

September 17, 2018

Project No: 18-97-01

Corporation of the Town of Huntsville
37 Main Street East
Huntsville, Ontario
P1H 1A1

Attention: Pete Kingshott,
Facilities Manager

Dear

Re: *Town Hall Structural Review*
37 Main Street East
Town of Huntsville

Introduction

Duke Engineering was retained to complete a structural analysis of the Huntsville Town Hall based on the original 1925 drawings, the 1985 renovation plans, and a visual condition assessment of the current building, in order to provide preliminary recommendations for maintenance and future capital works.

Based on information provided by the Town, the building was designed by the architectural firm of Ellis and Belfry and was opened on December 31, 1926. The original building was a 2 storey 13,000 ft² building with a full basement. Typical of the era, the exterior walls were of masonry construction, with main steel beams and wood joists for the floors and a steel angle truss system for the roof. The original layout contained a Militia Office and Stores, Armoury and Mechanical System in the basement, Customs, Post Office, Town Offices, Council Chamber, Police and Fire Hall on the main floor, and an Auditorium on the third floor.

The building has undergone numerous renovations and additions over the years. The Armoury in the basement level now serves as the Club 55 space, the main floor is generally administration, with the platform and Fire Hall living accommodations being converted into the Council Chambers in 1988. The east side of the Town Hall was linked to the new theatre in 2005.

Plans Review

The overall structure of the Town Hall has generally remained unchanged since its initial construction. The building has been well maintained over the years, however as with any building reaching 100 years of age, continuous maintenance is required due to exposure to the elements.

We have completed an initial Ontario Building Code (OBC) review of the existing floor joist and roof structure based on the current Code requirements. The building is constructed on concrete footings with brick exterior and interior faced structural clay tile foundation walls. The exterior face was waterproofed

with a cement parging. The above grade exterior walls are structural clay tile core, with brick exterior and plaster interior faces.

Renovation plans by Cravit Ortvad Architects Inc. of the Town Hall renovation in 1988 note the exterior walls to be the original masonry/plaster walls. As such, there is little or no insulation in the exterior walls of the building.

The main and second floor system was constructed with "I" 20x59 continuous steel beams spanning 28'-4" supporting 2x12 floor joists at 16" O.C. The roof structure consists of clear span built up steel angle trusses spanning approximately 60' across the Auditorium supporting 2x10 roof joists at 16" O.C.

Based on the above, we have analyzed the existing floor and roof structures for strength and serviceability based on current Code requirements for 100 PSF floor loading (Office Main Floor and Assembly) and 61 PSF snow load. Our results are as follows:

- The steel floor beams are no longer manufactured, so we have completed a finite element analysis of the beams given their shape and lower steel strength A16 steel, which was produced up to 1934. The yield strength of the steel used in the Town Hall is about half of that produced today. Based on the loading, spans and steel strength, our analysis indicates the beams fail in bending by approximately 9%. However, based on the accuracy of the actual spans and assumed steel strengths of the time, we can conclude that the existing steel beams satisfy current strength and serviceability requirements.
- The floor and roof wood joists are assumed to be rough sawn Eastern Hemlock (Northern species). Given the lumber at the time of construction, was much better quality than today, we have also assumed Select Structural grade. Given our above assumptions, both the floor and roof joist satisfy current Code requirements for strength and serviceability.
- The roof was constructed from clear span built up steel angle trusses on 14'-6" centres, spanning 60' across the original Auditorium. We have attempted to complete finite element analysis of these trusses from the information provided. Our initial results indicate that some of the end web compression members fail by as much as 3.92 times. Given that these results tend to contradict the observed long term performance of the trusses, our early conclusion is that a more detailed review of the existing trusses is required to perform an accurate analysis. We would note that there is likely little insulation in the roof and therefore the snow likely melts off the roof over the winter. This would indicate that the roof has never seen full design snow loads. Should additional insulation or live/dead loads be added to the roof, then a further detailed analysis should be completed.

Building Review

The Town Hall building is generally in good condition given its age. There is minor spalling of the exterior brick and window sill from exposure to freeze/thaw, however this is primarily limited to the west and north (Main Street) sides of the building.

The building structure (floor and roof) generally satisfy current Code requirements for strength and serviceability. However, we have not reviewed the floor or roof structure for modification during previous renovations or mechanical/electrical work that may have comprised portions of the structure.

The basement is exhibiting signs of leakage and structural distress in the foundation walls, primarily at the south side in the storage room. The 1926 building plan cross section notes the brick/tile masonry construction described above. The exterior waterproofing has now broken down and groundwater is seeping through the foundation wall. This is resulting in spalling of the interior face of the brick and damage to records stored in the room. While it is difficult to assess from the inside face of the foundation wall, the lateral strength of the foundation may be in question, especially given vehicle surcharge loading

from the parking lot at the south side of the building. Repairs should consist of installing a vertical drainage board to the inside face of the masonry wall and constructing a structurally reinforced concrete re-facing on the inside. This would be a more cost-effective alternative to excavating the south side of the building to the footing level and competing repair work.

Fireproofing material on the steel beams cast into the concrete main floor slab above the basement storage Rooms is beginning to spall and fall off exposing portions of the steel beams. While this is not a structural concern, the steel beams are not protected from the heat of a fire in certain locations, and the beams should be protected with spray fireproofing or similar material to provide the required fire protection.

The exterior walls are of masonry construction and have little, if any, thermal insulation. We understand that the existing HVAC system functions poorly given the heat loss through the walls and old windows resulting in temperate fluctuations throughout the building – especially on cold winter days.

Existing Council Chamber

It is our understanding that there are numerous concerns with regard to the existing Council Chambers. The Council Chambers are located on the second floor and the seating area is stepped. This leads to accessibility issues that are not in compliance with the intention of the Code. Concerns have also been raised that the current Chamber is too small for publicly attended committee meetings, which often lead to attendees having to stand at the back of the room or wait outside the chambers. We also understand that the roof leaks around the rooftop mechanical units.

Given that the current Council Chambers are considered undersized, expansion of the existing space would require adding to the south side of the building into the existing parking lot. An addition to this side of the building would result in new foundations to the existing footing level, which would solve basement leakage issues. The existing foundation wall would then be an interior wall and not have soil backfill on the opposite side. This would add space to the main floor of the building, however there may be a conflict with the existing Hydro transformer locater near the west corner of the parking lot.

Adding to rear of the building to expand the Council Chambers on the second floor would not solve the issues related to general accessibility.

The space currently occupied by Club 55 is located on the basement level of the building. This floor is currently fully accessible from the Main Street. The floor area is approximately 2300 ft², while the current Council Chambers – albeit a bit broken up is about 1300 ft². Renovation to the Town Hall during the construction of the Algonquin Theatre resulted in the public entrance to the Town Hall being relocated from Main Street to High Street, which visually appears to be the rear of the building. The Main Street side of the Town Hall, most notably the exterior masonry entrance stairs appear to have fallen into disrepair and the building lacks the grander façade that the Town Hall once had.

Given the above, consideration should be given to restoring the north or Main Street side of the building and relocating the Council Chambers to the current Club 55 space. Minor improvements may be required to the existing Main Street Algonquin Theatre access to this area to ensure it meets accessibility criteria as required by Code. Two columns are located in this room which support the first and second floors. Deleting these columns would require long span deep steel beams along with new footings. Should this space be considered for the design of the new Council Chambers, consideration should be given around maintaining the existing columns.

While our review is very preliminary, costs to renovate the Club 55 space into new Council Chambers and reviving the Town Hall main entrance off the Main Street, would appear to more cost effective than adding to the rear of the building. This option would also allow the existing Council Chamber to function until the new Chambers are complete, alleviating the disruption resulting from addition/renovation work.

Summary

The Town Hall building is generally in good condition for the age of the structure. Some maintenance related repairs to exterior brick and masonry sills are required. Some of the concrete fireproofing on the steel beams cast into the first floor concrete slab has come loose and requires replacement. The building is poorly insulated and as such, the existing HVAC system requires balancing to minimize the effects of heat loss through the walls. There is also indication that the roof is beginning to leak around the rooftop units on the existing Council Chambers.

Of greatest concern is the leakage and spalling of the interior brick face in the exterior foundation wall in the basement storage rooms. This is caused by a breakdown of the damp proofing/poor exterior drainage of the foundation wall. If not repaired, this will eventually lead to collapse of the rear foundation wall. While not an imminent concern, the repairs to the rear foundation wall should be considered in conjunction with potential plans to increase the size of the current Council Chambers, as it may dictate the best timing for this repair.

Adding to the rear of the building would allow for repairs to the distressed foundation wall, increase the area on the first floor and basement and allow for expansion of the current Council Chamber on the second floor. However, the Council Chambers accessibility issues would still be of concern.

As an alternative to putting an addition on the rear of the building, we suggest the option of moving the Council Chambers to the existing Club 55 space. This would be a more economical plan as it utilizes existing space that is accessible as required by Code and would allow for an easier transition from the existing Chambers to the new space. It would also return the main entrance of the Town Hall to the Main Street of Huntsville.

I trust the above is satisfactory for your immediate requirements. We would be pleased to provide more detailed investigation and recommendations for the work indicated above if required. Should you have any questions or require additional information, please do not hesitate to contact me.

Yours truly,



Dan Duke, P. Eng.
Duke Engineering