
Code Compliance and
Occupant Hazard Assessment
NWSS Massey Theater
735 Eighth Ave, New Westminster

ISSUED FOR REVIEW

Gage-Babcock & Associates Limited
GBA File # 091800
September 28, 2009

Prepared for:
School District No. 40
1001 Columbia Street, 2nd Floor
New Westminster, BC V3M 1C4

Prepared by:

Reviewed by:

Kevin Lau, P.Eng., CP
Project Engineer

Tony Godwin, NICET IV
Principal

TABLE OF CONTENTS

1.0 MAIN HEADING 2
1.1 Subheading 2

1.0 Introduction

This report provides a general review of the code compliance, fire, and life safety systems above captioned building located at 735 Eighth Ave., New Westminster. The objective of this review is to identify existing hazards, categorize the level of risk, and propose cost effective solutions that satisfy the general requirements of the 2006 BC Building Code (BCBC). The proposals identified herein are generally applicable to proposed future work to the theatre facility to demolish the gymnasium and school components of the facility.

The contents of this report and the opinions herein are based upon the information obtained at a site visit carried out on September 10, 2009 and drawing provided by Atelier Pacific Architecture. Items not specifically addressed are assumed to be in general conformance with the building regulations in force at the time of construction. Italicized terms are ascribed the same meaning as those in the building code.

2.0 Application of the Code

The existing building was constructed at a time when building regulations were more relaxed. As such, the subject building contains existing conditions that do not satisfy the literal requirements of the BCBC. However, it is not the intent that new versions of the building code necessitate retroactive upgrading. Consequently, existing conditions are permitted to remain, except where new renovations, alterations, or a changes of use is contemplated. Notwithstanding the foregoing, the AHJ may require upgrading or repairs to what is deemed to be an existing unsafe condition.

As a result, unless a specific hazard is uncovered that is an immediate danger, all proposed remedial measures identified in this report would be conducted on a strictly on a voluntary basis. Therefore, provided the Authority Having Jurisdiction (AHJ) is in agreement that the proposed modification to the building do not result in a reduction in the overall level of fire and life safety, such work need only comply with the BCBC to the extent that the AHJ deems necessary.

3.0 Existing Building

The Massey Theater is a substantial sized structure including a 672 m² Theater seating 1260 persons, with attached facilities for the New Westminster Secondary School inclusive of a 365 m² gymnasium, band, and drama facilities.

Originally constructed in 1948, the building is a 4 four storey wood framed structure

3.1 Use and Occupancy

At present, the building is used as a multiple use facility, including a community theatre and school. Accordingly, the usage of the building is presently classified as a Group A, Division 2 - "Assembly Occupancy" which is consistent with the building's current use.

3.1.1 Storage in Basement

There is presently a substantial storage of combustible and noncombustible products is located underneath the building within the basement. Storage is single level pile storage that typically does not exceed 10'-0".

Some storage was observed in stairs and in crawlspaces and is not permitted in these locations. Storage in these locations should be relocated into designated storage rooms within the basement area. Over the long term, it is recommended that the adequacy of the sprinkler system be assessed in detail with respects to the storage in these locations.

3.2 Construction Requirements of the 2006 BCBC

The present A2 occupancy of the building requires the general construction of the building to satisfy Article 3.2.2.24. of the BCBC. The construction requirements of this Article are summarized as follows:

Article 3.2.2.24. "Group A, Division 2, up to 6 Storeys, Any Area, Sprinklered".

Construction:	Noncombustible.
Floors:	Fire separation with a minimum 1 hour Fire-Resistance.
Mezzanines:	Minimum 1 hour fire-resistance.
Structural Elements:	Fire-resistance equal to the supported assembly.
Max. Area:	Unlimited.
Sprinklers:	Required - Designed according to NFPA 13 - 1999.

3.2.1 Existing Construction

Since this is an existing structure, the above construction requirement is only relevant for the purposes of establishing a basis for what is considered an acceptable level of safety. If constructed today, this building would not be constructed of wood. However, it is neither practical or required to remove existing construction.

Recommendation

Rather a strategy to improve existing fire separations in high hazard locations is recommended. These locations include electrical rooms containing substantial amounts of equipment, mechanical rooms containing fuel fired equipment, kiln room, and garbage rooms. Since creating a compliant fire separation is not practical in most circumstances, it is proposed that existing separation be improved by completion of the wall membrane to the adjacent concealed space in the wall, floor, and ceiling assemblies and includes firestopping of openings between floors.

Doors in the required fire separations indicated above were observed to frequently to be provided with grills or be wood doors. Grills should be outfitted with a fire damper assembly, and doors replaced with a fire resistive type where serving high hazard locations.

In some numerous locations between floors and in walls, penetrations through the assemblies have been sealed with an expanding polyethylene foam product. This is not appropriate in fire separations and should be replaced with an appropriate firestopping system, or at least cut back and sealed with an intumescent firestopping product if removal of the foam product is not feasible.

Existing storage rooms have been noted that open directly into exits. These are not permitted by the current building code. Since removal of these spaces is not practical, it is recommended that the separation of these rooms be made continuous and all openings firestopped. Doors serving these spaces should be tight fitting and weatherstripped.

Further to the foregoing recommendations, if substantial future construction adding to the building area is considered, this strategy should again be reviewed at that time. It is suggested that the provision of a continuous 2 h concrete fire separation would provide a suitable barrier to between new and existing construction so as to permit existing portions of the building to remain.

3.2.2. Existing Floors

Much of the existing building floors consist of laminated 2" x 4" set on ends. While this does not provide a 1 h fire separation as indicated in Appendix D of the BC Building Code, this does provide a substantial barrier to the passage of fire. For the purpose of occupant safety, it is expected that such a floor would provide sufficient time to egress the building occupants prior to collapse of the building.

4.0 Fire Safety Systems

GBA has conducted a general review of the fire safety system within the existing building. Despite the age of the system, the general condition of existing system is in relatively good shape. Specific comments with regards to the sprinkler and fire alarm systems follow.

4.1 Sprinkler System

The building is provided with a sprinkler system that protects essentially all areas. The physical condition of the system appears to be from good to excellent. Design drawings have not been reviewed to assess compliance with the BC Building Code, but visual inspection from floor level did not reveal any obvious non-compliance, except as noted below.

Three forms of deficiency were noted by visual inspection from floor level:

- The sprinklers installed are standard response type. The current BC Building Code requires quick response sprinklers in Light Hazard occupancies such as the Massey Theater. Quick response sprinklers provide both faster fire alarm initiation and earlier suppression than standard response sprinklers. Consideration should be given to changing the sprinklers, although retrofit is not a requirement in the absence of change of use or major modifications to the building.
- Older areas backstage are equipped with old-style sprinklers, which are designed to discharge approximately 40% of their water up towards the ceiling, instead of discharging down as is the case with modern sprinklers. Old style sprinklers were superseded in the 1960s with standard spray sprinklers, The old style sprinklers should be replaced with current model listed sprinklers.
- In some small renovated areas, sprinklers are located inappropriately after being left in their original locations when walls and ceilings were modified. Sprinklers should be relocated to accommodate the architectural changes made.

In the event of a future upgrades or additions to the building, the new addition must be sprinklered to satisfy the requirements of the BC Building Code. Although specific investigation of the sprinkler system to determine the nature of the design was not made, it is very likely that the sprinkler system is a of a "bird cage" type layout such that any demolition of existing building walls may impair the proper hydraulic function of the existing sprinkler system. Careful review and design may be required to ensure that the existing sprinkler system will continue to operate in conformance with the applicable sprinkler design standards.

Recommendation

Existing sprinkler though not totally conforming with the requirements of NFPA 13, provide a substantial improvement to the level fire safety within the building. In general, sprinkler coverage within the building is quite good, so spot deficiencies such as those noted are unlikely to compromise life safety although it may contribute to more substantial property damage than would otherwise occur.

On this basis, it is recommended that all old style heads within the existing sprinkler system be replaced in the near term. Placement issues surrounding the sprinklers can be delayed to the next major renovation to the building. Otherwise, sprinklers should be retrofitted as needed within the scope of small renovation work in the affected areas.

4.2 Fire Alarm System

The building is equipped with a fire alarm system that is an extension of the New Westminster Secondary School fire alarm system. No operational tests of the fire alarm system were carried out but the following issues were identified by visual inspection from floor level:

- Manual pull stations used to initiate a fire alarm condition are, in many cases, inappropriately located. The BC Building Code requires that pull stations be located near access to exits. In the actual case, pull stations are frequently located centrally in protected areas instead of near exits, and in several cases it is possible to exit from occupied areas without passing a pull station. A complete review is recommended, followed by relocation and addition of pull stations to bring the building into compliance with the current BC Building Code.
- Manual pull stations are installed higher than permitted by the BC Building Code. However, the height mandated by the Building Code is intended to permit operation of pull stations by persons in wheel chairs. Those installed in areas not accessible to persons in wheel chairs may remain at their current height, Those in areas accessible to wheel chairs should be lowered to the currently mandated installation height.
- Heat detectors are installed in many storage rooms and in some other areas. The location of many of these detector were noted as not being in conformance with the CAN/CSA-S524-M design standard. However, these detectors are only required where electrically supervised water flow detection devices are not provided as a part of the sprinkler system. A detailed review of the sprinkler system would permit the determination of whether the existing heat detection devices are redundant and whether existing heat detectors in sprinklered areas may be removed to reduce testing

and maintenance costs.

- Visual inspection indicates that fire alarm audibility deficiencies probably exist in several areas, such as music practice rooms and non-public areas below the occupied building. A full scale audibility test should be carried out, and bells added as required to bring the building into compliance with the current BC Building Code.

In the event of a significant upgrade or addition to the existing building, the fire alarm system should be examined for the possibility of replacement. As the existing devices continue to age, they will be increasingly likely to generate false alarms.

Additionally, the BC Building code will require that the entire building be served by a single system and zoned by floor, and the provision of addition devices will likely exceed the capacity of the existing system. Modern fire alarm systems generally have the capability of device addressing and can identify the activation or fault of specific detection devices which will be of value in detecting devices requiring maintenance or other attention.

Recommendation

The fire alarm system is a key component to occupant life-safety and provides an automatic means by which the fire alarm and maintenance personnel can be made aware of possibly severe conditions. The cost of delayed response can be considerable both for lives and for property hence, it is recommended that in the near term the existing fire alarm system be reviewed in detail and renovated as needed.

It is GBA's assessment that a correctly designed and maintained fire alarm system in conjunction with electrical water flow detection from the sprinkler system should be a vital component of the Massey Theater risk mitigation program. Consequently, over the long term, a detailed review of the fire alarm system should be conducted with a view to replacing the existing fire alarm system and devices.

5.0 BUILDING EXITING AND EGRESS

Building egress and exiting is required in conformance with the BC Building Code. This represents what is considered to be the acceptable level of life safety within BC. Maintenance of clear and safe egress routes is a major consideration with regards to occupant life safety.

Floor Area	Area (m ²)	Factor (p/m ²)	Occupants (p)
Basement - Storage	800	28.0	29
Basement - Office type use	610	9.3	66

Second Floor	450	9.3	49
Second Floor - Gymnasium	365	0.4	913
Second Floor - Stage	260	0.75	346
Second Floor - Fixed Seating	--	--	1260
Third Floor	260	1.2	216
Fourth Floor	70	1.85	38
Total			2917

Table 1. Occupant Load Calculation (Estimation)

The above table identifies an estimate of the building occupancy based on the requirements of the BC Building Code.

5.1 Exit Capacity

Appears to generally be compliant with what is considered reasonable under the current BCBC.

Egress Element	Stair Width (mm)	Door Width (mm)	Egress Factor (p/mm)	Capacity (p)
Basement	1200	900 (x12)	6.1 (doors) 8.0 (stairs)	1920
2 nd Floor	4000 +3500 + 1400	900 (x8)	6.1 (doors) 8.0 (stairs)	2293
3 rd Floor	2800 + 1400	--	8.0 (stairs)	525
4 th Floor	1000	--	8.0 (stairs)	125
Total				4863

Table 2. Exit Capacity Calculation (Estimation)

The overall egress from the Massey Theater is generally compliant with the number and capacity requirements of the BCBC. There may be some issues with regards to the construction of these exits. However, this condition would be typical of a building of this age. As it is impractical fully investigate the construction of stair fire separations, on going maintenance to repair damaged exit separations to prevent further deterioration is sufficient.

The existing Massey Theater boardroom on the 4th floor is served by a single egress

September 28, 2009

stair. Only a single means of egress has been provided, this is smaller than permitted by the current code, and the egress stair is not enclosed on the 3rd floor. This is not literally code compliant, but since occupancy is only intermittent and the occupant load is low, this condition is not deemed to represent a substantial risk within a fully sprinklered building with fire alarm system.

Recommendation

Door swing from the gymnasium egress is shown on the provided plans as in swinging doors. Since these doors serve an occupant load of greater than 60 persons, these doors should be rehung to swing outwards. Adjustments to the frame and door hardware may be need to support this. This would reduce the risk of injury as a result of a occupants being crushed against the exit doors during a mass evacuation.

5.1.1 Fixed Seating

Exiting from fixed seating is not compliant with the requirements of the BCBC. There are too many seats within a row of seats and the dimension between seats is only 360 mm where 400 mm is required by the current code.

The aisle serving the seating rows are 1400 mm wide. The aisle is required to be 1225 mm wide by code. There are four egress doors from the auditorium, but one set appears to no longer be in use. The equivalent code conforming case only required two means of egress from such a space. Therefore, it is concluded that the risk posed by the present egress is not unreasonable or significantly exceed what would be expected for a building of this type.

Recommendation

Relocation and reconfiguration of the existing seating and aisles is highly impractical. However, it is noted that the provided exiting from the auditorium is generally reasonable if not literally code compliant. From prior egress studies, it is generally known that in most cases, it is the egress provided from the auditorium that is the limiting factor to occupant movement rather than row clear width.

It is therefore recommended that in the short term, no work is required. However, at such time, major renovations or additions are carried out, a detailed review of the auditorium egress should be conducted. It is possible to conduct an egress model of occupant movement to confirm egress is reasonable and identify any potential areas of concern. A reasonably achievable fix to the existing exit condition may simply be to widen an doors to the seating area or redirect the abandoned egress route.

5.2 Stairs

Stairs are one of the most common locations where persons may inadvertently injure themselves. Tripping typically occurs as a result of difficulty in seeing the treads, or as a result of dimensional considerations in the design of the stairs.

Site review of the stairs at the Massey Theater indicates that within publicly accessible spaces, lighting is generally adequate, and that the rise and run of stairs is adequate. However, the stairs are provided with projecting nosings and the tread material is not always visually distinct.

Recommendation

It is recommended that contrasting nosings to be provided on publicly accessible stairs. This should consist of a minimum 1" colour contrasting strip at the edge of stairs. Contrasting nosing visually delineate the edge of the stair tread which helps occupants judge where to place their feet. This is of particular value where lighting of the stairs is required to be dim, such in the vicinity of the stage area.

Existing stairs generally have projecting nosings of up to 1". While these are permitted to remain as an existing condition, it is recommended that publically accessible stairs be modified with an angled in-fill material so as to eliminate these projecting nosings. Projecting nosings have been eliminated from the current code requirements to avoid the possibility of the nosing catching the heel of the occupant as they descend the stairs.

5.3 Handrails

The function of handrails is to provide an object that can be gripped in ascending or descending the stairs, and provide guidance for physically or visually impaired individuals. As such, the handrails should not terminate abruptly, and must be able of sustaining certain loads.

Existing handrails while typical of buildings of this age do not presently satisfy the dimensional or load-bearing requirements of the BCBC. As significant injuries can be sustained in a fall, this is a key area of occupant safety and substantial compliance with the standards set out in the BCBC is strongly recommended.

Recommendation

Replace existing nonconforming handrails with new handrails satisfying the dimensional and loading requirements of the BCBC. These should include 300 mm extension at top and bottoms of stairs, and they must be solidly affixed to existing construction, or solid blocking.

Missing handrails serving the mezzanine floor areas must be replaced.

5.4 Door Hardware and Locking Devices

A magnetic locking devices has been provided on the 4th floor corridor on the doors leading to the gymnasium upper level. It is our understanding that this was intended to address a security issue, but this magnetic lock assembly creates a dead end condition on the 4th floor.

A dead end condition creates a potentially serious situation for occupants during evacuation. If the single egress route is blocked, occupants have no recourse to another way out of the building. As a consequence, the building code only permits dead ends of very limited size, and generally in locations where occupants are familiar with the building layout.

Recommendation

The observed condition can be resolved by programming the magnetic locking devices to release in an emergency condition. This would mitigate the likelihood of persons becoming trapped in an emergency. However, this is not a literally code compliant solution and so would require the development and submission of an alternative solution by a registered professional to the Authority Having Jurisdiction.

Existing sliding doors were observed the means of egress adjacent to the stage. These may obstruct persons during egress since they will not swing in the direction of egress travel. Since it is not practical to replace these doors, it is recommended that a provision for operable swing doors be provided in the adjacent storage room adjacent to the loading dock so that persons can be use this as an alternate egress route in the event the sliding doors are shut.

If there are ongoing security issues within the building, a review by a registered security professional may be of value.

6.0 SEISMIC

GBA is unable to make specific comments with regards to the suitability of the building with regards to seismic and structural capacity. However, as the lower mainland is seismically active zone, there is a substantial risk of low order seismic event that may not critically compromise the building structure.

Recommendation

It is recommended that, attention should be paid to building equipment and components that may fall or come loose in the event of such a seismic event. Such equipment or components should be restrained appropriately, the cost of which is substantially lower than full scale seismic upgrading to the entire building.

7.0 ACCESSIBILITY

The requirements for occupant accessibility have not been reviewed as a part of this report as these do not generally impact occupant safety.

8.0 OPERATIONAL RISK REDUCTION RECOMMENDATIONS

The basis of any operational procedures should be the fire safety plan. The fire safety plan is mandated by the BC Fire Code, but it is very likely that the building fire safety plan has not been updated for some time, and that the plan is likely only a generic plan which does not specifically address the function or needs of the particular building. If so, this should be updated and made relevant to the building.

Further the improvement of the fire safety plan, the operator should develop emergency and evacuation procedures for notifying staff and the public, and ensuring the public is orderly and safely evacuated. Special consideration should be given as to how to do this in the middle of a production or show as it is not desirable to create confusion.

The building operator should also designate floor fire wardens and deputies and such persons should be trained so that they know what their duties are in the event of a fire. A regular training regime should be instituted so that general staff are made aware of these procedures, what constitutes an unsafe condition, what to do in the event of a fire, and the proper function of fire and life safety equipment. This training regime should also include items of electrical safety, worker safety, first aid, and so forth in addition to basic fire safety.

Staff should also be made aware of where are the correct areas to store items, as well as the manner in which these things are to be stored so as not to interfere with the operation of building fire and life safety systems. Regular rounds or inspections should be conducted to: Ensure that egress routes remain accessible and clear of unnecessary materials as appropriate to reduce the risk of an unserviceable exit.

Additional actions recommended of the operator include the removal of storage in inappropriate locations. Review fire and life safety systems in conformance with BCFC requirements. The operator may also provide additional signage where the direction of exit is not clearly indicated, or indicate areas that do not lead to an exit.

It is likely that at least some of these items are being carried out, but an ordered implementation of these items would represent an improvement in present operations and provide a commensurate reduction in risk to Massey Theatre.

9.0 SUMMARY OF FINDINGS

September 28, 2009

A general review of the NWSS Massey Theater to analyze the general fire and life safety of the building has been completed. It is found that the general fire and life safety aspects of the building while deficient, are in reasonable condition when compared to similar buildings of its age. As a first step to improving the level of fire and life safety of the building, the implementation of at least the operational level procedures is recommended.

This report was prepared by Gage-Babcock & Associates Ltd. (GBA) for the Client. The material herein, reflects GBA's best judgement in light of the information available to it at the time of preparation. GBA accepts no responsibility for damages, if any, suffered by any third party as a result of use of the contents of this report without authorization from GBA. GBA shall not be held responsible for any alternative solutions stated in this report without written acceptance of same by the applicable Authority Having Jurisdiction. It is the responsibility of the registered professionals of record to incorporate building code measures described herein, including alternative solutions, into the design, building permit and construction documents.

L:\Jobs_by_Year\09\091800 (kl) Massey Theatre - Risk Analysis\Correspondence\Reports and Alt Solutions\REP - Occupant Risk Analysis (final) 2009SEP28.wpd