

City of Cranbrook
40 10th Avenue South
Cranbrook, BC V1C 2M8

Project No. 2023-159
Date: 2024-01-17

Attention: **Tony Luce, Planning Supervisor**

**Re: Structural Condition Review for Occupant /Worker Safety
Knights Hall Building
King Street, Cranbrook, BC**

1.0 Introduction

Bolen Engineering Inc. (Bolen Engineering) presents this report on the structural condition review for occupant / worker safety of the building at the above noted address. It is the understanding of Bolen Engineering that this report was commissioned to review the existing structural condition of the building for obvious, visible signs of structural distress, damage, or displacement. It is also our understanding that this review is intended to be non-intrusive in nature and as such will be limited to a review of visible structural components. The review of demolition procedures, demolition safety, design of temporary shoring/bracing, and the detailed design of structural repairs (if required) is considered beyond the scope of this report.

Brandon Bolen, P. Eng, a structural engineer, employed at Bolen Engineering, attended the site on December 20th, 2023, and recorded observations and took photographs. A selection of relevant photographs has been included.

2.0 Site Description

The Knights Hall building can be described as an approximately 2,800 square foot footprint (3) storey wood framed building with a full brick exterior façade and a full basement. The building structure consists of wood framed roof, floor and wall systems which are supported on assumed conventional concrete foundations. According to local historical records, the original construction of the buildings appears to be circa 1927 with an exterior stairwell addition occurring an unknown time afterwards. Original building drawings were not available at the time of our review.



Photograph 1: Exterior Overall View

3.0 Observations

3.1 Background

We understand from discussion with Cranbrook Fire Department and City of Cranbrook staff that the Knights Hall building suffered damage from a fire event which occurred in the early morning of December 19th, 2023. From our discussion with on site staff, the structure was noted to have suffered damage from several previous fire events in November of 2022, September of 2006 and several other unconfirmed occasions throughout the life of the building.

Damage caused by the most recent fire appeared to be concentrated in the 2nd and 3rd floor areas of the building, as well as within the roof structure.

During the course of our initial perimeter review of the building, Bolen Engineering viewed several broken, deflecting, deteriorated, and collapsed roof, floor, and wall assemblies within the building and as such determined that entry into the building to perform a detailed review was not safe for Bolen Engineering employees. Review of the building damage was completed via ladder extension on a Cranbrook Fire Department fire engine. During the course of our review, Bolen Engineering was able to view a portion of the 2nd floor area via window openings, 3rd floor area via window openings, and the roof area via aerial view.



Photograph 2: Building Exterior Overview



Photograph 3: Exterior View of 3rd Floor Area

3.2 Existing Building Structural Condition

3.2.1 Roof System

The existing building roof structure appeared to consist of ceiling joists of unknown size, spaced nominally around the building with a roof rafter system installed above the ceiling joists to create a sloping upper roof surface.

The existing roof system of the building was observed to be nearly completely collapsed throughout the building. In areas where the roof had not collapsed fully the roof structure was observed to be severely damaged with charred and broken roof members and deflecting roof surfaces. Around the perimeter of the roof a parapet exists which originally closed in the edge of the roof framing. The parapet is also clad with brick masonry and was originally supported at the top and bottom by the roof structure. With the roof framing gone, the parapet is no longer laterally supported at the top or bottom and was observed to be deflecting out of plane with portions of the brick showing step cracks and loose and fallen bricks.



Photograph 4: Aerial View of Building Roof System



Photograph 5: Damaged and Collapsed Roof Components

3.2.2 Exterior Walls and Brick Façade

The exterior walls of the building appear to consist of 2" x 4" wood framed walls with a single wythe of red brick masonry façade tied to the exterior of the wood framed walls.

The exterior walls of the building were mainly concealed on the interior of the building and could not be reviewed in detail with the exception of the 3rd floor area.

Within the 3rd floor area, the exterior walls have suffered extensive damage due to the recent fire with varying degrees of damage observed around the building. In some areas, smoke damage and charring were observed and in other locations the wall framing has been destroyed completely, leaving only the exterior brick façade in place. Signs of

structural distress and damage were observed within the exterior walls in the form of step cracking in the exterior masonry surface, freshly broken and cracked bricks, crumbling brick mortar, deflecting wall surfaces, and leaning walls.



Photograph 6: Exterior Walls and Parapet



Photograph 7: Wall Facade Step Cracking



Photograph 8: Exterior Wall Damage

3.2.3 3rd Floor System

The 3rd floor framing system consists of a wood framed floor system with floor sheathing of unknown thickness supported on conventional wood floor joists of unknown sizes spaced nominally throughout the system. The floor joists are supported by a combination of interior bearing walls, floor beams and the exterior walls.

The 3rd floor framing that was able to be viewed appeared to have suffered fire damage in numerous locations, most extensively around the building stairwell. The damage observed consisted of smoke damage, charring and complete collapse in various areas around the building.

Photograph 9: Roof and 3rd Floor Damage at Stairwell

Photograph 10: 3rd Floor System DamagePhotograph 11: 3rd Floor Framing Damage

3.2.4 2nd Floor System

The 2nd floor framing system consists of a wood framed floor system with floor sheathing of unknown thickness supported on conventional wood floor joists of unknown sizes spaced nominally throughout the system. The floor joists are supported by a combination of interior bearing walls, floor beams and the exterior walls.

The 2nd floor framing that was mostly concealed and unable to be reviewed though in some locations visible via exterior windows, the floor framing did appear to have suffered fire damage. The damage observed consisted of smoke damage and charring in various areas around the building.



Photograph 12: 2nd Floor Area



Photograph 13: 2nd Floor Window Damage

3.2.5 Main Floor System

Due to the extent of fire damage above, the main floor system was not able to be safely reviewed at the time of our site visit.

3.2.6 Foundations

Due to the extent of fire damage above, the foundation system of the building was not able to be safely reviewed at the time of our site visit.

4.0 Discussion

It is the understanding of Bolen Engineering that this report was commissioned to review the existing structural condition of the building for obvious, visible signs of structural distress, damage, or displacement. A structural analysis of the existing building was not completed as this is considered beyond the scope of work on this report.

The observed damage to the roof, wall, and floor systems of the building have deteriorated the structural capacity of the building and introduced significant instability into the structure. The vertical and lateral load resistance of any structure relies upon the proper interaction of the building structural components to resist the applied loads and adequately distribute them to the foundation structures and the surrounding soils. The observed damage to the roof and floor systems has compromised the lateral load resisting system of the building which is required to resist lateral loads such as wind and seismic loading. As such, collapse of the building due to these environmental effects is a significant cause for concern.

In addition, the lack of support of individual components of the building presents a cause for concern. The collapse of the roof structure has eliminated the lateral support of the 3rd story walls and roof parapet above. As such, these walls and their brick façade have become extremely unstable, and collapse of these components is highly probable in the immediate future.

The lack of safe access within the building limited the review of the building structure, however the limited review that was able to be completed was deemed conclusive. The damage and deterioration of the building structure poses a significant risk to any persons entering the building or being present in the surrounding building vicinity due to the risk of structural collapse. The damage or deterioration of a single building component can pose a risk to the occupant(s) of a building within this structure. The damage and deterioration of the majority of the structural components was observed and to such an extent that collapse of the structure appears to be an imminent possibility.

5.0 Opinions & Recommendations

Based upon the above noted observations and discussions, Bolen Engineering provides the following opinions and recommendations:

1. **Observed Building Damage:** It is the opinion of Bolen Engineering that the observed recent fire damage to the Knights Hall building has compromised the structural integrity of the buildings roof framing, 3rd floor framing, a portion of the 2nd floor framing, stairwell framing, 3rd floor walls, and likely numerous other areas of the building that were inaccessible at the time of our review.
2. **Occupant and Worker Safety:** The observed structural damage to the roof, floor and wall structures of the building are a significant structural concern and an occupant risk does exist. It is the recommendation of Bolen Engineering that no persons enter the buildings or be within the buildings vicinity until demolition is completed.
3. **Safe Zone:** It is the recommendation of Bolen Engineering that the City of Cranbrook establish a Safe Zone around the building and create a Safe Perimeter (fence or other) at the edge of this zone to keep the public or any other persons from entering. Determination of the Safe Zone and Safe Perimeter should be completed by a qualified Safety Professional.

4. **Building Demolition:** It is the recommendation of Bolen Engineering that the building be demolished as soon as possible, and that demolition be completed in such a way that no worker is placed on or around the building within the established Safe Zone. All demolition work should be completed in accordance with local bylaws, BC Building Code requirements and WorkSafe BC/OSHA regulations.

6.0 Limitations:

This report has been compiled in a fashion consistent with the standard of care and skill which can ordinarily be expected of a member of the engineering profession under similar conditions. No warranty is made, whether implied or express. This document has been prepared for the sole use and benefit of this project and client only and represents the professional opinions and judgements of Bolen Engineering based upon the knowledge and information available at the time this report was prepared. Any and all recommendations provided by Bolen Engineering are based upon our non-intrusive site review as well as any information provided by the client. It is common for other issues to exist in a building which may not be detected during our review as they are not readily accessible or are hidden from view. As such, should additional issues be noted during construction or at a later date, Bolen Engineering should be notified immediately. Bolen Engineering cannot be held responsible in any way for unknown or hidden site conditions. Any persons relying on this report do so at their own risk. The observations, opinions, recommendations, and all other content contained within this report are specific and applicable to this project only and are not applicable to any other project. If reference is to be made to this report, it must be made to the report in its entirety.

We trust that this report satisfies your requirements for this project. If you have any additional questions or concerns, please contact the undersigned at (250) 464-9268 or (778) 962-0073.

Sincerely,

Reviewed



Brandon Bolen, P. Eng
Structural Engineer

Jason Rusu, ASCT
Engineering Technologist