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RJ Myers
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135 Rhone Street
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S.J.C. DEPARTMENT OF
JUL 11 2017
COMMUNITY DEVELOPMENT

Fire Marshal Myers,

We would like to address your letter dated 27 June, regarding the LPG storage vessel slated for Orcas Island. The final summary comments listed as **Additional Recommendations** which indicates instillation of a water suppression system for this storage vessel. We would like to address this stipulation with historical context and best current equipment technology, as well as empirical evidence pursuant to San Juan County directly.

The application of water suppression systems gained favor in the early segment of LPG fractionation and storage retention. There were valid reasons for this application within this time period due to LPG equipment limitations and varying fire suppression abilities exhibited by different first responders.

For the early decades of this industry, the standard for LPG retention in storage vessels was quite simple and somewhat unsophisticated. The equipment array consisted of a threaded excess flow valve and manual globe valve for each point of product ingress and egress. The excess flow valve was designed to "Check" any abnormally high flow rate values. This safety device worked well if the piping is severed completely, but if the piping was just cracked, the flow values may not have triggered the excess flow valve to control this outflow. The primary shut-off, manual globe valve had no thermal shut-off or remote closure components. Therefore, in an uncontrolled release of LPG back in the day, fire responders would have had to keep the vessel cool to maintain structural integrity, then under protection of fog nozzles, a responder would have physically approached the manual valve and turned it off. This was an unpleasant exercise.

Fixed water suppression eliminated on issue for the Fire Responders. This suppression system allowed them to focus on setting up the shut-off approach for manual valve closure, without having to simultaneously maintain vessel integrity and thus preventing a Boiling Liquid Expanding Vapor Explosion, or BLEVE from occurring.

Returning to the current time period and the era of positive product control, we will explain the present state of technology and the stages of implementation currently available. Although not as antiquated as the excess flow/manual shut-off valve LPG product control of the past, initial levels of code compliance is somewhat lacking in available applied technology. This “Threshold” level of compliance is found in **NFPA 58 (2014 version) 6.11** and this requirement consists of segments **6.11.2** through **6.11.5** inclusively. These segments indicate that LPG storage vessels of over 4,000 gallons water capacity are mandated to have internal-type valves with remote shut-off and thermal closure **only on liquid openings in the vessel, 1-1/4” or larger. No such requirement is stipulated for the 1-1/4” or larger vapor openings in the vessel. Additionally, this compliance level only requires one remote valve shut-off and it is to be located within 5 feet of the fuel transfer bulkhead.** Again, this is better than what was required in the past, but we are offering a better solution.

In NFPA 58 (listed in Chapter six), compliance levels become more stringent as the chapter advances from basic through maximum compliance regulations. If the “Threshold Level” is applied, later segments within Chapter six addresses additional requirements that may be stipulated. Segment **6.27 Fire Protection**, suggests different aspects of water provisions and thermal coatings that may be applied to further protect the LPG storage vessel from thermal denigration. In the draft hearings for the re-writing of NFPA 58, these fire protection stipulation were introduced because Fire First Responders and Code Enforcement Members of the NFPA committee were opposed to the inclusion of **6.11.2** through **6.11.5** as they thought it somewhat deficient in scope.

Fire Responders and Code Enforcement Staff were mostly in agreement with a large segment of the LPG industry in advancing the next segment of Chapter Six. This most stringent method of LPG storage installation is listed in **6.28 Alternate Provisions for Installation of ASME Containers**. In the “Hard Bound” version of NFPA 58, there is commentary on the reasons behind the Standards Writing Committee’s reasons for included language, and I will quote this introduction. ***“Section 6.28 allows alternative installation methods that provide incentive to construct facilities that are designed to a high level of safety. These incentives may involve the reduction of distance requirements and the easing of special protection requirements. The term used in this section, redundant fail-safe product control measures (RFPCM) is self-explanatory.***

This section was first introduced into the code in the 1998 edition to recognize the increased safety of using redundant systems to control product flow, and it provides a tradeoff allowing reduced installation distances where additional safety devices are installed. Some of the components required to achieve RFPCM have since been added to 5.7.4 and are now routinely used”.

We actually design and build to the section **6.28.4 Redundant Fail-Safe Product Control**. Paraphrasing some of the differences between threshold compliance and the RFSPC design, we protect ALL liquid and vapor openings in the vessel with internal-type pneumatic valves. We provide the standard pneumatic shut-off within 5 feet of the fuel transfer bulkhead and a second, remotely-located shut-off that is greater than 25 feet away, but less than 100 feet away. These internal valves have an excessive flow element, they provide bubble-tight shut-off capacity and are spring-loaded to the closed position, with both internal and external multiple springs. The pneumatic nitrogen pressure is used to open the valves, allowing fuel transfer. When the propane company is not actively transferring fuel, all these valves are left in the closed position. We also incorporate fusible elements into the nitrogen valve opening system. If these fusible elements are subjected to thermal impingement, the frangible elements will melt and discharge the motive pressure needed to keep the internal valves open, allowing them to automatically close. Code states these frangible elements must fail and vent motive pressure at a maximum of 250 degrees F and ours actually dissociate and vent motive pressure at 212 degrees F. These protections extend to all openings in the storage vessel that allow ingress or egress of LPG vapor or liquid. The distillation from this design is if there is a problem and a fire starts, the valves will automatically close once contacted by the flames.

If there is no fuel, there is no fire, therefore your volunteer Fire Department will not face a raging conflagration if and when they arrive at this site. Additionally, I might suggest that when I calculated the square footage of this vessel, the requisite water gallonage was slightly under 500 GPM. This was calculated as if the entire vessel structure was fully involved. I prior events with antiquated vessel valves and no thermal closure, typically one end or one half of the vessel was receiving thermal impingement. In practice, a value of 2/3 of the 500 GPM would be necessary, as an observation.

I would suggest that personal history be observed within San Juan County as a precedent. We placed the first skidded vessel on Mullis Street for David Morehouse nearly 25 years ago. We placed another one on Mullis for Vanderyacht Propane and a third one at Roche Harbor years ago. Last year we set another one for Inter-Island Propane just across from the fairgrounds, on Argyle Street. There never has been a problem or incident with our engineering or execution.

Now other people had provided equipment to Orcas Island in the past that may or may not have had the same level of engineering as our equipment includes. I did not view that particular equipment, but I do know that a loss of fuel occurred. Our design does take into account a potential "Drive-away" situation and we use "Moment Release Nipples" in the vertical aspect of the transfer hose connections. These are designed to release if lateral "Drive-away" forces impinge upon these attachments. Additionally, these release nipples have stainless steel cables attached to them and course to a pneumatic closure switch behind the fuel transfer bulkhead. In the event of a drive-away, the cables will cause the pneumatic switch to close, venting motive pressure from the nitrogen system allowing the valves to close behind the fuel transfer bulkhead. Furthermore, newer trucks are designed to a standard that if the filling hoses are connect between the storage and the truck, the driver is unable to un-lock the air-brakes to move the truck. These developments are there to insure a drive-away does not occur.

We are not proposing the same situation that was present before on Orcas Island. There is not one properly designed LPG storage facility in the County that water suppression was needed or required. I was present at the primary meeting when Petro San Juan petitioned placement on that first skid tank on Mullis, at the "S" curve. These are the same superior engineering standards I presented at that time and they have only improved since then.

Thank you,
Arch Hudelson