



## **FIRE RISK MANAGEMENT, INC**

1 Front St., Bath, ME 04530  
207/442-7200 [221-1295 (fax)]  
www.fireriskmgt.com

Date: 4 April, 2014

# **Memo Report**

**From:** W. Mark Cummings, P.E.

**To:** Mr. Nicholas Ray: TEC

**Subject:** **Fire Safety Assessment of the Ocean Gateway Terminal in Portland, ME.**

As requested, Fire Risk Management, Inc. (FRM) has performed a review of the fire safety features associated with the Ocean Gateway Terminal located in Portland, ME. The Pier and its associated terminal buildings, along with the adjacent parking and staging areas, collectively constitute the terminal area. The primary function for this review is to assess the overall code compliance of the Ocean Gateway Terminal facility and evaluate if any additional fire protection features may be needed to support the current plans to once again use this facility to support ferry operations to/from Nova Scotia.

Although the two terminal buildings associated with the Ocean Gateway Terminal appear to be code compliant, with respect to fire and life safety code requirements, the scope of this effort did not include a code assessment of the individual buildings.

### ***Background***

The Ocean Gateway Terminal is to be utilized for the loading and unloading of vehicles and passengers to and arriving from Yarmouth, NS on the Nova Star Ferry. The Terminal primarily consists of a Pier and two buildings, the Lower and Main Terminal Buildings, along with the paved areas at the base of the pier that are used for parking adjacent to the Lower Terminal Building and the large enclosed (fenced) area that is used to stage outbound vehicles waiting to load on the ferry and the inbound vehicles that are waiting to clear Customs. The main Pier is approximately 600 ft long and 50 ft wide for the majority of its length; not inclusive of the area occupied by the Main Terminal Building. Attached to the main Pier, at the location of the Main Terminal Building, is another narrow pier section, which runs at an oblique angle to the north, that is used to provide access to what is called the “Megabirth”; that portion of the pier that is used to accommodate larger cruise ships. The Main Terminal Building is located near the end of the main Pier and consists of a two-story structure. A raised walkway is installed along the north side of the main pier that provides access from the 2<sup>nd</sup> level of the Main Terminal Building and gradually slopes down to pier level at a point near the shoreside end of the main pier; adjacent to the Lower Terminal Building. Both terminal buildings are provided with installed automatic fire sprinkler systems. The Main Terminal Building is provided with a dry-pipe system that is supplied from the sprinkler valve room in the Lower Terminal Building. A (dry) 4-inch water supply pipe is installed below the raised walkway that connects the dry-pipe control valve in the Lower Terminal Building to the sprinkler distribution piping in the Main Terminal Building.

A City fire hydrant is located adjacent to the pier access road; at the corner of Thames and Hancock Streets; City Hydrant #1939. This hydrant is approximately 125 ft from the west wall of the Lower Terminal Building. The nearest adjacent hydrants are located near the south end of the terminal, on the west side of Commercial St. at a point that is adjacent to the Customs inspection areas (City Hydrant # 45) and another hydrant is located at the north end of Thames St., near the access point to the north end of the Lower

Terminal Building's parking lot. No other access to firefighting water exits within the Ocean Gateway Terminal.

Associated with the terminal is the large, enclosed vehicle staging area that is used for queuing vehicles associated with the ferry operations; both incoming vehicles awaiting inspection by Customs Officials and outgoing vehicles awaiting loading on the ferry. The area dedicated for queuing vehicles is approximately 700 ft in length, from the fence line to the north to the Customs Inspection stations at the southern end, and approximately 120 ft in width. Due to a requirement to further isolate the incoming traffic prior to proceeding through the Customs inspection, this queuing area will be further subdivided, lengthwise and along the centerline, by an additional fence; effectively splitting this area into eastern and western halves.

For ferry operations, the outbound passengers not associated with the vehicular traffic will be routed through the Lower Terminal Building; loading either by the vehicle ramp or by a portable gangway from the pier itself. Inbound passengers will be routed to the Main Terminal Building to pass through Customs and then exit through the Lower Terminal building via the raised walkway that runs along the north side of the pier. All passengers associated with cruise ships loading and unloading from the megabirth will generally follow the same process and pathways.

### ***Review and Assessment of Code & Standards Requirements***

Although a number of sources have been used in support of the overall fire safety review of the Ocean Gateway Terminal, the primary fire protection requirements that are discussed below are those outlined by the applicable State-adopted National and Municipal code requirements; including those contained in:

- The City of Portland Code of Ordinances, Chapter 10, *Fire Prevention and Protection*
- NFPA 1, *Fire Code*
- NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*
- City of Portland Fire Department Rules and Regulations
- The City of Portland Technical Manual, Section 3 – *Public Safety*

The applicable chapters of NFPA 307 represent the primary source of most of the fire protection requirements for the terminal site. NFPA 1 was reviewed, but in general, the applicable requirements within this code simply mirror those of NFPA 307. The Fire Prevention and Protection chapter of the City of Portland's ordinances was also reviewed, but again, did not impose any additional requirements beyond those of NFPA 307; albeit the sections of the City's Ordinances, Technical Manual, and Fire Department Rules and Regulations that outline requirements for fire hydrants and access by fire department equipment will need to be adhered to.

A significant aspect of the fire protective measures for a marine terminal is having access to adequate firefighting water. This fact is exhibited in the requirement that fire hydrants and/or hose connections that are connected to an adequate water supply be installed throughout the terminal area. The hydrants should be spaced along the fire access lanes at a distance that does not exceed 300 ft. The closest hydrant to the pier is located at the intersection of Thames and Hancock streets approximately 125 ft from the Lower Terminal Building. The nearest adjacent hydrants are those located to the south, adjacent to Commercial St., and to the north, adjacent to Thames St.; at a distance of 760 ft and 450 ft, respectively. The NFPA also requires that a fire hydrant or hose connection be located no more than 150 ft. from the end of any dead-end access lane. Due to the construction of the Main Terminal Building on the main pier, this requirement would also apply to the pier.

Associated with the hydrant (hose connections) spacing requirements is the need to ensure adequate access is available to the entire terminal area by firefighting equipment (trucks). The standards require fire lanes of at least 20 ft in width be provided such that no point within the terminal is greater than 50 ft from these access lanes. Both NFPA 1 and the City's ordinances include a requirement to provide a "turn-around" area at the end of any "dead-end" fire access lane that is 150 ft or greater.

Chapter 9 of NFPA 307, *General Terminal Operations*, includes a number of requirements that apply to the overall operational requirements for the terminal. This chapter is primarily for the terminal “operator” and outlines requirements for the safe operation of the terminal. This includes items in Section 9.2 that specifically address the need for personnel (operator employees) to be specifically trained in responding to fire and other emergencies. Additionally, Section 9.8 includes a requirement to provide an “International Shore Connection” in accordance with the International Maritime Organization’s (IMO) International Convention for the Safety Of Life At Sea (SOLAS), which allows shipboard firemain systems to be connected to the shoreside water supply system. Section 9.10 has a requirement that a means to rapidly notify the fire department in the event of an emergency be provided. No specific means is mandated and this can either be via installed systems, such as manual pull stations located throughout the terminal, or through the use of other communication systems, such as telephones.

### ***Summary and Recommendations:***

In general, the primary area of concern, with regards to the Ocean Gateway Terminal being fully compliant with applicable fire protection code requirements, is the lack of adequate access to firefighting water throughout the terminal area. This includes not having access to firefighting water on the main pier itself. Most other code requirements outlined above that are not (currently) specifically defined or documented for the terminal’s operation can be accommodated through the development of administrative and/or emergency procedures; such as identifying the means that will be used to rapidly notify the fire department of an emergency. Although it is understood that the primary impetus behind this assessment is to accommodate the use of the terminal to support ferry operations, many of these general requirements also apply to any other use of this terminal, such as when cruise ships are scheduled to make use of this facility.

The available fire water supply system at the terminal does not meet code requirements; primarily as it pertains to the spacing of fire hydrants and hose connections as specified by NFPA 307. Although specific fire access lanes have yet to be defined for the areas within the terminal itself, no direct access to any fire hydrants or hose connections currently exist within the secure areas of the terminal. To fully meet code requirements, it would be necessary to install at least two (2) additional hydrants or hose connections within the enclosed area that is dedicated to the staging of incoming and outgoing vehicles, depending on the configuration of the designated fire access lane(s), as well as two (2) hydrants or hose connections along the main pier. If, as a result of the need to isolate inbound and outbound traffic, the fire department access lanes are to be provided along the east and west sides of the queuing areas, it would be necessary to have at least four (4) additional hydrants / hose connections within this area of the terminal to meet the code’s spacing requirements. However, it should be noted that many of the requirements within NFPA 307 are intended to specifically address fire hazards typically associated with marine terminals that handle a wide range of bulk cargo, including hazardous materials. The primary fire hazard that will be present within the Ocean Gateway terminal will be the vehicles themselves, and any contents contained therein. Since the ferry currently programmed to operate from the Ocean Gateway Terminal is not licensed to transport any hazardous materials, no other specific fire or explosion hazards are anticipated as being present within the terminal. Historically, most vehicle fires are limited to the vehicle of origin; albeit the potential does exist for a gas tank or fuel line to rupture, thereby providing the potential for a fire to spread to adjacent vehicles. In either case, it is anticipated that the water supply (fire flow) requirements to control vehicle fires would be less than that needed to control fires involving bulk cargo containers.

With the current configuration of the fire water supply system, the distance from the end of the pier to the nearest water supply source (hydrant) is in excess of 700 ft. NFPA 307 does not specifically mandate the need for a water supply source on the pier itself; other than it can be interpreted as being a portion of the terminal, which is often the interpretation made by the Authority Having Jurisdiction (AHJ). As such the spacing requirements outlined above are applied to the pier as well. In this particular instance, the fact that the Main Terminal Building is located on the pier adds additional fire protection requirements outside of NFPA 307. Specifically, the Main Terminal Building represents an “assembly” occupancy that must be

treated, from the fire protection perspective, the same as if it were constructed on shore; as is the case with the Lower Terminal Building. As such, the requirements of Chapter 18, *Fire Department Access and Water Supply*, of NFPA 1 must also be taken into consideration as part of this review. Based on both the City's requirements and those of NFPA 1, a hydrant with a minimum flow of 1000 gpm would be required to support the fire flow requirements for the Main Terminal Building. Additionally, the City's Fire Department Rules and Regulations cite the use of NFPA 1, Annex E<sup>1</sup> to determine the required numbers and locations of fire hydrants. In this instance, at least one fire hydrant would need to be located within 250 ft of the Main Terminal Building.

Since this pier is installed on pilings, any water supply line to support firefighting operations on the pier will be exposed to the ambient environment, including freezing temperatures during the winter months. Currently, the dry-pipe sprinkler system in the Main Terminal Building is supplied by a 4-inch water line that is installed beneath the raised walkway. This line is supplied from the dry-pipe sprinkler control valve located within the Lower Terminal Building. Although it is unlikely that this 4-inch line can support a minimum flow of 1000 gpm, it represents the most cost-effective means to provide access to fire hose connections on the pier. To accommodate the NFPA 1 and City requirements that a fire hydrant should not be within 40 ft of a building, it would be possible to connect to ("tee off" from) the existing fire water distribution pipe at a point at least 40 ft away from the Main Terminal Building; potentially at the point where the walkway is supported and a wall exists that can be used to support and protect the hose valves and connecting pipe. This fire hose connection can also serve as a means of meeting the requirement to provide an international shore connection, either by having the necessary connection "hard piped" from the new supply line or by providing the necessary adapter that will allow this connection to be attached to the fire hose connection; maintaining the adapter fitting at an accessible location, such as in the sprinkler valve room in the Lower Terminal Building.

Based on initial (rough) hydraulic calculations, coupled with the flow data from hydrant #1939, it is estimated that the 4-inch water supply line could accommodate an approximate flow of up to 750 gpm at the new fire hose connection, while maintaining an acceptable (positive) level of residual pressure. To accommodate a larger flow at this location, it would be necessary to increase the size of the supply pipe. It is estimated that the cost to provide the new hose connection on the pier would be less than \$3k. Although this option does not meet NFPA 307 requirements for fire hydrants or hose connections spaced at 300 ft intervals, nor the NFPA 1 building fire flow requirement of at least 1000 gpm, given the lack of fire hazards that are likely to exist on the pier itself and the presence of the fire sprinkler system within the Main Terminal Building, this option is considered as being adequate to support the necessary firefighting operations.

Also a function of the Main Terminal Building's location, a fire access lane should be provided that extends down the pier to within 50 ft of at least one exterior door that provides access to the building's interior, as well as within 150 ft of all exterior walls of the building. This will require that a 20 ft section of the pier be designated as the fire access lane, such that it cannot be used to store materials or any other use that might cause it to be blocked. Given that the raised walkway already takes up nearly half of the pier's 50-foot width for much of the distance between the head of the pier and the Main Terminal Building, it is likely that this section of pier should be designated as remaining clear at all times. Additionally, if structural data are not readily available, it must be verified that the pier can, in fact, adequately support the weight of fire department vehicles.

Both NFPA 1 and the City's regulations include a requirement to provide a "turn-around area" for firefighting vehicles when a dead-end fire access lane exceeds 150 ft. Based on a review of the City's requirements for the design of a "turn-around" area [Figure I-5 of the City's Technical Manual], the potential exist that the section of pier adjacent to the southeast wall of the Main Terminal Building or the

---

<sup>1</sup> Paragraph 2.7 of the *Fire Department Rules and Regulations* erroneously cites "Annex I" of NFPA 1 with regards to locating fire hydrants. NFPA 1 has no Annex I and this paragraph should reference Annex E.

end section of the pier might be sufficient to support this requirement. A portion of the last section of the pier, within the last 75 ft, appears to be nearly 70 ft in width. Equally, depending on the actual height of the overhanging roof at the southeast end of the Main Terminal Building, where the pier is even wider, it might be possible to designate one of these areas as the turn-around point for firefighting vehicles. However, this would be subject to PFD review to assess if this were a feasible option. Otherwise, it will be necessary for any fire department vehicles that transit to the pier to back out. The cost to modify the pier to specifically support a turn-around area would not be considered justified.

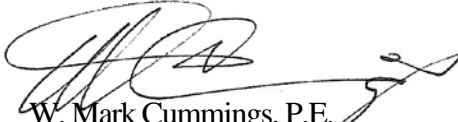
Like most NFPA codes and standards, NFPA 307 includes a caveat that the AHJ has the ultimate authority to determine the appropriate level of fire protection needed, based on the actual hazards that exist. Equally, NFPA 307 also includes the potential for alternate sources fire water and/or types of firefighting equipment to be taken into consideration when evaluating the fire protection needs for the facility; such as the availability of Portland's fire boat.

Based on the evaluation of the code requirements, coupled with the assessment of the specific operations that are planned for the Ocean Gateway Terminal, the following recommendations are provided:

1. Provide designated fire access lanes within the terminal area. Depending on the final plans for the terminal's operations, consideration should be given to having an access lane along the eastern and western boundaries of the vehicle queuing area and along the southern side of the main pier. If it is assumed that the queuing area entry point for fire department vehicles will be from the gates installed in the fence to the north, it will be necessary to identify the means for the fire department vehicles to exit at the southern end, via the Customs area, or provide the necessary turn-around area.
2. If it is anticipated that ferry operations are to be a long-term tenant at the Ocean Gateway Terminal, consideration should be given to providing additional access to fire hydrants within the vehicle queuing areas sometime in the future. Based on the likely fire hazards, along with the potential location for fire access lanes to be located at the eastern- and western-most edges of the queuing areas, it is recommended that a hydrant be located on the east and west sides of queuing area, centered between the fence line to the north and the Customs inspection stations to the south. Until such time as these additional hydrants are added, the PFD should coordinate with the Terminal Operator to develop a pre-fire plan that outlines how access to the firefighting water will be provided, which may include the need to install an additional gate(s) in the fence that separates the queuing area from Commercial and Thames Streets to allow better access to connect hoses to existing hydrants.
3. Coordinate with the PFD to determine if the designation of a turn-around area on the pier is feasible. If so, this area should be designated as remaining free from any other use.
4. Install a new fire hose connection on the pier. This connection should consist of two (2) 2½-inch hose valves. The hose connection is to be more than 40 ft from the Main Terminal Building and will be connected to the existing 4-inch water distribution pipe that currently supplies the sprinkler system in the Main Terminal Building. This connection should also serve as the required International Shore Connection, with the necessary fittings/adapters being provided.
5. The City should ensure that the Terminal Operator has an emergency or safety plan that outlines how all operations within the terminal will be conducted in a safe manner. At a minimum, this plan should include;
  - designation of personnel (terminal staff) responsible for fire safety, along with outlining their responsibilities in the event of an emergency,
  - identifying the means that will be used to provide rapid notification to the fire department in the event of an emergency,

- outlining how the public will be evacuated from within the outbound queuing area if a fire occurs within this area, and
- outlining how and where the public is to be evacuated within the inbound queuing area if a fire occurs within this area; realizing that these individuals have yet to clear Customs and will need to be moved to a designated area(s) that remains secure, yet remote from potential hazards.

Should there be any questions regarding this assessment and the recommendations contained herein, please do not hesitate to contact me.



W. Mark Cummings, P.E.  
Principal Fire Protection Engineer