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Memo Report

From: W. Mark Cummings, P.E.

To: Mr. Tom Blackburn

Subject: **Code Review and Life Safety Evaluation; ICW Building Located at 519 Congress St., Portland, ME**

As requested, Fire Risk Management, Inc. (FRM) has performed a review of the information that has been provided with regards to the building located at 519 Congress Street in Portland, ME; the Mechanics Hall. In addition to the various discussions we have had regarding your desire to expand the use of this facility to support additional private and public activities and events, a site visit was performed on May 9th to review the building, with a specific emphasis on a number of the assembly areas.

The scope of this code review and building evaluation is mostly confined to an assessment of the potential expanded use of the building in supporting a range of public and private events within the various assembly areas that exist on the 2nd, 3rd, and 4th floors of the building. However, to support this evaluation of the overall fire protection and life safety requirements that may apply to this building, all areas of the building were included in this assessment and all building occupancies and their configurations/locations were included within the overall evaluation and considered when developing any recommendations.

Background

The building at 519 Congress St. is currently owned by the Maine Charitable Mechanics Association (MCMA). In addition to housing the entryway to the "Mechanics Hall," the 1st floor of the building also houses two retail spaces; listed as 517 and 521 Congress St.; albeit all three occupancies are included within the same building/structure. The building consists of a four (4) story structure with a basement below grade. The 4th floor is listed as being an "attic" space, but this level is accessed by a stairway and could potentially be used as an additional assembly area. The 3rd floor of the building is also provided with a mezzanine level that includes areas that were previously used as "coat rooms," the orchestra balcony, and a kitchen area; albeit the kitchen is no longer active and all equipment has been removed from that area and the gas lines abandoned.

The Mechanics Hall is listed on the National Registry of Historic Landmarks. The original construction of the building was completed in 1859. At that time, the library was located on the 1st floor and access to the ballroom was from the 2nd floor, with the ceiling height spanning all the way to the attic floor. Construction to move the library from the 1st floor to the 2nd floor by modifying the configuration of the ballroom was completed in 1886 and included the installation of a new floor/ceiling assembly in this area.

In general, this building would be classified as a non-separated "mixed use" occupancy, per the International Building Code (IBC), inclusive of assembly (A-3), business , and mercantile occupancies. With the potential exception of the floor/ceiling assembly that separates the (now) 2nd floor library and 3rd floor assembly hall, the building appears to generally meet the requirements for a Type IV construction, per the IBC (MUBEC) and Type IV (2HH) per the NFPA. The specific construction configuration of the

floor/ceiling assembly between the library and ballroom is unknown, although given the timeframe of construction; it is likely that it is similar to that throughout the rest of the building. Otherwise, the building's construction is likely to fall into the category of a Type IIIB, but with a number of heavy timber (HT) elements that would provide the requisite 1 hour ratings that might also qualify this as being a Type IIIA. A more detailed inspection of all the construction elements would be required to better determine the specific construction category, but for this evaluation it is not considered crucial to make this distinction.

The building is fully protected throughout by an automatic fire sprinkler system. A fire alarm/notification system is also installed throughout the building. Only a single, open stairway provides access to all floors of the building. In the 1950's, the stairway design was modified to accommodate the installation of an elevator that serves the basement and upper three floors. The stair now "wraps around" the elevator shaft. Although the stairway is isolated from all adjoining rooms/areas at all floors by doors, these doorways and the surrounding walls do not have any associated fire resistance rating; with many of the doorways having glass transoms. Only the 3rd floor ballroom and 2nd floor library have direct access to a secondary means of egress; via exterior fire escapes.

The primary codes and regulations used in support of this building evaluation include the following;

1. The International Existing Building Code (IEBC); 2009 ed.
2. The Life Safety Code, NFPA 101; 2009 ed.
3. The City of Portland Code of Ordinances, Chapter 10 – Fire Prevention and Protection
4. The City of Portland Fire Department Rules and Regulations; dated 10/11/2012

Discussion

There are a number of factors to be considered when performing a "code evaluation" of this building; most specifically, what codes are, in fact, applicable. This is an existing building that is not undergoing a "change in use," nor are any extensive renovations being performed at this time that would require the building to be updated to existing code requirements. It was originally constructed to include assembly occupancies and apparently has mostly functioned in this capacity throughout its history; albeit portions of the building are now being used for both mercantile and business uses. Another factor to be considered is the building's historic nature and a desire by all to maintain its original character and cultural significance. However, the fact that the building's ownership wishes to use (lease) some of the building's assembly spaces for events by personnel that are not members of the MCMA does change its general use from one that is primarily private in nature, to one that includes access by the general public; people that may not be familiar with the building itself.

In general, any area of the building that is to be made available to the public at large for private and/or public activities should be evaluated to assess if the level of life safety provided is adequate to ensure that the public is not unduly put at risk. The three (3) areas in the Mechanics Hall that have been identified as potentially representing spaces that could be used by non-MCMA membership to conduct meetings and/or other events and activities include;

1. The meeting/classroom on the 2nd floor,
2. The 3rd floor ballroom, and
3. The 4th floor (attic) space.

For both the 2nd and 4th floor spaces, it is likely that these areas would be used to accommodate a range of meeting and/or classroom type activities. For these areas, the occupant load factor listed in NFPA 101 for "less concentrated use" (15 ft^2 per person) is considered appropriate for evaluating the maximum occupant load for each of these areas. Based on the available floor areas for the 2nd floor and 4th floor spaces, it is

estimated that the maximum occupant load would be 56 and 158, respectively. Given that it is the intent to remove existing walls (partitions) that currently subdivide the ballroom into two spaces, this evaluation will treat the ballroom as a single space; consisting of approximately 3300 ft^2. If the ballroom is to be used to support events that are more properly associated with a "ballroom", an occupant load factor of 7 ft^2 per person for "more concentrated use" would be applied; providing a maximum occupant load of approximately 470 persons. If used more as an assembly hall, whereby chairs and potentially tables may be present, then a maximum occupant load of 220 would be assigned for this room, based on a less concentrated use.

The actual maximum occupant load of any floor that is typically allowed by the codes is a function of the capacity of the means of egress from each floor. The primary means of egress for the Mechanics Hall building is the main stairway and the doorways that access this set of stairs. The building is only provided with one internal stairway that serves all floors. Subsequent to the installation of the elevator in the 1950's, the width of the stairway was significantly reduced; currently having a clear width of approximately 39 inches. Using the capacity factor for stairs provided in NFPA 101 (0.3 inches per person), these stairs would be considered as having the capacity to accommodate up to 130 persons per floor. Both the 2nd and 3rd floors also have access to external fire escape stairs. The limiting factor on these fire escapes is the narrowest set of stairs, which are 24 inches. Using the same capacity factor, these stairs would be able to accommodate up to 80 persons. NFPA 101 requires that when fire escapes stairs are used as part of the means of egress, these stairs cannot be used to accommodate more than 50% of the total occupant load for any one area or floor. As such, the maximum occupant load on the 2nd and 3rd floors that would be allowed by existing code requirements would be no more than 160 persons.

In addition to the capacity of the means of egress, the codes also have restrictions regarding a number of aspects associated with the travel distances within the means of egress from all areas of the building. The primary aspects of concern for travel distances are the maximum "common path" of travel and the maximum total travel distances to an exit from any area of the building. Common path of travel is that distance an occupant must travel before they reach a point where access to two separate means of egress is available. Given that the three areas under consideration for access by the general public are considered assembly areas, the travel distance requirements outlined in NFPA 101, Chapter 13 – *Existing Assembly Occupancies*, were used for this evaluation. The common path of travel allowed for assembly occupancies is only 20 ft., except where there are no more than 50 occupants within a specific area; whereby the maximum common path of travel is then extended to 75 ft. For a building that is fully protected by an automatic sprinkler system, as is the case with the Mechanics Hall, the maximum total travel distance to an exit is 250 ft.

The 4th floor (attic) space is only provided with a single means of egress; the main stairway. As a result, the common path of travel distance from this space is the furthest distance a person must travel from within this room to the stair landing at the 3rd floor; at which point access is also available to the fire escape at this level. This travel distance is in excess of 120 ft.; well above the maximum allowed by the codes. Both the 3rd floor ballroom and the 2nd floor meeting room can comply with the code requirements for common path of travel. The maximum travel distance from the 4th floor space to an exit (the building's main entrance) is estimated to be slightly under the code maximum of 250 ft.; estimated at 247 ft. using the drawings provided. The maximum travel distances from both the 3rd floor ballroom and 2nd floor meeting room to the building's main entrance are estimated as being approximately 160 ft. and 115 ft., respectively; well within the code limits.

The building's fire sprinkler system was reportedly installed in the 1950's, at the same time frame when the elevator was installed. Based on visual inspection only, the sprinkler system installation appears to be code

compliant, with the piping and components in generally good condition. Although a close inspection of the sprinklers was not performed, these appear to be original. If that is the case, these sprinklers would be more than 50 years old and the codes would require that they either be tested[1] to verify their ability to continue to properly operate or be replaced. NFPA 101 would only require that a fire alarm/notification be installed in assembly occupancies with an occupant load greater than 300. Although the building is currently not being used to support functions that would have occupant loads greater than 300, the assembly areas within this building do have the capacity to support occupant loads that will exceed this value. Therefore, a fire alarm/notification system would be required for this building. Although a fire alarm/notification system is installed in the building, this system does not serve all areas of the building, which must include the two mercantile spaces on the 1st floor. Additional notification devices would also be required in all areas of the building that are to be used as assembly areas.

Summary and Recommendations

Based on the review and evaluation of the existing configuration of the Mechanics Hall building, it is not possible for this building to fully comply with the existing requirements of NFPA 101 without performing an extensive renovation of the building; including the addition of a second, enclosed stairway that connects all floors of the building. Given the minor renovations that are planned for the near term, which primarily include removal of the partitions in the ballroom area and upgrading the electrical systems, and based on the specific requirements of the codes adopted by the State of Maine and City of Portland, it would not be mandated that any areas of the building that are not part of those "work areas" comply with all existing code requirements. Equally, the fact that this building is a historic landmark also provides additional latitude in what upgrades to the building's life safety systems would be mandated by the codes; even if more extensive renovations are performed. However, the intent of this evaluation is to assess the ability of the existing building to provide adequate life safety for its use by the general public. Although it is believed that this building can safely support that function, some restrictions on how the assembly areas are used, along with specific upgrades to some of the life safety systems are recommended.

In general, the Mechanics Hall building is a relatively small building and the maximum travel distances from anywhere in the building are relatively short and will comply with that allowed by NFPA 101. However, it is recommended that actions be taken to improve the integrity of the enclosure around the main stairway such that it can better protect occupants in the event a fire occurs; for a period of time that is likely needed for escape. Although concern exists regarding maintaining the building's historic nature, a significant improvement in life safety can be achieved by simply ensuring that the stairway remains "smoke tight." This can be achieved with minimal impact on the historic ambiance of the building. It is recommended that all transoms above the doorways that open to the main stairway be kept in the closed position and that all doors that open to the stairway be provided with automatic door closures. Those doors that are not regularly used and are not part of a means of egress may be locked shut when not in use. Due to the relatively short travel distances to reach an exit from all areas of the building, if the stairway is maintained as a smoke tight enclosure, it is likely that all occupants would have sufficient time to egress the building before the integrity of the stairway is lost and conditions deteriorate to the point that egress using these stairs is not possible.

Based on the total travel distance from the 4th floor area to an exit, coupled with the fact that it is provided with only a single means of egress and the common path of travel significantly exceeds that allowed by code, it is recommended that this area not be used to support any public events. If a secondary means of

[1] Per the requirements of NFPA 25, at least 10% of the installed sprinklers must be tested for proper operation. If any of the sampled sprinklers fail, then additional samples must be taken and tested.

egress can be provided, such as extending the existing fire escape to this level, then it would be possible to safely use this area for that purpose.

Due to the limited capacity of the means of egress in this building, it is recommended that any public event that is held in the ballroom be limited to no more than 160. Although this is likely a conservative limit that could safely accommodate events in this area, it does represent a strict compliance with existing codes; albeit not taking into account the "historic" nature of the building. If it is desired that a larger occupant load be used for this area, a more detailed egress analysis can be performed that will likely be able to demonstrate that this occupant load value can be safely increased. However, it would be recommended that prior to performing any such evaluation, concurrence be obtained from City officials that they would be willing to accept the results of such an analysis.

The 2nd floor meeting area can be safely used to support small meeting and/or training (classroom) type events. Based on the actual area of the room, the maximum occupant load for this room was estimated as 56. However, since this room is only provided with a single means of egress[2], it is recommended that any event within this room be limited to no more than 50 occupants; thereby continuing to comply with current code requirements.

It is also recommended that a number of improvements be implemented on a number of the life safety systems throughout the building. At a minimum, these include the following:

1. Install automatic door closures on all doors that open to the main stairway and are needed as part of the building's means of egress. Doors not required for use may be locked to ensure they will be closed.
2. Secure all transoms in the closed position in doorways that open to the main stairway.
3. Verify the age of the installed sprinklers. If the age of these components exceed the code requirements (50 years), ensure that the proper number of sample sprinklers are tested to verify proper operation or replace all sprinklers. If sprinklers are to be replaced, it is strongly recommended that consideration be given to the use of quick-response sprinklers, since these will provide better protection and more rapid notification for building occupants.
4. Upgrade the fire alarm/notification system to be fully compliant with NFPA 72. This includes the addition of pull stations and notification devices throughout the building where required to meet code and manufacturer's listing requirements, including adding devices within the two mercantile spaces on the 1st floor. It is imperative that all building occupants be readily aware of a fire or emergency event in other areas of the building; whereby an alarm initiating device has been activated.
5. Install proper exit signage throughout the building and verify proper emergency lighting is provided in all means of egress areas.

It is recommended that the above listed building modifications be implemented as outlined. Subsequent to these modifications and verification of proper operation of all life safety systems, it is considered that both the 3rd floor ballroom and 2nd floor meeting room can safety be used by the general public, as long as their respective occupant load restrictions are maintained as noted above.

If you have any questions regarding what has been outlined above, please don't hesitate to contact me.

W. Mark Cummings, P.E.
Principal Engineer

[2] Although this room is provided with two separate doorways, they are located immediately adjacent to one another an do not meet the NFPA requirements for separation of means of egress. As such, they must be considered as a single means of egress.