall and resists wind and earthquake loading. The bracing often involves a second line of columns parallel to the retained perimeter columns with diagonal bracing in between. This would require a width of approximately 15 to 20 feet for a six-storey structure.

The great challenge presented for the Legion building is to permit the excavation through soil and bedrock for four levels of underground parking. This would require that the façade be supported in place while the shoring system is constructed below to support the soil pressures from the perimeter of the excavation. Lateral bracing of a six-storey façade and soil shoring systems are significant challenges on their own but are exponentially more challenging when combined.

**Temporary Bracing Outside Facade:**

Installing a temporary bracing system outside of the façade would avoid the conflict with the excavation process. A piling line immediately outside of the building and a second line approximately 15 feet from the first line would be required. The first line of piles would need to extend into the bedrock and below the new founding level. Tie backs into the bedrock and bracing would be required.

The new steel bracing would need to be connected to the Legion House perimeter steel structure and this would require penetration of the façade and stone veneer.

We understand that there is significant infrastructure within the footprint of the bracing system which would greatly complicate piling and lengthy sidewalk and lane closures could be expected. We leave it to the Civil Engineers to further evaluate the interference with respect to the underground services.

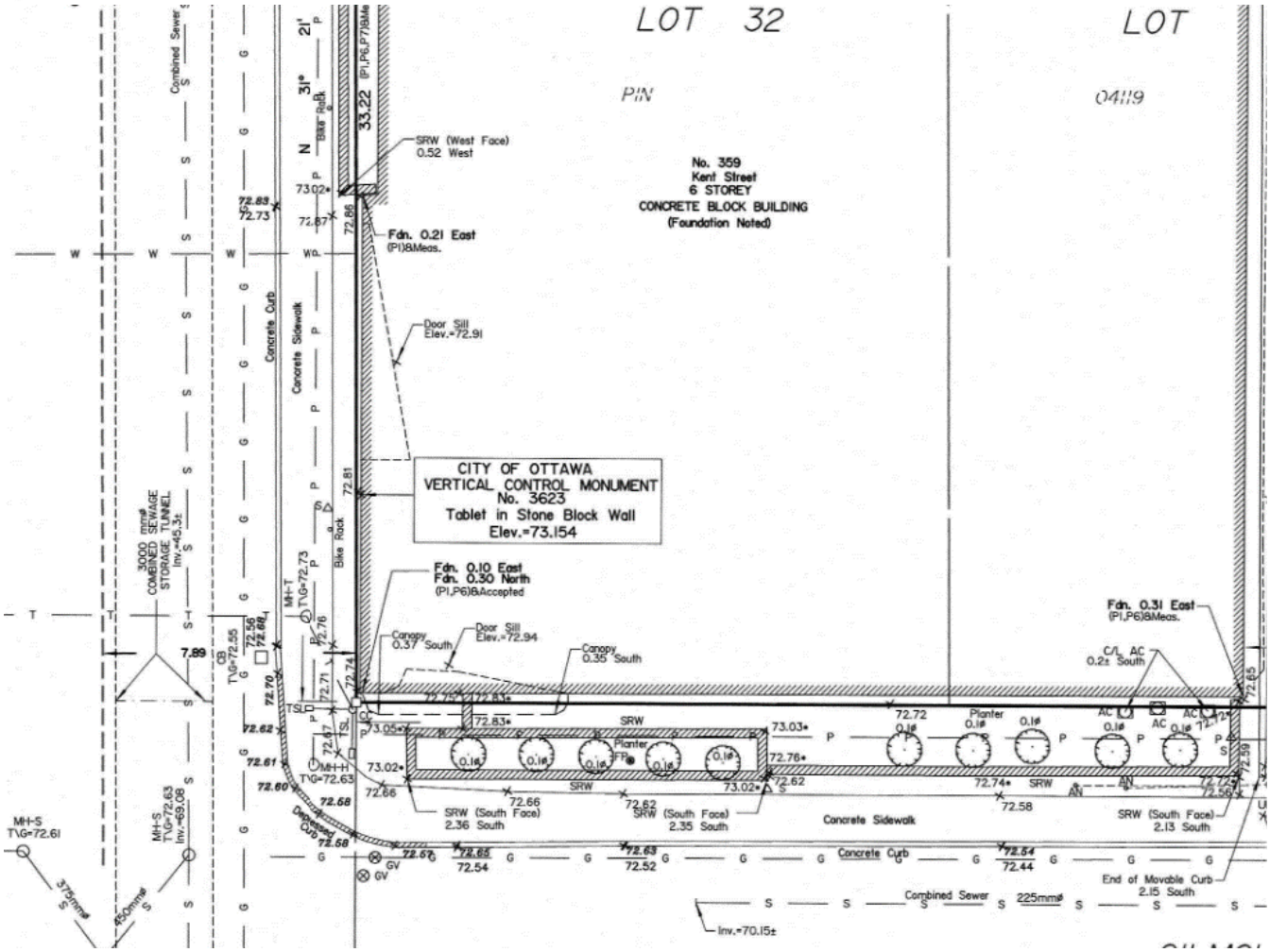



*Figure 5. Survey of 359 Kent Showing Underground Services (2021).*

**Temporary Bracing Inside Façade:**

Installing temporary shoring inside of the existing Legion building would avoid the interference with underground services and sidewalk / lane closures concerns expressed with respect to the exterior bracing but would create others. Interior braced frames which would laterally support the wall would interfere with the excavation for the parking levels. Piling on the interior of the building would be greatly complicated due to limited headroom and access. The piles would require lagging to retain the soil at the perimeter and would require tie backs into bedrock outside of the building footprint. In addition to the lateral support for the perimeter wall, the gravity loads of the wall would need to be supported by the new piles as the existing footings would be eliminated.

The interior excavation for the parking levels would be encumbered by the piles in this scenario where the excavation extends to the perimeter. This complicated temporary shoring arrangement is too risky to be considered as practical or realistic.

Should the excavation for the parking levels be offset from the perimeter walls and located at the interior of the 15’ braced depth then the structural bracing complexity would be reduced but would dramatically reduce the

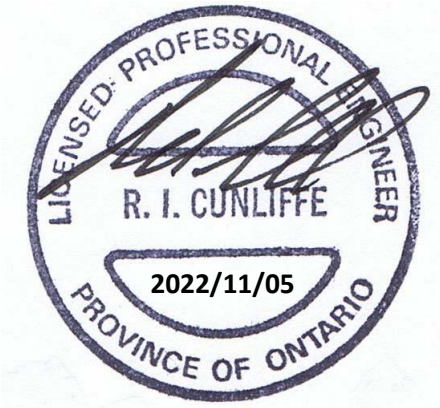
parking area. In addition, removing this area from the underground parking footprint would make the function of the ramps impractical and the depth of the garage would need to increase with additional parking levels.

**A Practical Solution:**

Our understanding is that the important part of the Kent and Gilmour Street façade "International Style" is the Niagara limestone veneer and the fenestration. The heritage evaluation indicates that the modernists believed that "the function should inform its design and that this function should be clearly legible from the building's exterior."

In our opinion the shoring costs and safety risks associated with retention of the existing façade walls on the Kent and Gilmour facades should be avoided. It would be in-keeping with the modernist philosophy of structural simplicity to remove the facades and re-create them to conserve the community history. We recommend the **careful removal and recording of the veneer units and incorporation into a new insulated wall, designed with rain screen principals, is the appropriate solution.** The re-assembly of the limestone veneer with appropriate insulation and stainless steel anchors would secure the façade for generations to come.

Yours truly,
CUNLIFFE & ASSOCIATES INC.




**Richard I. Cunliffe, P.Eng., Principal**