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www.vectorengineeringinc.com

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Rachael Brown
Planner

Kirstin Hofmann
Emergency Manager

City Of Puyallup
333 S. Meridian
Puyallup, WA 98371

Via e-mail:
KHofmann@puyallupwa.gov
rnbrown@puyallupwa.gov

Regarding: Genesee Propane Bulk Plant
Construction Exemption – Exterior Propane Tank

Location: 412 23rd Street, Puyallup, WA

Per the Pre application development letter provided by City of Puyallup Development Services Center on Oct 21, 2021 the above proposed project is required to apply for an exemption to the Construction Prohibition for Volcanic Hazard Areas. The finding from the City of Puyallup is that the quantity of liquid propane (LPG) or 30,000 Gallons stored in an exterior tank is considered a “Hazardous Facility”.

The reason given is that if it were stored inside a building, it would cause said building to be defined as a hazardous (H Occupancy) facility. Thus, making it a “critical facility” per the City of Puyallup code {Critical Areas}.

This construction exemption must meet 3 criteria for approval by the Emergency Manager. These criteria and their responses follow:

- (a) *The critical facility has a satisfactory critical alert notification system in place which coordinates with the local and emergency monitoring system.*

The building construction plans shall incorporate a monitoring system that alerts the on site manager as well as a back up emergency contact via SMS or electronic communication for oncoming emergency and actions.

- (b) *The critical facility has an emergency evacuation plan which adequately demonstrates the ability to evacuate all expected occupants in a lahar situation to an acceptable area outside of the volcanic hazard lahar area, in coordination with city emergency plans.*

The tank is not occupied but the emergency plan will ensure the tank is secured prior to staff leaving the site in a lahar situation. The Maintenance and Emergency manual will provide all securing requirements and checklists.

- (c) *That the critical facility has procedures in place to ensure that the emergency evacuation plan is maintained over the life of the critical facility and that occupants of the critical facility are involved in periodic drills and/or other instruction regarding those emergency evacuation procedures.*

A facility maintenance and emergency manual will be kept on site at all times and updated as personnel changes throughout the life of the facility. The manual will be available for City inspection and review at any time.

The proposed propane tank poses no significant risk or additional need for emergency services during a lahar event. See sections [1] through [5] below discussing this project in relation to the lahar.

[1] Building Code:

Propane is considered a class of *Liquified Petroleum Gases (LPG)* with an energy density less than Gasoline. The codes regarding the use proposed are:

- IBC as Amended by Puyallup and WA state
- IFC Chapter 61 Liquified Petroleum Gases
- NFPA 58 Liquified Petroleum Gas Code
- International Fuel Gas Code (valves, and emergency shut offs, etc)

Per the *IFC* LPG shall not be stored inside a building, thus there is no published quantity that triggers the hazardous facility requirement. The Authority Having Jurisdiction (AHJ) can determine an outside storage volume trigger per the IFC 6104.2. This quantity is yet to be defined by the jurisdiction for this use.

To match the code more closely, we assume that the tank itself is an “H” (Hazardous) Occupation, although it will not be occupied, and all controls and evacuation measures will be kept on site in the building for the H occupancy tank.

Per the IFC and NFPA 58 tanks of 30,000 gallons (water capacity) shall be stored a minimum of 50 feet from property lines that can be built upon. A 50’ setback for the tank is required for this project except along the Railroad right of way. There are other horizontal distance requirements, but the 50’ setback is the most stringent applied to this tank location and governs it’s placement. The other major consideration for propane tank location is distance from overhead power lines. This site will have underground power, with the nearest aerial power line on the west side of 23rd Avenue.

Table 6.4.1.1 Separation Distances Between Containers, Important Buildings, and Line of Adjoining Property That Can Be Built Upon

Water Capacity per Container		Minimum Distances					
		Mounded or Underground Containers ^a		Aboveground Containers		Between Containers ^b	
gal	m ³	ft	m	ft	m	ft	m
<125 ^c	Previous <0.5 ^c	10	3	0 ^d	0 ^d	0	0
125–250	0.5–1.0	10	3	10	3	0	0
251–500	>1.0–1.9	10	3	10	3	3	1
501–2,000	>1.9–7.6	10	3	25 ^c	7.6	3	1
2,001–30,000	>7.6–114	50	15	50	15	5	1.5
30,001–70,000	>114–265	50	15	75	23		
70,001–90,000	>265–341	50	15	100	30		
90,001–120,000	>341–454	50	15	125	38		
120,001–200,000	>454–757	50	15	200	61		
200,001–1,000,000	>757–3,785	50	15	300	91		
>1,000,000	>3,785	50	15	400	122		

^aSee 6.4.2.1.

^bSee 6.4.4.5.

^cSee 6.4.4.4.

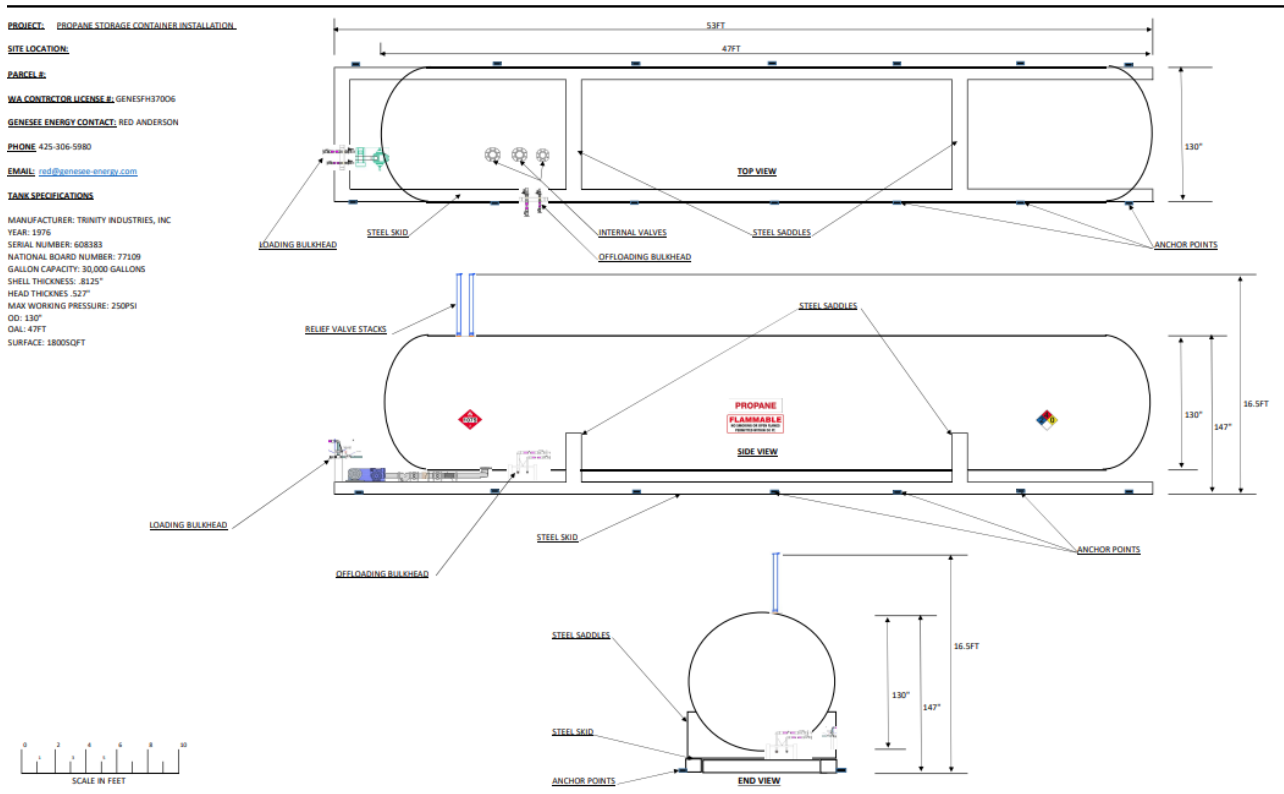
^dSee 6.4.4.1, 6.4.4.2, 6.4.4.3, and 6.4.4.4.

^eSee 6.4.1.3.

NFPA 58 – Distance Table

[2] Tank Construction Discussion

Installation of Horizontal above ground tanks is regulated by NFPA 58 6.8.3. This project proposes an ASME rated skid tank. The proposed tank has 14 Anchor points and is required per the NFPA to be anchored to concrete or masonry foundation.



Proposed Tank cut sheet- 30,000 Gallons

Due to the Lahar Zone (mud or flood flow) the proposed foundation is designed to resist buoyancy of the tank if the area is flooded. See section [3] for discussion of the flood.

Tank Buoyancy Check

Volume of Tank = 30,000 Gallon * 0.134 CF/Gal = 4,020 CF

Buoyancy Displaced Area = 4,020 CF * 62.4 Lb/CF = 212,160 LB

Weight of LP (assume 25% full) = 30,000 Gal * 0.25 * 4.24 LB Per Gal = 31,800 LB

Weight of Tank (7/8" thick Steel – 17' Circumference) = 800 Sf * 35 Lb/SF = 28K

Weight of Skids = 53FT * 2 skids* 26 Lb/FT = 2,756 LB

Minimum Foundation Weight = 212,160 LB – 31,800 LB - 28,000 LB – 2,756 LB = 150,000 LB

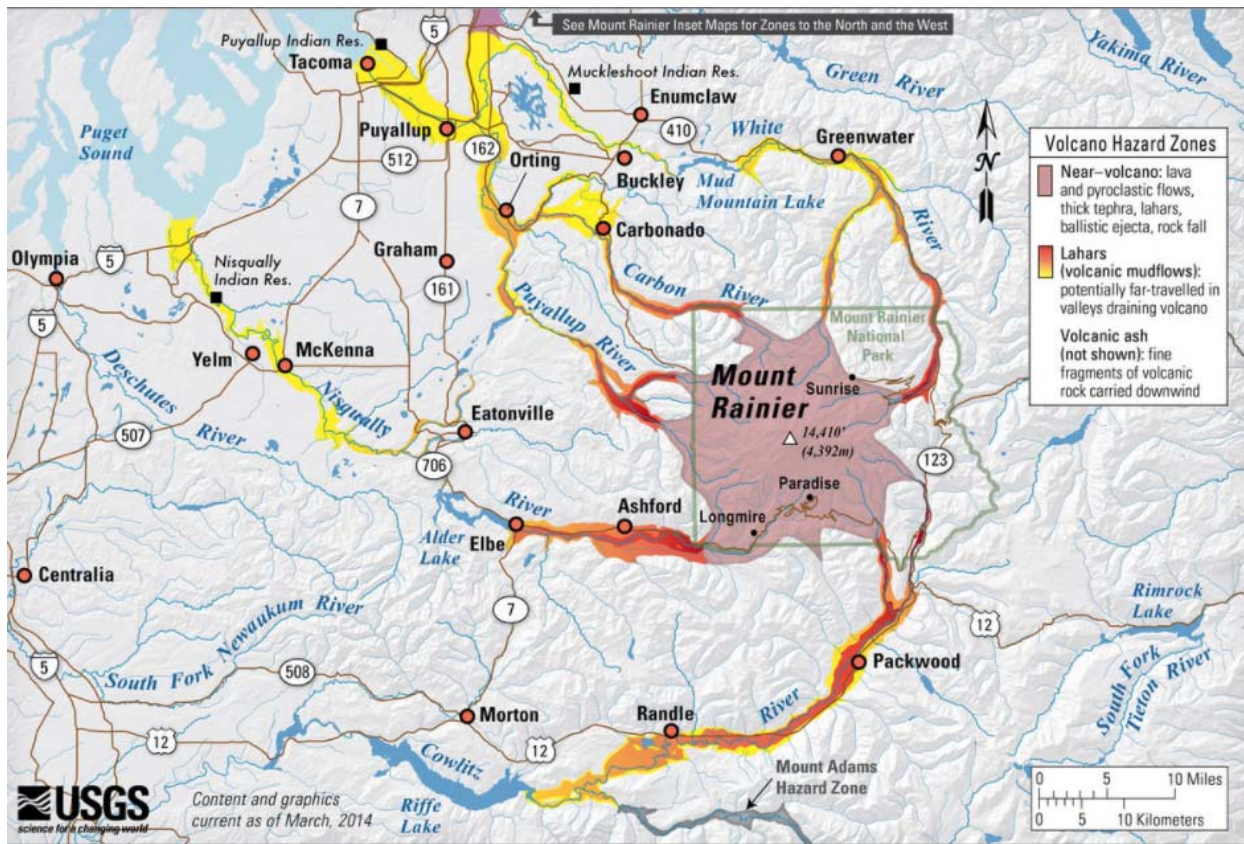
Concrete Weight = 150 PCF, thus 1000 CF foundation required

Foundation Area = 60' X 12' = 720 SF

Min Thickness = 1.34 FT or 16"

To ensure floatation and movement of the tank during a Lahar mud flow or significant flood, the tank foundation must be 16" thick, or thicker as required by the Geotech for other loading.

[3] Lahar Discussion



USGS Map of Mt Rainier Lahars

Per USGS *SEDIMENTOLOGY, BEHAVIOR AND HAZARDS OF DEBRIS FLOW AT MT. RAINIER, WASHINGTON*. The most probable recurrence of a maximum lahar (Case 1) is a debris avalanche with a lahar runout that could reach the Puget Sound Lowland with a probability of 500 to 1000 years. The “Electron Mudflow” would be the most notable of these for the Puyallup basin according to USGS. The Geotech borings on this site do not indicate any Lahar type deposits on site, but do show alluvium from stream deposits. We believe this to mean that the site would most likely receive a Case II Lahar.

Case II lahar has a recurrence interval of 100 to 500 years and according to USGS “is analogous to the 100-yr flood, one widely considered for structure design and flood-plain management.” This site is out of the 100 year flood by a few hundred feet (backwater in Deer Creek to the west), but the 500 year flood may reach the site, in which case we would expect low velocity backwater flow from the Deer Creek (southwest) direction.

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Likely Lahar path to Site – City Of Puyallup Critical Areas Map

This type of flooding would have very little velocity and, computationally the seismic requirements for the tank will create a much higher lateral load to the foundation anchorage than the velocity of flood water. Design documents meeting the IBC for lateral loading will ensure that any flood velocity on site is mitigated by the tank foundation.

[4] Propane Explosivity during Lahar

Pressurized Liquid Propane (LPG) is stored at -45 degrees Fahrenheit. Above that temperature propane boils off to vapor. Propane vapor is not a pollutant according to EPA, or toxic in air according to CDC.

Propane Explosions are extremely rare as they are typically due to having a tank leak and flame entering the tank and causing the internal pressure to explode the tank. In the situation of a Lahar mud/flood flow the chances for ignition are negligible as the tank will be surrounded by water. The Maintenance and Emergency plan will ensure that the tank is secured prior to the Lahar. ASME rated tanks all have relief valve systems to ensure that tank pressure does not reach the point of tank explosion.

Propane leaks, as noted above vaporize when exposed to air. There is no environmental risk from a propane spill as the half life of propane vapor is 14 days and liquid propane cannot exist in the ambient environment.

[5] Emergency Services Requirements

The focus of this exemption is that emergency services will be required for many other areas of the City of Puyallup during a lahar event. This tank and foundation will be designed and sited such that it will not move during a lahar flood, and cannot be contacted with live power during the lahar event. The maintenance and emergency plan will ensure that power to the facility is turned off until such time as it can be safely powered.

Further, should a lahar event happen it is highly likely that residences and commercial buildings throughout the Puyallup river valley will be without power for a significant amount of time. Having another local source of LPG will provide heating and cooking gas for many homes and businesses during power outages

It is our opinion that installation of the propane tanks in the area proposed create no significant risk for explosion, or additional requirements for emergency services. The tank provides a resource for propane in the aftermath of a lahar type event.

If you have any questions please do not hesitate to call or email.

Very Truly Yours,

A handwritten signature in blue ink, appearing to read 'RM', with a horizontal line extending to the right.

Ryan Moore, PE
Vector Engineering, Inc.
360.352.2477

cc: file