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# Life Safety Analysis Report

## Tesoro Savage Vancouver Energy Distribution Terminal Port of Vancouver, Washington

Submitted: July 14, 2014

### Pooler Fire Protection

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# Chapter 1 - Introduction

This document has been developed to review and consider all aspects of the Tesoro Savage Vancouver Energy Distribution Terminal (Terminal) project as they relate to life safety, fire suppression and fire alarm and detection according to the requirements of the International Building Code. The intent of this document is to discuss the requirements as set forth by code and what is being done to comply. This document briefly touches on all aspects, however further and more detailed information can be found in the *Fire Protection Basis of Design Engineering Evaluation Report* and the *Life Safety Basis of Design Engineering and Evaluation Report*.

## Chapter 2 - Project Summary

The Terminal is located at the Port of Vancouver near the City of Vancouver, Washington. This facility is being designed and constructed to unload multiple grades of crude oil from railcars, then pump the crude oil to storage tanks in the tank farm east of Far West Steel and then later pump the crude oil from the storage tanks to the transport vessels at the dock area. The project has been broken down into five separate and distinct areas: 1) Area 200 – Railcar Unloading Building Area; 2) Area 300 – Tank Farm Area; 3) Area 400 – Dock Area; 4) Area 500 – Crude Oil Pipeline Area; and 5) Area 600 – West Boiler Area. Below is a brief description of each area. Each area will include multiple support buildings that vary between areas. These buildings include E-houses which contain the electrical equipment and control rooms for processing and transferring of the crude oil, Fire Pump and Foam Buildings which contain the diesel driven fire pump as well as the foam suppression equipment, a Storage Building which will house miscellaneous items relevant to the unloading and transfer process, and a Boiler Building which will heat the future heavy crude so that it can be unloaded and transferred.

### Area 200 – Unloading and Office

The Rail Off Loading Area currently includes two unloading tracks for light crude oil with the potential of adding a third track for unloading heavy crude oil. The unloading tracks will be located inside an unloading building. Each unloading track will accommodate 30 cars for a total length of approximately 1,800 feet. The unloading building will be approximately 1,850 feet long and 90 feet wide to accommodate the length of these unloading tracks and the unloading operations.

The building has a complete metal roof, while the walls will only consist of seven metal wall panels spaced along the south side of the building. These seven metal wall panels will be spaced at locations corresponding with E-houses, the fire pump/foam skid building, and other appurtenances that are to be located on the south side of the building. The remainder of the wall area on the building will be open. Within the building there will be two elevated walkways running the length of the building used in the unloading process, and five crossover egress walkways providing access to the north and south sides of the building spaced approximately every 357 feet. There will be three rail tracks running east to west, two trenches (approximately 9 foot wide by 5 foot

deep) accommodating the piping system that is used to transport the crude oil to the pump basins (located between the tracks), and 10 pump basins (5 for the south trench and 5 for the north trench), which will be spaced every 355 feet that house the transfer pumps. These transfer pumps will be used to pump the crude oil out of the Unloading Building to the Tank Storage. The Unloading Building will be completely protected by a fire detection and sprinkler system.

Access stairs will be provided between the railcars which will enable workers performing any unloading operations at the track level to exit up the stairs to the elevated crossovers and over the railcars to reach an exterior exit from the Railcar Unloading Building.

Other structures located in the Rail Offloading Area include E-houses, Control Room/E-house and the Fire Pump and Foam Building.

The Office Area contains the Office Building and two Change Rooms. The Office Building and East Change Room are located approximately 225 feet to the North of the Unloading Building. These buildings consist of modular office trailers that are pre-built off site and placed at their specific location on the job site. The West Change Room will be constructed in the future and has not been designed yet but will be similar to the East Change Room. The Office Building and change rooms will not be provided with an automatic suppression system.

### **Area 300 – Storage**

The Storage area is currently being planned for the construction of four crude oil storage tanks with the potential of two more tanks in the future. The storage tanks will have a nominal storage capacity of 380,000 barrels (15,960,000 gallons) each and they will be approximately 50 feet tall with a diameter of 240 feet. All tanks will be located inside a perimeter dike capable to contain 110% of the volume of the largest tank plus the anticipated precipitation from a 24 hour, 100 year storm. The tanks will be positioned so that the distance between each tank is 120 feet in any direction. The distance from the tank to the dike varies from a minimum distance of approximately 33 feet to a maximum of 150 feet.

Other structures located in the Storage area will include a pump basin for the pumps that will be used to transfer the crude from the tank storage area to the vessels at Berth 13, Storage Building, Control Room/E-house, and a Fire Pump and Foam Building.

### **Area 400 – Marine Terminal**

The Marine Terminal Area will consist of Berths 13 and 14. Crude oil will be pumped from the Storage Area in a 36-inch pipe to Berth 13. The berth will be able to accommodate vessels with a capacity of up to 380,000 barrels, with loading rates of up to 32,000 barrels per hour. Safety measures include automatic shutoff valves, a return and stripping line for the crude to return back to the storage tanks, a marine vapor combustion unit, floating booms and manual fire protection features.

Berth 14 will be used for storage of and access to the boat that will be used to deploy the boom in the water around the ship. There are no other crude unloading operations planned for Berth 14. Safety measures include manual fire protection features.

Other structures located at the dock area will include a Control Room/E-house, Vapor Blower Staging Unit, Fire Pump and Foam Building, and a Dock Safety Unit.

### **Area 500 – Transfer Pipelines**

The transfer pipelines consists of the pipeline runs between the area 200 Unloading Building and the area 300 Storage Area and between the Storage Area and area 400 Marine Terminal. Depending on the location of the piping runs, the number of pipes varies from 1 ea 36 inch pipe and 1 ea 6 inch pipe to 3 ea 24 inch pipes, 1 ea 36 inch pipe, and 1 ea 6 inch pipe. The transfer pipelines are mainly aboveground and on supports. Where required to avoid interferences or cross over rail track, the pipeline does go underground and is encased in a secondary containment pipe.

### **Area 600 – West Boiler**

The West Boiler area contains a Boiler Building that will be utilized to generate steam to heat the heavy crude in the heated crude unloading operations inside the Unloading Building at area 200. Other than the E-house, no other buildings will be located on the area 600 site. The west Boiler Building will not include an automatic fire suppression system.

## **Chapter 3 - Applicable Design Criteria**

The following codes and standards are applicable for this project:

- International Building Code, 2012
- International Fire Code, 2012
- NFPA 10, *Standard for Portable Fire Extinguishers*, 2010
- NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*, 2010
- NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2010
- NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2012
- NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 2011
- NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2010 Edition
- NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2010
- NFPA 30, *Flammable and Combustible Liquids Code*, 2012 Edition
- NFPA 70, *National Electrical Code*, 2011

- NFPA 72, *National Fire Alarm and Signaling Code*, 2010
- NFPA 101, *Life Safety Code*, 2012
- NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, 2011 Edition
- Factory Mutual Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*, April 2011
- Factory Mutual Data Sheet 3-0, *Hydraulic of Fire Protection Systems*, March 2010
- Factory Mutual Data Sheet 3-26, *Fire Protection Water Demand for Nonstorage Sprinklered Properties*, July 2011
- FMDS 4-0, *Special Protection Systems*, April 2012
- FMDS 4-7N, *Low Expansion Foam Systems*, September 2010, (Interim Revision January 2013)
- Factory Mutual Data Sheet 4-12, *Foam-Water Sprinkler Systems*, October 2011
- Factory Mutual Data Sheet 5-40, *Fire Alarm Systems*, September 2007
- Factory Mutual Data Sheet 5-48, *Automatic Fire Detection*, January 2011
- Factory Mutual Data Sheet 7-32, *Ignitable Liquid Operations*, April 2012
- Factory Mutual Data Sheet 7-88, *Flammable Liquid Storage Tanks*, October 2011
- ANSI Z358.1, *Standard for Emergency Eyewashes and Shower Equipment*, 2009

## **Chapter 4 - Life Safety Analysis Scope**

A complete project life safety analysis has been performed to evaluate life safety features as they apply to this project. Only life safety as it pertains to constructability and the International Building Code were evaluated; occupational safety was not reviewed. The documentation below will outline the required features at each area and how these requirements are being met.

## **Chapter 5 - Area 200 – Unloading and Office**

### **5.1 Construction and Egress**

#### **5.1.1 Occupancy Classification and Description of Contents**

The Railcar Unloading Building is considered to be a single use separated occupancy (IBC, Section 508.4). The occupancy classification is considered to be High-hazard (Group H-2) due to the pressure in the crude oil pipeline (90 psi) used to transport the crude from the Railcar Unloading Building to the crude oil storage tanks. E-houses 1

and 2, Control Room/E-house 3, and E-houses 4 and 5, as well as, fire pump and foam building located on the south side of the Railcar Unloading Building are considered to be Factory Industrial (Group F-1). The E-houses and Control Room/E-house will be separated from the Railcar Unloading Building in accordance with Table 508.4 of the IBC. The E-houses and Control Room/E-house are required to be separated from the Railcar Unloading Building because H-2 occupancies are exempt from nonseparated occupancies (IBC Section 508.2.4).

The Administration Buildings are considered to be single use nonseparated occupancy (IBC, Section 508.3). The occupancy classification is considered to be Business (Group B). Mechanical, electrical, and restroom spaces are considered as “incidental use” and considered part of the predominant occupancy for the building.

### **5.1.2 Type of Construction**

The Railcar Unloading Building and ancillary buildings (E-houses, Control Room/E-house and Fire Pump and Foam Building) will be steel and are constructed to be Type II-B in accordance with IBC, Section 602.2.

The Administration Buildings are constructed to be Type V-B in accordance with IBC, Section 602.5.

### **5.1.3 Separations**

#### ***5.1.3.1 Occupancy Separations***

For the Railcar Unloading Building, the E-houses, Control Room/E-house and Fire Pump and Foam Building shall be considered accessory use in accordance with Section 508 of the IBC. The total area of the E-houses will not exceed 10% of the Railcar Unloading Building area. 3-hour fire resistant separation of the E-houses will be required in accordance with Table 508.4 of the IBC.

For the Administration Buildings, no separation is required between accessory and predominant occupancies (IBC, Section 508.2.4).

#### ***5.1.3.2 Room Separations***

The Fire Pump and Foam building at the Railcar Unloading Building will be separated from the Railcar Unloading Building by a 2-hour fire resistance rated construction in accordance with Table 508.4 of the IBC.

#### ***5.1.3.3 Building Separations***

For the Railcar Unloading Building and Administration Buildings, according to IBC, Table 602, there are no exposure protection requirements for the exterior walls because the buildings are separated by more than 60 feet.

### **5.1.4 Fire Resistive Requirements**

For the Railcar Unloading Building, E-houses, Control Room/E-house and Fire Pump and Foam Building the structural elements will be noncombustible. Non-structural

elements are permitted to be of combustible materials. Through penetrations and membrane penetrations of walls, barriers, and partitions required to have a fire-resistance rating will be protected with UL listed firestopping assemblies.

For the Administration Buildings, the structural elements are permitted to be of combustible materials.

The following table summarizes the requirements for Type II-B and V-B construction as described in IBC, Tables 601 and 602.

<b>Building Element</b>	<b>Required Fire Resistance Rating (hours)</b>
Primary Structural Frame	0
Bearing Walls	
– Interior	0
– Exterior	0
Non-Bearing Walls and Partitions	
– Interior	0
– Exterior	0
Floor Construction and Secondary Members	0
Roof Construction and Secondary Members	0

There are no shafts or vertical exit enclosures in this building.

## **5.1.5 Height and Area Limitations**

### **5.1.5.1 Building Height**

The Railcar Unloading Building is a special industrial occupancy in accordance with IBC Section 503.1.1. This is based on the fact the building is industrial in nature, has a very low occupant load and due to the size of the railcars and the industry standard method to empty the railcars. Therefore, the building is exempt from the building height and area limitation of IBC Table 503. The building is one story and 38 feet tall.

The building heights of the E-houses, Control Room/E-house and Fire Pump and Foam Building shall be in accordance with IBC. Table 503 indicates that the height of the building cannot exceed two stories totaling 55 feet (based on Group F-1 occupancy). The E-houses and Control Room/E-house will not receive sprinkler systems, so no increase is included or required. The Fire Pump and Foam Building will receive a sprinkler system; however the increase is not included. Therefore, the total allowable height of the building is two stories and 55 feet. The E-houses and Control Room/E-house Building's actual height is one story and less than 15 feet, and is acceptable. The Fire Pump and Foam Building's actual height is one story and 9 feet 7 inches, and is acceptable.

The Administration Buildings height is in accordance with IBC. Table 503 indicates that the height of the building cannot exceed two stories totaling 40 feet (based on Group B

occupancy). The Administration Buildings will not receive sprinkler systems, so no increase is included or required. Therefore, the total allowable height of the building is two stories and 40 feet. The building's actual height is one story with an overall height of 10 feet 10 inches; therefore, compliant with the height limitations of the IBC.

#### **5.1.5.2 Building Area**

The Railcar Unloading Building is a special industrial occupancy in accordance with IBC Section 503.1.1. This is based on the fact the building is industrial in nature, has a very low occupant load and due to the size of the railcars and the industry standard method to empty the railcars. Therefore, the building is exempt from the building height and area limitation of IBC Table 503. The building actual area is 165,060 sq.ft., and is acceptable.

For the E-houses, Control Room/E-house and Fire Pump and Foam Building, Table 503 will be applicable. A Group F-1 occupancy, with Type II-B construction, shall have an area not to exceed 15,500 sq.ft. The E-houses Building's actual area, 336 sq.ft., is acceptable without any modifications. The Control Room/E-house Building's actual area, 285 sq.ft. is acceptable without any modifications. The Fire Pump and Foam Building's actual area, 750 sq.ft. is acceptable without any modifications.

For the Administration Buildings, Section 503.1.2 will be applicable to the Office Building and Change Building since they are on the same lot and will be considered one building as allowed by the IBC for the purpose of complying with the area limitations of Table 503. A Group B occupancy, with Type V-B construction, shall have an area not to exceed 9,000 sq.ft. The building actual area of both buildings is, 6,534 sq.ft., is acceptable without any modifications.

#### **5.1.5.3 High Rise Requirements**

The building does not contain an occupied floor located more than 75 feet above the lowest level of fire department vehicle access, and is therefore not considered a high rise in accordance with IBC, Section 202.

### **5.1.6 Means of Egress**

#### **5.1.6.1 Occupant Load**

The calculated occupant loads throughout the buildings will be determined by using the appropriate occupant load factors found in IBC, Section 1004.1.2. For the Railcar Unloading Building, the exception for Section 1004.1.2 allowing actual occupant load will be used. The occupant load factors to be used and the calculated occupant loads for the building are as follows:

OCCUPANCY	AREA	OCCUPANT LOAD FACTOR	NUMBER OF OCCUPANTS
<b>Administration Buildings</b>			
Business	3,267 ft <sup>2</sup> per building	100 ft <sup>2</sup> per person (gross)	33 per building
<b>Railcar Unloading Building</b>			
Industrial (H-2)	165,060 ft <sup>2</sup>	28 (actual occupant load)	28 actual occupant load
<b>E-houses</b>			
Industrial (F-1)	336 ft <sup>2</sup>	100 ft <sup>2</sup> per person (gross)	4
<b>Control Room/E-house</b>			
Industrial (F-1)	285 ft <sup>2</sup>	100 ft <sup>2</sup> per person (gross)	3
<b>Fire Pump and Foam Building</b>			
Industrial (F-1)	750 ft <sup>2</sup>	100 ft <sup>2</sup> per person (gross)	8

### 5.1.6.2 Egress Capacity Requirements

The actual exit capacity will meet the minimum exit capacity required by IBC, Section 1005.3. Exit width factors to be used for each component are as follows:

COMPONENT	WIDTH FACTOR	OCCUPANT LOAD	MINIMUM EGRESS CAPACITY
<b>Administration Buildings</b>			
Stairs	0.3 inches per person	33	9.9 inches
Other Components	0.2 inches per person		6.6 inches
<b>Railcar Unloading Building</b>			
Stairs	0.3 inches per person	20	6 inches
Other Components	0.2 inches per person		4 inches
<b>E-houses and Control Room/E-house</b>			
Stairs	0.3 inches per person	4	1.2 inches
Other Components	0.2 inches per person		0.8 inches
<b>Fire Pump and Foam Building</b>			
Stairs	0.3 inches per person	8	2.4 inches
Other Components	0.2 inches per person		1.6 inches

### 5.1.6.3 Number of Exits

For the Railcar Unloading Building, a minimum of two exits are required from the building according to Table 1021.2(2) of the IBC based on the occupant load. The actual number of provided exits will be 14 spaced at both ends of the building and every 350 feet, approximately, for the length of the building.

For the E-houses, Control Room/E-house, and Fire Pump and Foam Building, a minimum of one exit is required from each building according to Table 1021.2(2) of the

IBC. The actual number of provided exits will be two from the E-houses, two from the E-house side of the Control Room/E-house, one from the Control Room side of the Control Room/E-house, and two from the Fire Pump and Foam Building.

For the Administration Buildings, a minimum of two exits are required from each building according to Table 1021.2(2) of the IBC. The actual number of provided exits will be three for each building.

#### **5.1.6.4 Door Requirements**

For the Railcar Unloading Building, E-houses, Control Room/E-house, Fire Pump and Foam Building, and the Administration Buildings, all exit door assemblies, and doors within the egress paths (where applicable), will swing in the direction of exit travel and will be equipped with appropriate hardware as required by Section 1008.1.9 of the IBC.

#### **5.1.6.5 Dead-end Limits**

For the Railcar Unloading Building, E-houses, Control Room/E-house, Fire Pump and Foam Building, and the Administration Buildings, the dead-end limits shall be restricted to 20 feet or less as required by Section 1018.4 of the IBC. There are no anticipated dead-ends in the Railcar Unloading Building, E-houses, Control Room/E-house, or Fire Pump and Foam Building. In the Administration Buildings, there are no anticipated dead-ends in the Change Building and the Office Building has a dead-end corridor of 16 feet.

#### **5.1.6.6 Common Path of Travel**

For the Railcar Unloading Building, the common path of travel is restricted to 25 feet as indicated in Table 1014.3 of the IBC. The most restrictive common path of travel before the occupant reaches two separate and distinct paths of egress travel is the egress from the pump basins measured at approximately five feet.

For the E-houses, Control Room/E-house, and Fire Pump and Foam Building, the common path of travel is restricted to 75 feet for the E-houses and Control Room/E-house and 100 feet for the Fire Pump and Foam Building, as indicated in Table 1014.3 of the IBC. There are no restrictive common paths of travel before the occupant reaches two separate and distinct paths of egress travel for these buildings.

For the Administration Buildings, the common path of travel is restricted to 75 feet as indicated in Table 1014.3 of the IBC. The most restrictive common path of travel before the occupant reaches two separate and distinct paths of egress travel is 27 feet in the Men's Changing Room for the Change Building and 38 feet from the southeast office of the Office Building.

#### **5.1.6.7 Travel Distance**

For the Railcar Unloading Building, the travel distance is restricted to 100 feet as indicated in Table 1016.2 of the IBC for an H-2 occupancy. The prescriptive requirements of the IBC cannot be reasonably achieved while efficiently using the structure. Therefore, a performance-based alternative was developed as allowed by

Section 104.11 of the IBC to develop alternative methods of design while still meeting the intent of the code. Through the development of this design, the allowable travel distance was found to be acceptable to be increased from the 100 feet requirement in the IBC to the planned exits located every 350 feet the length of the building. For further information, please see the *Fire Modeling Briefing Report*, dated December 30, 2014.

For the E-houses, Control Room/E-house, and Fire Pump and Foam Building, the travel distance is restricted to 200 feet for the E-houses and Control Room/E-house Building and 250 feet for the Fire Pump and Foam Building, as indicated in Table 1016.2 of the IBC. The most restrictive travel distances are 20 feet for the E-houses, 17 feet for the Control Room/E-house Building, and 30 feet for the Fire Pump and Foam Building.

For the Administration Buildings, the travel distance is restricted to 200 feet as indicated in Table 1016.2 of the IBC. The most restrictive travel distance is 82 feet from the Men's Changing Room for the Change Building and 63 feet from the office next to the dead-end corridor for the Office Building.

#### **5.1.6.8 Discharge from Exits**

The Railcar Unloading Building, E-houses, Control Room/E-house, Fire Pump and Foam Building, and the Administration Buildings will comply with IBC, Section 1027.

#### **5.1.6.9 Interior Finish**

For the Railcar Unloading Building, the interior finish shall be Class B throughout in accordance with Table 803.9. No rooms or enclosed spaces are anticipated inside the unloading building. The actual interior finishes of the Railcar Unloading Building are planned to be steel and concrete meeting the interior finish classification of Class A.

The E-houses, Control Room/E-house, and Fire Pump and Foam Building shall have an interior finish of the interior exit passageways of Class B for the E-houses and Control Room/E-house Building and Class C for the Fire Pump and Foam Building while the rest of the building shall be Class C. The actual interior finishes of the buildings will be Class B or above.

For the Administration Buildings, the interior finish of the interior exit passageways shall be Class B while the rest of the building shall be Class C in accordance with Table 803.9. The actual interior finishes of the Administration Buildings will be Class B or above.

## **5.2 Active Fire Safety Features**

### **5.2.1 Fire Suppression Systems**

#### **5.2.1.1 Fire Protection System Water Supply**

The water supply for Area 200 was tested by the City of Vancouver on May 30, 2013 on fire hydrants of the dedicated fire water distribution system. These results are for the

City of Vancouver water supply only and do not reflect the condition of the Port of Vancouver's water supply. The water supply at Area 200 is not sufficient to meet the demand of the sprinkler system without increasing the pressure and flow by a dedicated fire pump.

#### **5.2.1.2 Automatic Sprinkler System**

For the Railcar Unloading Building, an automatic sprinkler system will be provided in accordance with IBC Section 903.2.5. The sprinkler system will be a closed-head foam-water sprinkler system that will be divided into five separate zones. Each zone will be supplied by a single interlock pre-action sprinkler system. The pre-action valves will be supplied by the City of Vancouver water supply, supplemented by a dedicated fire pump. The pre-action valves and fire pump will be located inside the Fire Pump and Foam Building, positioned along the south side of the Railcar Unloading Building.

For the Administration Buildings, an automatic sprinkler system will not be provided. According to the allowable height and area for a Group B occupancy, the buildings can be built in conformance with the code without the need for a sprinkler system.

The E-houses and Control Room/E-house located along the south side of the Unloading Building will not be provided with sprinkler systems. These buildings are considered accessory to the use of the Unloading Building and will have a 3-hour fire resistant separation in accordance with Table 508.4 of the IBC.

The Fire Pump and Foam Building located along the south side of the Railcar Unloading Building will be provided with a sprinkler system.

All suppression systems will be designed and installed per NFPA 11, NFPA 13, FM DS 2-0, FM DS 3-0, FM DS 3-7, FM DS 3-26, FM DS 4-12, and FM DS 7-32.

#### **5.2.1.3 Portable Fire Extinguishers**

The Railcar Unloading Building will be classified as being capable of having Class B fire with a hazard classification of extra (high). Fire extinguishers will be sized according to Table 906.3(2) of the IBC and will be a basic minimum extinguisher rating of 80-B spaced a maximum travel distance of 50 feet.

The Administration Buildings will be classified as being capable of having Class A fire with a hazard classification of light (low). Fire extinguishers will be sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet.

The E-houses and Control Room/E-house buildings located along the south side of the Railcar Unloading Building will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet.

The Fire Pump and Foam Building located along the south side of the Railcar Unloading Building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet.

## **5.2.2 Fire Alarm Systems**

### **5.2.2.1 Railcar Unloading Building**

The Railcar Unloading Building, E-houses and Control Room/E-house located in Area 200 will be provided with a fire alarm system control panel and user interface, located in Control Room/E-house 3. The control panel will independently transmit back to a supervising station. The fire alarm system will be designed and installed per NFPA 70, NFPA 72, FM DS 5-40 and FM DS 5-48.

H<sub>2</sub>S and LEL detection will be provided at each unloading station and in the pump basins throughout the Unloading Building. In addition, O<sub>2</sub> monitoring is being provided for the pump basins. This monitoring will detect when oxygen levels are below the allowable limits for exposure and provide notification that entrance to the pump basin is not allowed without the appropriate personal protective equipment.

Manual release stations for the foam suppression system will be strategically located so that in the event of an incident, the system can be actuated quickly. In addition, automatic activation of the suppression system is accomplished by linear heat detection located at the roof level of the Railcar Unloading Building, as well as, in the pump basins. When either the manual or automatic activation of the system happens the fire alarm panel will activate a solenoid causing the pre-action valve to release and send foam water solution to the active system. See sheet 0200-FA-002 for further detail.

### **5.2.2.2 Administration Buildings**

The Administration Buildings will not receive a fire alarm system due to their occupancy classification of Group B and occupant load being less than that required by Section 907.2.2 of the IBC.

### **5.2.2.1 E-houses, Control Room/E-house, Fire Pump and Foam Buildings**

Smoke detectors will be located in the E-houses, Control Room/E-house, and the Fire Pump and Foam Building and will be connected to the fire alarm system for notification purposes.

## **5.2.3 Alarm Reporting System**

The fire alarm panel will be FM Approved and will be provided with a way to directly communicate to the control operations HMI, the panel will also be provided with a DACT to transmit/communicate all alarm signals to a supervising station. The Area 200 Unloading Building will transmit any signals to the supervising station independent of the other areas related to this project.

## **5.2.4 Fire Department Access**

### **5.2.4.1 General**

Access to the Unloading Building, E-houses, Control Room/E-house, Fire Pump and Foam Building, and Administration Buildings will be required in accordance with Section 503 of the IFC.

### **5.2.4.2 Railcar Unloading Building**

Access to the Unloading Building is within 150 feet of all portions of the building except on the east end of the building that is 190 feet. Here, exception 1 and 2 for Section 503.1.1 of the IBC will have to be taken as existing conditions do not allow for the access road to be located any closer.

### **5.2.4.3 Administration Building**

Access to the Administration Buildings is within 150 feet of all portions of the buildings.

### **5.2.4.1 E-houses, Control Room/E-house, and Fire Pump and Foam Building**

Access to the E-houses, Control Room/E-house, and Fire Pump and Foam Building is within 150 feet of all portions of the buildings.

## **5.2.5 HVAC Control System**

No HVAC systems will be of a size to require compliance with NFPA 90A.

## **5.3 Life Safety Features**

### **5.3.1 Exit Signs**

#### **5.3.1.1 General**

Exit signs are required at exits and exit access doors, readily visible from any direction of egress travel. The exit sign placement shall be such that no point within the exit access corridor or exit passageway is more than 100 feet from the nearest visible exit sign according to Section 1011.1 of the IBC.

#### **5.3.1.2 Railcar Unloading Building**

For the Railcar Unloading Building, as allowed by Exception 2 under Section 1011.1 of the IBC, no exit signs will be provided since the main paths of travel inside the building lead to the exits.

#### **5.3.1.3 E-houses and Control Room/E-house**

For the E-houses and Control Room/E-house, as allowed by Exception 1 under Section 1011.1 of the IBC, no exit signs are required since only one exit is required for these buildings. However, exit signs will be provided above each door.

#### **5.3.1.4 Administration Buildings**

For the Administration Buildings, exit signs will be located in both the Change Building and the Office Building. Exit signs will be located above all doors leading to the exterior.

### **5.3.1.5 Fire Pump and Foam Building**

According to Exceptions 1 and 2 under Section 1011.1 of the IBC, no exit signs will be required for the Fire Pump and Foam Building as the only doors of the Fire Pump and Foam Building are the exit doors.

## **5.3.2 Means of Egress Illumination**

### **5.3.2.1 General**

Emergency lighting shall be in accordance with Section 1006 of the IBC. The means of egress, including the exit discharge are to be illuminated at all times the building space is occupied. The illumination level under normal conditions shall not be less than one footcandle at the walking surface. Emergency power for illumination shall be required in accordance with Section 1006.3 of the IBC.

### **5.3.2.2 Railcar Unloading Building**

The Railcar Unloading Building will be equipped with emergency light fixtures incorporated to the whole building lighting layout. See drawings 0200-ED-071 through 0200-ED-083.

### **5.3.2.3 E-houses and Control Room/E-house**

The E-houses and Control Room/E-house will be equipped with emergency light fixtures as indicated on drawings 0200-ED-084, 0200-ED-087 and 0200-ED-090.

### **5.3.2.4 Administration Buildings**

The Administration Building will be equipped with emergency light fixtures as indicated on drawing 0200-AD-010.

### **5.3.2.5 Fire Pump and Foam Building**

The Fire Pump and Foam Building will be equipped with emergency light fixtures as indicated on drawing 0200-LS-003 and 0200-FA-010.

## **5.3.3 Stairways**

The Railcar Unloading Building stairs will comply with Section 1009 of the IBC. No enclosure for the exit stairways will be provided as allowed by Exception 6 and 7 of Section 1009.3. The stair riser height and tread depth conform to Section 1009.7.2 of the IBC. See drawings 0200-SD-029 through 0200-SD-031 for further information.

## **5.3.4 Handrails**

The Railcar Unloading Building handrails located on the stairs shall comply with Section 1012 of the IBC. The handrail heights will be between 34 inches and 38 inches. See drawings 0200-SD-029 through 0200-SD-031 for further information.

## **5.3.5 Guards**

The Railcar Unloading Building guards located on catwalks and elevated egress walkways shall comply with Section 1013 of the IBC. The guard heights will be a

minimum of 42 inches tall. See drawing 0200-SD-031 through 0200-SD-033 for further information.

## **Chapter 6 - Area 300 – Storage**

### **6.1 Construction and Egress**

#### **6.1.1 Occupancy Classification and Description of Contents**

The E-houses, Storage Building and Fire Pump and Foam Building located on the Area 300 site are single use nonseparated occupancy (IBC, Section 508.3). The occupancies are considered to be Factory Industrial (Group F-1). The E-houses will contain the electrical equipment for monitoring the transfer of crude oil between Area 200 to Area 300 and from Area 300 to Area 400, in addition to the transfer pumps and all electrical equipment at Area 300. The Storage Building will house equipment used throughout the different project areas, Factory Industrial was used rather than Storage due to the fact that it is understood this building will not house goods but be regularly accessed for parts used throughout the facility. The Fire Pump and Foam Building houses the site fire pump and foam and tank suppression system risers.

#### **6.1.2 Type of Construction**

All buildings at Area 300 will be Type II-B construction in accordance with IBC, Section 602.2.

#### **6.1.3 Separations**

##### **6.1.3.1 Occupancy Separations**

No separations are required in the E-houses, Storage Building or Fire Pump and Foam Building in accordance with Section 508.2.4 of the IBC.

##### **6.1.3.2 Building Separations**

The Fire Pump and Foam Building will be located 50 feet from all other structures in accordance with NFPA 20, Section 4.12.1.1.2.

The E-houses and Storage Building will comply with Section 503.1.2 of the IBC since they are on the same lot and will be considered one building for the purpose of complying with the area limitations of Table 503.

#### **6.1.4 Fire Resistive Requirements**

For the buildings located at Area 300, the structural elements will be noncombustible. Non-structural elements of the facility are permitted to be of combustible materials. Through penetrations and membrane penetrations of walls, barriers, and partitions required to have a fire-resistance rating will be protected with UL listed firestopping assemblies.

The following table summarizes the requirements for Type II-B construction as described in IBC, Tables 601 and 602.

<b>Building Element</b>	<b>Required Fire Resistance Rating (hours)</b>
Primary Structural Frame	0
Bearing Walls	
– Interior	0
– Exterior	0
Non-Bearing Walls and Partitions	
– Interior	0
– Exterior	0
Floor Construction and Secondary Members	0
Roof Construction and Secondary Members	0

There are no shafts or vertical exit enclosures in these buildings.

### **6.1.5 Height and Area Limitations**

#### **6.1.5.1 Building Height**

The building heights of the buildings at Area 300 shall be in accordance with IBC. Table 503 indicates that the height of the building cannot exceed two stories totaling 55 feet (based on Group F-1 occupancy). The E-houses and Storage Building will not receive sprinkler systems, so no increase is included or required. The Fire Pump and Foam Building will receive a sprinkler system; however the increase is not included. Therefore, the total allowable height of the building is two stories and 55 feet. The E-houses buildings actual height is one story and less than 15 feet, and is acceptable. The Storage Building’s actual height is one story and less than 30 feet, and is acceptable. The Fire Pump and Foam Building’s actual height is one story and 9 feet 7 inches, and is acceptable.

#### **6.1.5.2 Building Area**

For the building areas of the buildings at Area 300, Table 503 will be applicable to the E-houses, Storage Building and Fire Pump and Foam Building. A Group F-1 occupancy, with Type II-B construction, shall have an area not to exceed 15,500 sq.ft. The E-houses building’s actual area, 527 sq.ft., is acceptable without any modifications. The Storage Building’s actual area, 1,406 sq.ft. is acceptable without any modifications. The Fire Pump and Foam Building’s actual area, 750 sq.ft. is acceptable without any modifications.

## 6.1.6 Means of Egress

### 6.1.6.1 Occupant Load

The calculated occupant loads throughout the buildings will be determined by using the appropriate occupant load factors found in IBC, Section 1004.1.2. The occupant load factors to be used and the calculated occupant loads for the building are as follows:

OCCUPANCY	AREA	OCCUPANT LOAD FACTOR	NUMBER OF OCCUPANTS
<b>E-houses</b>			
Industrial (F-1)	527 ft <sup>2</sup> per E-house	100 ft <sup>2</sup> per person (gross)	6 per E-house
<b>Storage Building</b>			
Industrial (F-1)	1,406 ft <sup>2</sup>	100 ft <sup>2</sup> per person (gross)	14
<b>Fire Pump and foam Building</b>			
Industrial (F-1)	750 ft <sup>2</sup>	100 ft <sup>2</sup> per person (gross)	8

### 6.1.6.2 Egress Capacity Requirements

The actual exit capacity will meet the minimum exit capacity required by IBC, Section 1005.3. Exit width factors to be used for each component are as follows:

COMPONENT	WIDTH FACTOR	OCCUPANT LOAD	MINIMUM EGRESS CAPACITY
<b>E-houses</b>			
Stairs	0.3 inches per person	10	3 inches
Other Components	0.2 inches per person		2 inches
<b>Storage Building</b>			
Stairs	0.3 inches per person	14	4.2 inches
Other Components	0.2 inches per person		2.8 inches
<b>Fire Pump and foam Building</b>			
Stairs	0.3 inches per person	8	2.4 inches
Other Components	0.2 inches per person		1.6 inches

### 6.1.6.3 Number of Exits

For the buildings at Area 300, a minimum of one exit is required from each building according to Table 1021.2(2) of the IBC. The actual number of provided exits will be two from the E-houses, two from the Storage Building, and two from the Fire Pump and Foam Building.

### 6.1.6.4 Door Requirements

For the buildings at Area 300, all exit door assemblies, and doors within the egress paths (where applicable), will swing in the direction of exit travel and will be equipped with appropriate hardware as required by Section 1008.1.9 of the IBC.

### **6.1.6.5 Dead-end Limits**

The dead-end limits for the buildings at Area 300 shall be restricted to 20 feet or less as required by Section 1018.4 of the IBC. There are no anticipated dead-ends in these buildings.

### **6.1.6.6 Common Path of Travel**

For the buildings at Area 300, the common path of travel is restricted to 75 feet for the E-houses and Storage building and 100 feet for the Fire Pump and Foam Building, as indicated in Table 1014.3 of the IBC. There are no restrictive common paths of travel before the occupant reaches two separate and distinct paths of egress travel for the buildings at Area 300.

### **6.1.6.7 Travel Distance**

For the buildings at Area 300, the travel distance is restricted to 200 feet for the E-house and Storage building and 250 feet for the Fire Pump and Foam Building, as indicated in Table 1016.2 of the IBC. The most restrictive travel distances are 25 feet for the E-House, 42 feet for the future E-house, 47 feet for the Storage Building, and 30 feet for the Fire Pump and Foam Building.

### **6.1.6.8 Discharge from Exits**

The buildings at Area 300 will comply with IBC, Section 1027.

## **6.1.7 Interior Finish**

The buildings at Area 300 shall have an interior finish of the interior exit passageways of Class B for the E-house and Storage Building and Class C for the Fire Pump and Foam Building while the rest of the building shall be Class C. The actual interior finishes of the buildings will be Class B or above.

## **6.2 Active Fire Safety Features**

### **6.2.1 Fire Suppression Systems**

#### **6.2.1.1 Fire Protection System Water Supply**

The water supply for Area 300 was tested by the City of Vancouver on May 30, 2013 on fire hydrants of the dedicated fire water distribution system. These results are for the City of Vancouver water supply only and do not reflect the condition of the Port of Vancouver's water supply. The water supply at Area 300 is not sufficient to meet the demand of the suppression systems without increasing the pressure and flow by a dedicated fire pump.

#### **6.2.1.2 Automatic Suppression System**

The E-houses and Storage Building will not be provided with sprinkler systems. According to the allowable height and area for a Group F-1 occupancy, the buildings can be built in conformance with the code without the need for a sprinkler system.

The Fire Pump and Foam Building will be provided with a sprinkler system in accordance with IBC Section 903.2.5.

The crude oil storage tanks will be protected by fixed foam-water fire suppression systems that will protect the seal area around the perimeter for each tank in accordance with NFPA 11. Monitor nozzles attached to fire hydrants, supplied by the fire pump, will be provided around the dike area at to provide fire suppression and cooling to the crude oil storage tanks so that every tank can be reached by two hydrants. Each nozzle will also have a foam educator to allow foam to be mixed at the nozzle to provide a foam water spray.

All suppression systems will be designed and installed per NFPA 11, NFPA 13, FM DS 2-0, FM DS 3-0, FM DS 3-7, FM DS 3-26, FM DS 4-12, FM DS 7-32, and FM DS 7-88.

### **6.2.1.3 Portable Fire Extinguishers**

The E-houses will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet.

The Storage Building will be classified as being capable of having a Class B fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet.

The Fire Pump and Foam Building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet.

## **6.2.2 Fire Alarm Systems**

### **6.2.2.1 Crude Oil Storage Area**

The Area 300 buildings and crude oil storage area will be provided with a fire alarm system control panel and user interface, located in an E-house. The control panel will independently transmit back to a supervising station. The fire alarm system will be designed and installed per NFPA 70, NFPA 72, FM DS 5-40 and FM DS 5-48.

H<sub>2</sub>S and LEL detection will be provided at the pump basin. A smoke detector will be located in the E-house and in the Fire Pump and Foam Building. The smoke detectors will be connected to the fire alarm system for notification purposes.

Notification appliances will be located strategically throughout Area 300 so as to notify any occupants of an alarm condition. See sheet 0300-FA-003 for further detail.

Manual release stations for the foam suppression system inside the crude oil storage tanks will be strategically located so that in the event of an incident, the system can be actuated quickly. In addition, automatic activation of the suppression system is accomplished by linear heat detection located along the foam dam of the crude oil storage tanks. When either the manual or automatic activation of the system happens the fire alarm panel will activate a solenoid causing the pre-action valve to release and send foam water solution to the active system. See sheet 0300-FA-003 for further detail.

### **6.2.3 Alarm Reporting System**

The fire alarm panel will be FM Approved and will be provided with a way to directly communicate to the control operations HMI, the panel will also be provided with a DACT to transmit/communicate all alarm signals to a supervising station. The Area 300 buildings will transmit any signals to the supervising station independent of the other areas related to this project.

### **6.2.4 Fire Department Access**

#### **6.2.4.1 General**

Access to the buildings will be required in accordance with Section 503 of the IFC.

#### **6.2.4.2 Area 300 Buildings**

Access to the buildings is within 150 feet of all portions from the paved roadway and parking areas.

### **6.2.5 HVAC Control System**

No HVAC systems will be of a size that requires compliance with NFPA 90A.

## **6.3 Life Safety Features**

### **6.3.1 Exit Signs**

#### **6.3.1.1 General**

Exit signs are required at exits and exit access doors, readily visible from any direction of egress travel. The exit sign placement shall be such that no point within the exit access corridor or exit passageway is more than 100 feet from the nearest visible exit sign according to Section 1011.1 of the IBC.

#### **6.3.1.2 Area 300 Buildings**

For the E-houses, as allowed by Exception 1 of Section 1011.1 of the IBC, no exit signs are required since only one exit is required for these buildings. However, exit signs will be provided above each door.

For the Storage Building, exit signs shall be located above each man door. The exit signs will comply with Section 1011 of the IBC.

According to Exception 2 under Section 1011.1 of the IBC, no exit signs will be required for the Fire Pump and Foam Building as the only doors of the building are the exit doors.

## **6.3.2 Means of Egress Illumination**

### **6.3.2.1 General**

Emergency lighting shall be in accordance with Section 1006 of the IBC. The means of egress, including the exit discharge are to be illuminated at all times the building space is occupied. The illumination level under normal conditions shall not be less than one footcandle at the walking surface. Emergency power for illumination will be required in accordance with Section 1006.3 of the IBC.

### **6.3.2.2 Area 300 Buildings**

The E-houses will be equipped with emergency light fixtures as indicated on drawings 0300-ED-034.

The Storage Building will be equipped with emergency light fixtures as indicated on drawings 0300-LS-002.

The Pump Basin will be equipped with emergency light fixtures as indicated on drawing 0300-ED-033.

The Fire Pump and Foam Building will be equipped with emergency light fixtures as indicated on drawing 0300-LS-002 and 0300-FA-005.

## **Chapter 7 - Area 400 – Marine Terminal**

### **7.1 Construction and Egress**

#### **7.1.1 Occupancy Classification and Description of Contents**

The crane and gangway towers located on the dock are not considered an occupied space and are primarily used for day to day operations. These towers are not considered buildings and will not be evaluated to the IBC, stairs, guards, and other features should comply with OSHA safe work standards.

The E-house and Fire Pump and Foam Building located on the Area 400 site are single use nonseparated occupancy (IBC, Section 508.3). The occupancies are considered to be Factory Industrial (Group F-1). The E-house will contain the electrical equipment for monitoring the transfer of crude oil between Area 300 to Area 400 and from Area 400 to crude oil transfer vessels. The Fire Pump and Foam Building houses the site fire pump and monitor nozzle suppression system riser.

#### **7.1.2 Type of Construction**

All buildings at Area 400 will be Type II-B construction in accordance with IBC, Section 602.2.

### 7.1.3 Separations

#### 7.1.3.1 Occupancy Separations

No separations are required in the E-house or the Fire Pump and Foam Building in accordance with Section 508.2.4 of the IBC.

#### 7.1.3.2 Building Separations

The Fire Pump and Foam Building will be located 50 feet from all other structures in accordance with NFPA 20, Section 4.12.1.1.2.

### 7.1.4 Fire Resistive Requirements

For the buildings located at Area 400, the structural elements will be noncombustible. Non-structural elements of the buildings are permitted to be of combustible materials. Through penetrations and membrane penetrations of walls, barriers, and partitions required to have a fire-resistance rating will be protected with UL listed firestopping assemblies.

The following table summarizes the requirements for Type II-B construction as described in IBC, Tables 601 and 602.

Building Element	Required Fire Resistance Rating (hours)
Primary Structural Frame	0
Bearing Walls	
– Interior	0
– Exterior	0
Non-Bearing Walls and Partitions	
– Interior	0
– Exterior	0
Floor Construction and Secondary Members	0
Roof Construction and Secondary Members	0

There are no shafts or vertical exit enclosures in this building.

### 7.1.5 Height and Area Limitations

#### 7.1.5.1 Building Height

The building heights of the buildings at Area 400 shall be in accordance with IBC. Table 503 indicates that the height of the building cannot exceed two stories totaling 55 feet (based on Group F-1 occupancy). The E-house will not receive sprinkler systems, so no increase is included or required. The Fire Pump and Foam Building will receive a sprinkler system; however the increase is not included or required. Therefore, the total allowable height of the building is two stories and 55 feet. The E-house building's actual height is two stories with an overall approximate height of 23 feet, and is acceptable. The Fire Pump and Foam Building's actual height is one story totaling 9 feet 7 inches, and is acceptable.

### 7.1.5.2 Building Area

For the building areas of the buildings at Area 400, Table 503 will be applicable to the E-house and Fire Pump and Foam Building. A Group F-1 occupancy, with Type II-B construction, shall have an area not to exceed 15,500 sq.ft. The E-house building's actual area, 480 sq.ft. per floor, is acceptable without any modifications. The Fire Pump and Foam Building's actual area, 750 sq.ft. is acceptable without any modifications.

### 7.1.6 Means of Egress

#### 7.1.6.1 Occupant Load

The calculated occupant loads throughout the buildings will be determined by using the appropriate occupant load factors found in IBC, Section 1004.1.2. The occupant load factors to be used and the calculated occupant loads for the building are as follows:

OCCUPANCY	AREA	OCCUPANT LOAD FACTOR	NUMBER OF OCCUPANTS
<b>E-house</b>			
Industrial (F-1)	480 ft <sup>2</sup> per floor	100 ft <sup>2</sup> per person (gross)	5 per floor
<b>Fire Pump and foam Building</b>			
Industrial (F-1)	750 ft <sup>2</sup>	100 ft <sup>2</sup> per person (gross)	8

#### 7.1.6.2 Egress Capacity Requirements

The actual exit capacity will meet the minimum exit capacity required by IBC, Section 1005.3. Exit width factors to be used for each component are as follows:

COMPONENT	WIDTH FACTOR	OCCUPANT LOAD	MINIMUM EGRESS CAPACITY
<b>E-houses</b>			
Stairs	0.3 inches per person	5 per floor	1.5 inches
Other Components	0.2 inches per person		1 inches
<b>Fire Pump and foam Building</b>			
Stairs	0.3 inches per person	8	2.4 inches
Other Components	0.2 inches per person		1.6 inches

#### 7.1.6.3 Number of Exits

For the buildings at Area 400, a minimum of one exit is required from each building according to Table 1021.2(2) of the IBC. The actual number of provided exits will be one from the E-house, one from the control room, and two from the Fire Pump and Foam Building.

#### **7.1.6.4 Door Requirements**

For the buildings at Area 400, all exit door assemblies, and doors within the egress paths (where applicable), will swing in the direction of exit travel and will be equipped with appropriate hardware as required by Section 1008.1.9 of the IBC.

#### **7.1.6.5 Dead-end Limits**

The dead-end limits for the buildings at Area 400 shall be restricted to 20 feet or less as required by Section 1018.4 of the IBC. There are no anticipated dead-ends in these buildings.

#### **7.1.6.6 Common Path of Travel**

For the buildings at Area 400, the common path of travel is restricted to 75 feet for the E-house and 100 feet for the Fire Pump and Foam Building, as indicated in Table 1014.3 of the IBC. There are no restrictive common paths of travel before the occupant reaches two separate and distinct paths of egress travel for the buildings at Area 400.

#### **7.1.6.7 Travel Distance**

For the buildings at Area 400, the travel distance is restricted to 200 feet for the E-house and 250 feet for the Fire Pump and Foam Building, as indicated in Table 1016.2 of the IBC. The most restrictive travel distances are 50 feet for the E-house and 30 feet for the Fire Pump and Foam Building.

#### **7.1.6.8 Discharge from Exits**

The buildings at Area 400 will comply with IBC, Section 1027.

### **7.1.7 Interior Finish**

The buildings at Area 400 shall have an interior finish of the interior exit passageways of Class B for the E-house and Storage Building and Class C for the Fire Pump and Foam Building while the rest of the building shall be Class C. The actual interior finishes of the buildings will be Class B or above.

## **7.2 Active Fire Safety Features**

### **7.2.1 Fire Suppression Systems**

#### **7.2.1.1 Fire Protection System Water Supply**

The water supply for Area 400 was tested by the City of Vancouver on May 30, 2013 on fire hydrants of the dedicated fire water distribution system. These results are for the City of Vancouver water supply only and do not reflect the condition of the Port of Vancouver's water supply. The water supply at Area 400 is not sufficient to meet the demand of the suppression systems without increasing the pressure and flow by a dedicated fire pump.

### **7.2.1.2 Automatic Suppression System**

The E-house will not be provided with a sprinkler system. According to the allowable height and area for a Group F-1 occupancy, the building can be built in conformance with the code without the need for a sprinkler system.

The Fire Pump and Foam Building will be provided with a sprinkler system in accordance with Section 903.2.5 of the IBC. Elevated monitor nozzles will be installed to provide protection to the dock area. The monitor nozzles will have the capability to flow a foam-water solution.

All suppression systems will be designed and installed per NFPA 11, NFPA 13, FM DS 2-0, FM DS 3-0, FM DS 3-7, FM DS 3-26, FM DS 4-12, FM DS 7-32, and FM DS 7-88.

### **7.2.1.3 Portable Fire Extinguishers**

The E-house building will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet.

The Fire Pump and Foam Building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet.

## **7.2.2 Fire Alarm Systems**

### **7.2.2.1 Area 400 Notification**

The Area 400 buildings and dock area will be provided with a fire alarm system control panel and user interface, located in the E-house. The control panel will independently transmit back to a supervising station. The fire alarm system will be designed and installed per NFPA 70, NFPA 72, FM DS 5-40 and FM DS 5-48.

A smoke detector will be located in the E-house and in the Fire Pump and Foam Building. The smoke detectors will be connected to the fire alarm system for notification purposes.

Notification appliances will be located strategically throughout Area 400 so as to notify any occupants of an alarm condition. See sheet 0400-FA-003 for further detail.

Manual release stations for the foam suppression monitor nozzles located on the dock will be strategically located so that in the event of an incident, the system can be actuated quickly. Manual activation is the only means of operating the pre-action system for the dock suppression system. See sheet 0400-FA-003 for further detail.

### **7.2.3 Alarm Reporting System**

The fire alarm panel will be FM Approved and will be provided with a way to directly communicate to the control operations HMI, the panel will also be provided with a DACT to transmit/communicate all alarm signals to a supervising station. The Area 400 buildings will transmit any signals to the supervising station independent of the other areas related to this project.

### **7.2.4 Fire Department Access**

#### **7.2.4.1 General**

Access to the buildings will be required in accordance with Section 503 of the IFC.

#### **7.2.4.2 Area 400 Buildings**

Access to the buildings is within 150 feet of all portions from the paved roadway and parking areas.

### **7.2.5 HVAC Control System**

No HVAC systems will be of a size that compliance with NFPA 90A is required.

## **7.3 Life Safety Features**

### **7.3.1 Exit Signs**

#### **7.3.1.1 General**

Exit signs are required at exits and exit access doors, readily visible from any direction of egress travel. The exit sign placement shall be such that no point within the exit access corridor or exit passageway is more than 100 feet from the nearest visible exit sign according to Section 1011.1 of the IBC.

#### **7.3.1.2 Area 400 Buildings**

For the E-house, as allowed by Exception 1 of Section 1011.1 of the IBC, no exit signs are required since only one exit is required for these buildings. However, exit signs will be provided above each door.

According to Exceptions 1 and 2 under Section 1011.1 of the IBC, no exit signs will be required for the Fire Pump and Foam Building as the only doors of the building are the exit doors.

### **7.3.2 Means of Egress Illumination**

#### **7.3.2.1 General**

Emergency lighting shall be in accordance with Section 1006 of the IBC. The means of egress, including the exit discharge are to be illuminated at all times the building space is occupied. The illumination level under normal conditions shall not be less than one footcandle at the walking surface. Emergency power for illumination shall be required in accordance with Section 1006.3 of the IBC.

### **7.3.2.2 Area 400 Buildings**

The E-house will be equipped with emergency light fixtures as indicated on drawings 0400-ED-022.

The Fire Pump and Foam Building will be equipped with emergency light fixtures as indicated on drawing 0400-LS-002 and 0400-FA-005.

### **7.3.3 Stairways**

The E-house stairs will comply with Section 1009 of the IBC. No enclosure for the exit stairways will be provided as allowed by Exception 6 and 7 of Section 1009.3. The stair riser height and tread depth conform to Section 1009.7.2 of the IBC. See drawing 0400-ED-025 for further information.

### **7.3.4 Handrails**

The E-house handrails located on the stairs and stair landings shall comply with Section 1012 of the IBC. The handrail heights shall be between 34 inches and 38 inches. See drawing 0400-ED-025 for further information.

### **7.3.5 Guards**

The guards located on stair landings shall comply with Section 1013 of the IBC. The guard heights shall be a minimum of 42 inches tall. See drawing 0400-ED-025 for further information.

## **Chapter 8 - Area 500 – Crude Oil Pipeline Area**

### **8.1 General**

There are no occupancies located along the lengths of the pipeline between Area 200 to Area 300 and between Area 300 to Area 400. It was determined that no life safety analysis was needed in this area.

## **Chapter 9 - Area 600 – West Boiler Area**

### **9.1 Construction and Egress**

#### **9.1.1 Occupancy Classification and Description of Contents**

The Boiler Building located at Area 600 is a single use nonseparated occupancy (IBC, Section 508.3). The E-house located on the south side of the building is considered part of the Boiler Building in accordance with Section 503.1.2 of the IBC. The Boiler Building is considered to be Factory Industrial (Group F-1). The Boiler Building will contain the boilers necessary for heating the heavy crude to a viscosity acceptable for unloading operations.

## 9.1.2 Type of Construction

The buildings at Area 600 will be Type II-B construction in accordance with IBC, Section 602.2.

## 9.1.3 Separations

### 9.1.3.1 Occupancy Separations

No separations are required in the Boiler Building or the E-house in accordance with Section 508.2.4 of the IBC.

### 9.1.3.2 Building Separations

No separations are required between the Boiler Building and other buildings. All buildings are considered to be over 30 feet from the Boiler Building in accordance with Table 602 of the IBC. The E-house is considered part of the Boiler Building in accordance with Section 503.1.2, is the same occupancy classification and therefore does not require separation.

## 9.1.4 Fire Resistive Requirements

For the buildings located at Area 600, the structural elements will be noncombustible. Non-structural elements of the buildings are permitted to be of combustible materials. Through penetrations and membrane penetrations of walls, barriers, and partitions required to have a fire-resistance rating will be protected with UL listed firestopping assemblies.

The following table summarizes the requirements for Type II-B construction as described in IBC, Tables 601 and 602.

Building Element	Required Fire Resistance Rating (hours)
Primary Structural Frame	0
Bearing Walls	
– Interior	0
– Exterior	0
Non-Bearing Walls and Partitions	
– Interior	0
– Exterior	0
Floor Construction and Secondary Members	0
Roof Construction and Secondary Members	0

There are no shafts or vertical exit enclosures in this building.

## 9.1.5 Height and Area Limitations

### 9.1.5.1 Building Height

The building heights at Area 600 shall be in accordance with IBC. Table 503 indicates that the height of the building cannot exceed two stories totaling 55 feet (based on Group F-1 occupancy). The Boiler Building and E-house will not receive a sprinkler system, so no increase is included or required. Therefore, the total allowable height of

the building is two stories and 55 feet. The Boiler Building's actual height is one story and approximately 30 feet at the eave, and is acceptable. The E-house building's actual height is two stories and approximately 23 feet, and is acceptable.

### 9.1.5.2 Building Area

For the building area of the buildings at Area 600, Table 503 will be applicable. A Group F-1 occupancy, with Type II-B construction, shall have an area not to exceed 15,500 sq.ft. The Boiler Building's actual area, 6,600 sq.ft., is acceptable without any modifications. The E-house building's actual area , 750 sq.ft. is acceptable without any modifications.

### 9.1.6 Means of Egress

#### 9.1.6.1 Occupant Load

The calculated occupant loads throughout the buildings will be determined by using the appropriate occupant load factors found in IBC, Section 1004.1.2. The occupant load factors to be used and the calculated occupant loads for the building are as follows:

OCCUPANCY	AREA	OCCUPANT LOAD FACTOR	NUMBER OF OCCUPANTS
<b>Boiler Building</b>			
Industrial (F-1)	6,600 ft <sup>2</sup> per floor	100 ft <sup>2</sup> per person (gross)	66
<b>E-house</b>			
Industrial (F-1)	480 ft <sup>2</sup> per floor	100 ft <sup>2</sup> per person (gross)	5

#### 9.1.6.2 Egress Capacity Requirements

The actual exit capacity will meet the minimum exit capacity required by IBC, Section 1005.3. Exit width factors to be used for each component are as follows:

COMPONENT	WIDTH FACTOR	OCCUPANT LOAD	MINIMUM EGRESS CAPACITY
<b>Boiler Building</b>			
Stairs	0.3 inches per person	66	19.8 inches
Other Components	0.2 inches per person		13.2 inches
<b>E-house</b>			
Stairs	0.3 inches per person	5	1.5 inches
Other Components	0.2 inches per person		1 inches

#### 9.1.6.3 Number of Exits

For the buildings at Area 600, a minimum of two exits is required from the Boiler Building and a minimum of one exit is required from the E-house according to Table 1021.2(2) of the IBC. The actual number of provided exits will be four for the Boiler Building and two for the E-house.

#### **9.1.6.4 Door Requirements**

For the buildings at Area 600, all exit door assemblies, and doors within the egress paths (where applicable), will be equipped with appropriate hardware as required by Section 1008.1.9 of the IBC.

#### **9.1.6.5 Dead-end Limits**

The dead-end limits for the buildings at Area 400 shall be restricted to 20 feet or less as required by Section 1018.4 of the IBC. There are no anticipated dead-ends in these buildings.

#### **9.1.6.6 Common Path of Travel**

For the buildings at Area 600, the common path of travel is restricted to 75 feet, as indicated in Table 1014.3 of the IBC. The actual common path of travel, 23 feet for the Boiler Building, is acceptable. There are no restrictive paths of travel before the occupant reaches two separate and distinct paths of egress travel for the E-house.

#### **9.1.6.7 Travel Distance**

For the buildings at Area 600, the travel distance is restricted to 200 feet for the Boiler Building and E-house, as indicated in Table 1016.2 of the IBC. The most restrictive travel distances are 15 feet for the E-house and 92 feet for the Boiler Building.

#### **9.1.6.8 Discharge from Exits**

The buildings at Area 600 will comply with IBC, Section 1027.

### **9.1.7 Interior Finish**

The buildings at Area 600 shall have an interior finish of the interior exit passageways of Class B for the E-house and Boiler Building while the rest of the building shall be Class C. The actual interior finishes of the buildings will be Class B or above.

## **9.2 Active Fire Safety Features**

### **9.2.1 Fire Suppression Systems**

#### **9.2.1.1 Automatic Suppression System**

The Area 600 buildings will not be provided with a sprinkler system. According to the allowable height and area for a Group F-1 occupancy, the building can be built in conformance with the code without the need for a sprinkler system.

#### **9.2.1.2 Portable Fire Extinguishers**

The Boiler Building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet.

The E-house building will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire

extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet.

## **9.2.2 Fire Alarm Systems**

### **9.2.2.1 Area 600 Buildings**

The Area 600 buildings will be provided with a smoke detectors in the Boiler Building and E-house, however no control panel or user interface will be present at Area 600. Signals from these devices will be transmitted back to the Area 200 control panel and displayed on the user interface there.

## **9.2.3 Alarm Reporting System**

The detectors at area 600 will transmit their signal back to Area 200 and reporting to the supervising station will be accomplished at Area 200.

## **9.2.4 Fire Department Access**

### **9.2.4.1 General**

Access to the buildings will be required in accordance with Section 503 of the IFC.

### **9.2.4.2 Area 600 Buildings**

Access to the buildings is within 150 feet of all portions from the paved roadway and parking areas.

## **9.2.5 HVAC Control System**

No HVAC systems will be of a size that compliance with NFPA 90A is required.

## **9.3 Life Safety Features**

### **9.3.1 Exit Signs**

#### **9.3.1.1 General**

Exit signs are required at exits and exit access doors, readily visible from any direction of egress travel. The exit sign placement shall be such that no point within the exit access corridor or exit passageway is more than 100 feet from the nearest visible exit sign according to Section 1011.1 of the IBC.

#### **9.3.1.2 Area 600 Buildings**

For the Boiler Building, exit signs shall be located above each man door. The exit signs will comply with Section 1011 of the IBC.

For the E-house, as allowed by Exception 1 of Section 1011.1 of the IBC, no exit signs are required since only one exit is required for these buildings. However, exit signs will be provided above each door.

## **9.3.2 Means of Egress Illumination**

### **9.3.2.1 General**

Emergency lighting shall be in accordance with Section 1006 of the IBC. The means of egress, including the exit discharge are to be illuminated at all times the building space is occupied. The illumination level under normal conditions shall not be less than one footcandle at the walking surface. Emergency power for illumination shall be required in accordance with Section 1006.3 of the IBC.

### **9.3.2.2 Area 600 Buildings**

The Boiler Building will be equipped with emergency light fixtures as indicated on drawing 0600-ED-010

The E-house will be equipped with emergency light fixtures as indicated on drawings 0600-ED-015.

## **Chapter 10 - Conclusion**

This Life Safety Basis of Design / Engineering Evaluation (Fire Protection Engineering Analysis) has been prepared by John W. Poole, III a Washington licensed Fire Protection Engineer. Mr. Poole will also be serving as the Fire Protection Engineer of Record for the project and will review and PE stamp all design drawings, calculation and material submittals and witness system acceptance testing.

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# **Life Safety Basis of Design Engineering Evaluation Report**

**Tesoro Savage Vancouver  
Energy Distribution Terminal  
Port of Vancouver, Washington**

**Submitted: July 14, 2014**

## **Poole Fire Protection**

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# Chapter 1 - Introduction

This document has been developed to support the Life Safety (LS) series drawings. The intent is to establish the requirements that drive the necessary life safety devices needed for the Tesoro Savage Vancouver Energy Distribution Terminal (Terminal) facility to be compliant with code. This Basis of Design does not address fire suppression, fire alarm, gas detection, or construction and egress requirements. For further information on the fire suppression, fire alarm, and gas detection systems please refer to the *Fire Protection Basis of Design Engineering Evaluation Report*. For further information on construction and egress requirements and other life safety features please refer to the *Life Safety Analysis Report*.

## Chapter 2 - Project Summary

The Terminal is located at the Port of Vancouver in the City of Vancouver, Washington. This facility is being designed and constructed to unload multiple grades of crude oil from railcars, then pump the crude oil to storage tanks in the tank Storage area east of Far West Steel and then later pump the crude oil from the storage tanks to the transport vessels at the dock area. The project has been broken down into five separate and distinct areas: 1) Area 200 – Unloading and Office; 2) Area 300 – Storage Area; 3) Area 400 – Marine Terminal; 4) Area 500 – Transfer Pipelines; and 5) Area 600 – West Boiler. Below is a brief description of each area.

### Area 200 – Unloading and Office

The Rail Off Loading Area currently includes two unloading tracks for light crude oil with the potential of adding a third track for unloading heavy crude oil. The unloading tracks will be located inside an unloading building. Each unloading track will accommodate 30 cars for a total length of approximately 1,800 feet. The unloading building will be approximately 1,850 feet long and 90 feet wide to accommodate the length of these unloading tracks and the unloading operations.

The building has a complete metal roof, while the walls will only consist of seven metal wall panels spaced along the south side of the building. These seven metal wall panels will be spaced at locations corresponding with E-houses, the fire pump/foam skid building, and other appurtenances that are to be located on the south side of the building. The remainder of the wall area on the building will be open. Within the building there will be two elevated walkways running the length of the building used in the unloading process, and five crossover egress walkways providing access to the north and south sides of the building spaced approximately every 357 feet. There will be three rail tracks running east to west, two trenches (approximately 9 foot wide by 5 foot deep) accommodating the piping system that is used to transport the crude oil to the pump basins (located between the tracks), and 10 pump basins (5 for the south trench and 5 for the north trench), which will be spaced every 355 feet that house the transfer pumps. These transfer pumps will be used to pump the crude oil out of the Unloading Building to the Tank Storage. The Unloading Building will be completely protected by a fire detection and sprinkler system.

Access stairs will be provided between the railcars which will enable workers performing any unloading operations at the track level to exit up the stairs to the elevated crossovers and over the railcars to reach an exterior exit from the Railcar Unloading Building.

Other structures located in the Rail Offloading Area include control room/E-houses and the fire pump/foam skid building.

The Office Area contains the Office Building and two change rooms. The Office Building and East Change Room are located approximately 225 feet to the North of the Unloading Building. These buildings consist of modular office trailers that are pre-built off site and placed at their specific location on the job site. The West Change Room will be constructed in the future and has not been designed yet but will be similar to the East Change Room. The Office Building and change rooms will not be provided with an automatic suppression system.

### **Area 300 – Storage**

The Storage area is currently being planned for the construction of four crude oil storage tanks with the potential of two more tanks in the future. The storage tanks will have a nominal storage capacity of 380,000 barrels (15,960,000 gallons) each and they will be approximately 50 feet tall with a diameter of 240 feet. All tanks will be located inside a perimeter dike capable to contain 110% of the volume of the largest tank plus the anticipated precipitation from a 24 hour, 100 year storm. The tanks will be positioned so that the distance between each tank is 120 feet in any direction. The distance from the tank to the dike varies from a minimum distance of approximately 33 feet to a maximum of 150 feet.

Other structures located in the Storage area will include a Pump Basin for the pumps that will be used to transfer the crude from the tank storage area to the vessels at Berth 13. A Storage Building, a control room/E-house, and a fire pump and foam building.

### **Area 400 – Marine Terminal**

The Marine Terminal Area will consist of Berths 13 and 14. Crude oil will be pumped from the Storage Area in a 36-inch pipe to Berth 13. The berth will be able to accommodate vessels with a capacity of up to 380,000 barrels, with loading rates of up to 32,000 barrels per hour. Safety measures include automatic shutoff valves, a return and stripping line for the crude to return back to the storage tanks, a marine vapor combustion unit, floating booms and manual fire protection features.

Berth 14 will be used for storage of and access to the boat that will be used to deploy the boom in the water around the ship. There are no other crude unloading operations planned for Berth 14. Safety measures include manual fire protection features.

Other structures located at the dock area will include a control room/E-house, vapor blower staging unit, fire pump and foam building, and a dock safety unit.

### **Area 500 – Transfer Pipelines**

The transfer pipelines consists of the pipeline runs between the area 200 Unloading Building and the area 300 Storage Area and between the Storage Area and area 400 Marine Terminal. Depending on the location of the piping runs, the number of pipes varies from 1 ea 36 inch pipe and 1 ea 6 inch pipe to 3 ea 24 inch pipes, 1 ea 36 inch pipe, and 1 ea 6 inch pipe. The transfer pipelines are mainly aboveground and on supports. Where required to avoid interferences or cross over rail track, the pipeline does go underground and is encased in a secondary containment pipe.

### **Area 600 – West Boiler**

The West Boiler area contains a boiler building that will be utilized to generate steam to heat the heavy crude in the heated crude unloading operations inside the Unloading Building at area 200. Other than the E-house, no other buildings will be located on the area 600 site. The west boiler building will not include an automatic fire suppression system.

## **Chapter 3 - Applicable Design Criteria**

The following codes and standards are applicable for this project:

- NFPA 10, *Standard for Portable Fire Extinguishers*, 2010
- NFPA 101, *Life Safety Code*, 2012
- NFPA 30, *Flammable and Combustible Liquids Code*, 2012 Edition
- International Building Code, 2012
- International Fire Code, 2012
- ANSI Z358.1, *Standard for Emergency Eyewashes and Shower Equipment*, 2009

## **Chapter 4 - Portable Fire Extinguishers**

### **4.1 Extinguisher type and spacing requirements**

#### **4.1.1 General**

All portable fire extinguishers will be located and installed in accordance with the IBC and NFPA 10. Office buildings will be classified as capable of producing Class A fires and will be categorized as Light (Low) Hazard locations in accordance with NFPA 10. Those locations where flammable or combustible liquids are to be present will be classified as capable of producing Class B fires and will be categorized as Ordinary (Moderate) Hazard or Extra (High) Hazard locations in accordance with NFPA 10. Spaces capable of producing fires involving energized electrical equipment will be classified as Class C fires and will be categorized as Light (Low) or Ordinary (Moderate) Hazard locations in accordance with NFPA 10.

## **Area 200 – Unloading and Office**

### **Unloading Building:**

The unloading building will be classified as being capable of having Class B fire with a hazard classification of extra (high). Fire extinguishers will be sized according to Table 906.3(2) of the IBC and will be a basic minimum extinguisher rating of 80-B spaced a maximum travel distance of 50 feet. See sheet 0200-LS-002 for further information.

### **Office and Change Buildings:**

The office and Office Buildings will be classified as being capable of having Class A fire with a hazard classification of light (low). Fire extinguishers will be sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet. See sheet 0200-LS-003 for further information.

### **E-houses:**

The E-house buildings located along the south side of the Railcar Unloading Building will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet. See sheet 0200-LS-003 for further information.

### **Fire Pump and Foam Building:**

The fire pump and foam building located along the south side of the Railcar Unloading Building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet. See sheet 0200-LS-003 for further information.

## **Area 300 – Storage**

### **Storage Building:**

The Storage Building will be classified as being capable of having Class A fire with a hazard classification of ordinary (moderate). Fire extinguishers will be sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet. See sheet 0300-LS-002 for further information.

### **E-houses:**

The E-house buildings will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet. See sheet 0300-LS-002 for further information.

### **Fire Pump and Foam Building:**

The fire and foam pump building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B

spaced a maximum travel distance of 30 feet. See sheet 0300-LS-002 for further information.

**Pump Basin:**

The Pump Basin will be classified as being capable of having a Class B and C fire with a hazard classification of extra (high). Fire extinguishers will be sized according to Table 906.3(2) of the IBC and will be a basic minimum extinguisher rating of 80-B spaced a maximum travel distance of 50 feet. See sheet 0300-LS-002 for further information.

**Area 400 – Marine Terminal**

**Berth 13:**

The quantity of Berth 13 fire extinguishers and sizes will be in accordance with NFPA 30, Section A.29.3.28. Because NFPA 30 covers flammable and combustible liquids the extinguisher size will be a 30 lb Class B extinguisher. Total quantity will be three located appropriately across the dock. In addition, two wheeled 150 lb Class B extinguishers are required to be located appropriately across the dock. See sheet 0400-LS-002 for further information.

**Berth 14:**

Berth 14 will be classified as being capable of having Class A fire with a hazard classification of ordinary (moderate). A fire extinguisher will be sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet. See sheet 0400-LS-002 for further information.

**E-house:**

The E-house building will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet. See sheet 0400-LS-002 for further information.

**Fire Pump and Foam Building:**

The fire pump and foam building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet. See sheet 0400-LS-002 for further information.

**Marine Vapor Combustion Unit:**

No fire extinguisher will be provided for the Vapor Combustion Unit as this location is typically unmanned and the space will not accommodate one.

## **Area 500 – Transfer Pipelines**

There are no codes or standards that drive the requirement for portable fire extinguishers along the pipeline between operation areas. No portable fire extinguishers will be provided.

## **Area 600 – West Boiler**

West Boiler Building:

The west boiler building will be classified as being capable of having a Class B and C fire with a hazard classification of ordinary (moderate). The fire extinguisher is sized according to Table 906.3(2) of the IBC and will be a minimum rated size of 10-B spaced a maximum travel distance of 30 feet. See sheet 0600-LS-002 for further information.

E-house:

The E-house building will be classified as being capable of having Class C fire with a hazard classification of light (low). Because fire is a Class A or B hazard, the fire extinguisher is sized according to Table 906.3(1) of the IBC and will be a minimum rated size of 2-A spaced a maximum travel distance of 75 feet. See sheet 0600-LS-002 for further information.

# **Chapter 5 - Exit Signs**

## ***5.1 Exit sign type and spacing requirements***

### **5.1.1 General**

Exit signs will be provided at exits and exit access doors, readily visible from any direction of egress travel. The exit sign placement will be such that no point within the exit access corridor or exit passageway is more than 100 feet from the nearest visible exit sign (IBC, Section 1011.1).

## **Area 200 – Unloading and Office**

Unloading Building:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs will be required for the Railcar Unloading Building as the main paths of travel inside the building lead to the exits.

Office and Change Buildings:

The Administration Buildings will be equipped with exit signs as required by the IBC. The exit signs will be located at the exterior doors and will be internally illuminated. See sheet 0200-AD-010 and 0200-LS-002 for further information.

E-houses:

According to Exception 1 under Section 1011.1 of the IBC, no exit signs are required for the E-houses as the only doors of the E-houses are the exit doors. However, exit signs are provided as indicated on 0200-ED-084, 0200-ED-087 and 0200-ED-090, as well as on sheet 0200-LS-002.

Fire Pump and Foam Building:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs will be required for the fire pump and foam building as the only door is the exit door.

### **Area 300 – Storage**

Storage Building:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs will be required for the Storage Building as the only doors are the exit doors.

E-houses:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs are required for the E-houses as the only doors of the E-houses are the exit doors. However, exit signs are provided as indicated on 0300-ED-034 and on 0300-LS-002.

Fire Pump and Foam Building:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs will be required for the fire pump and foam building as the only door is the exit door.

Pump Basin:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs will be required for the Pump Basin as the main paths of travel lead to the exits.

### **Area 400 – Marine Terminal**

E-house:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs are required for the E-houses as the only doors of the E-houses are the exit doors. However, exit signs are provided as indicated on 0400-ED-022 and on 0400-LS-002.

Fire Pump and Foam Building:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs will be required for the fire pump and foam building as the only door is the exit door.

### **Area 500 – Transfer Pipelines**

No parts of the transfer pipelines between the main operations areas will be in an enclosure, therefore no exit signs are required.

### **Area 600 – West Boiler Area**

West Boiler Building:

The west boiler building will be equipped with exit signs as required by the IBC. The exit signs will be located as indicated on 0600-ED-010 and 0600-LS-002. The exit signs will be internally or externally illuminated.

E-house:

According to Exception 2 under Section 1011.1 of the IBC, no exit signs are required for the E-houses as the only doors of the E-houses are the exit doors. However, exit signs are provided as indicated on 0600-ED-015 and 0600-LS-002.

## Chapter 6 - Means of Egress Illumination

### 6.1 *Emergency light type and spacing requirements*

#### 6.1.1 General

Emergency lighting will be in accordance with Section 1006 of the IBC. The means of egress, including the exit discharge are to be illuminated at all times the building space is occupied. The illumination level under normal conditions will not be less than one footcandle at the walking surface. Emergency power for illumination will be required in accordance with Section 1006.3 of the IBC.

#### **Area 200 – Unloading and Office**

Unloading Building:

The unloading building will be equipped with emergency lights incorporated to the whole building lighting layout drawings. See drawings 0200-ED-071 through 0200-ED-083, also a typical layout of the emergency lights only can be found on 0200-LS-002.

Office and Change Buildings:

The office and Office Buildings will be equipped with emergency lights as indicated on drawing 0200-AD-010 and 0200-LS-002.

E-houses:

The E-houses will be equipped with emergency light fixtures as indicated on drawings 0200-ED-084 and 0200-ED-090 and 0200-LS-002.

Fire Pump and Foam Building:

The fire pump and foam building will be equipped with emergency light fixtures as indicated on drawing 0200-LS-002 and 0200-FA-010.

#### **Area 300 – Storage**

Storage Building:

The Storage Building will be equipped with emergency light fixtures as indicated on drawing 0300-LS-002.

E-houses:

The E-houses will be equipped with emergency light fixtures as indicated on drawing 0300-ED-034 and 0300-LS-002.

Fire Pump and Foam Building:

The fire pump and foam building will be equipped with emergency light fixtures as indicated on drawing 0300-LS-002 and 0300-FA-005.

Pump Basin:

The Pump Basin will be equipped with emergency light fixtures as indicated on drawing 0300-ED-033.

Tank Storage Area:

No emergency lighting will be provided in the Tank Storage Area since this area is typically unmanned and is outside.

### **Area 400 – Marine Terminal**

Berth 13:

The dock will be equipped with emergency light fixtures as indicated on drawing 0400-ED-014.

Berth 14:

No emergency lighting will be provided on Berth 14 as it is typically unmanned and is outside.

E-house:

The E-house will be equipped with emergency light fixtures as indicated on drawing 0400-ED-022 and 0400-LS-002.

Fire Pump Foam Building:

The fire pump and foam building will be equipped with emergency light fixtures as indicated on drawing 0400-LS-002 and 0400-FA-005.

### **Area 500 – Transfer Pipelines**

No parts of the transfer pipelines between the main operations areas will be in an enclosure, therefore no means of egress illumination are required.

### **Area 600 – West Boiler Area**

West Boiler Building:

The west boiler building will be equipped with emergency light fixtures as indicated on drawing 0600-ED-010 and 0600-LS-002.

E-house:

The E-house will be equipped with emergency light fixtures as indicated on drawing 0600-ED-015 and 0600-LS-002.

## **Chapter 7 - Eye Wash Stations**

### ***7.1 Eye wash station type and spacing requirements***

#### **7.1.1 General**

All eyewash stations will be located in accordance with ANSI Z358 and Savage Services requirements. Where feasible the industry standard 10 second rule will be applied which equates to roughly every 55 feet. This standard is recognized by Savage Services as acceptable and will be applied on this facility, except as modified herein. Eyewash stations will be equipped with a heater built in to the unit to prevent freezing.

Electrical connections for the heating unit of the eye wash station will be required to be coordinated where applicable.

### **Area 200 – Unloading and Office**

#### **Unloading Building:**

Due to the hazardous materials located inside the unloading building, eyewash stations will be located at every unloading station, both at grade and on the elevated walkway. Due to the occupant load and expected egress routes, eye wash stations are being provided as described above and are located at an approximate travel distance of 180 feet. This is recognized by Savage Services as acceptable for the Unloading Building. A total of 20 eyewash stations will be located inside the unloading building. See sheet 0200-LS-002 for further information.

#### **Office and Change Buildings:**

No eyewash station will be provided in the office and Office Buildings since no operations around hazardous materials are conducted.

#### **E-houses:**

No eyewash station will be provided in the unmanned E-houses since no operations around hazardous materials are conducted. A portable eyewash will be provide in the Control Room of Control Room/E-house 3.

#### **Fire Pump and Foam Building:**

No eyewash station will be provided in the fire pump and foam building as this location is not typically occupied.

### **Area 300 – Storage**

#### **Storage Building:**

The Storage Building will contain an eyewash station due to the equipment and materials stored.

#### **E-houses:**

The E-house, though it is not necessary to locate one here since no operations around hazardous materials is conducted, will have one eye wash station (heated on the outside of the building) for emergency use. See sheet 0200-LS-002 for further information.

#### **Fire Pump and Foam Building:**

No eyewash station will be provided in the fire pump and foam building as this location is not typically occupied.

#### **Tank Storage:**

No eyewash station will be provided in the tank storage berm area since it will generally be unmanned and an eyewash station is located at the E-house.

### **Area 400 – Marine Terminal**

#### **Berth 13:**

Due to the hazardous materials located on the dock, eyewash stations will be strategically located to achieve the required travel limitations. Two eyewash stations are anticipated for the dock. See sheet 0200-LS-002 for further information.

#### **Berth 14:**

No eyewash station will be provided on Berth 14 since no operations around hazardous materials are conducted.

#### **E-house:**

The E-house, though it is not necessary to locate one here since no operations around hazardous materials is conducted, will contain at least one eye wash station for emergency use. See sheet 0200-LS-002 for further information.

#### **Fire Pump and Foam Building:**

No eyewash station will be provided in the fire pump and foam building as this location is not typically occupied.

### **Area 500 – Transfer Pipelines**

No eyewash station will be provided for the transfer pipelines as this location is not typically occupied.

### **Area 600 – West Boiler**

#### **West Boiler Building:**

Due to the occupancy type and use of the boiler building, an eyewash station will be strategically located to achieve the required travel limitations. Only one eyewash station is anticipated for the boiler building.

#### **E-house:**

No eyewash station will be provided in the E-house building as this location is not typically occupied.

## **Chapter 8 - Conclusion**

This Life Safety Basis of Design / Engineering Evaluation (Fire Protection Engineering Analysis) has been prepared by John W. Poole, III a Washington licensed Fire Protection Engineer. Mr. Poole will also be serving as the Fire Protection Engineer of Record for the project and will review and PE stamp all design drawings, calculation and material submittals and witness system acceptance testing.

