

## APPENDIX K: SEPARATION DISTANCES FOR MINOR RELEASE WITH FIRE SCENARIOS

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Thermal radiation (heat) flux standards have been established by the U.S. Department of Housing and Urban Development (HUD) for establishing Acceptable Separation Distances (ASDs) for buildings and people for HUD-funded projects. While adherence to ASDs is not a requirement for the WesPac Pittsburg Energy Infrastructure Project (project), the ASDs established for HUD projects provide a data point that can be compared with risks posed by the project.

The thermal radiation flux standards established by HUD for calculating ASDs are 31.5 kilowatt per square meters ( $\text{KW}/\text{m}^2$ ) for buildings and 1.4  $\text{KW}/\text{m}^2$  for people. The 31.5  $\text{KW}/\text{m}^2$  standard for buildings is designed such that even old wood structures that are not fire resistant can resist fire for at least 15 minutes, allowing time for fire department response. The thermal flux standard for people is designed for application to places where people congregate in open spaces such as parks and playgrounds. The 1.4  $\text{KW}/\text{m}^2$  standard for people is about 40 percent stronger than directly overhead sunshine on a cloudless day. This level of thermal flux can cause discomforting heat and redness of the skin and is low enough such that people can readily egress to safety if uncomfortable levels of heat are experienced.

ASDs are the calculated minimum distances at which the HUD thermal flux standards for buildings and people are met. Table 1 provides the HUD ASDs for minor release with fire scenarios, also discussed in Impact HM-5. For each of the nearby receptors, Table 1 provides a most likely fire scenario and a shortest separation distance fire scenario. The most likely fire scenario considers a fire occurring on the side of the tank where the tank fill/suction lines would be located. For the East Tank Farm, these locations are on the western side of the tanks (i.e., southwest side of Tanks Nos 1, 3 and 5, and northwest side of Tanks Nos 2, 4 and 6), which is the far side of the tanks compared to the nearby residential and public use areas (refer to Figure 1). For the South Tank Farm, Tank No 9 is closest to offsite receptors and is designed with the fill/suction lines on the southeast side (refer to Figure 2).

For analysis of ASD, the small release with fire scenario is considered to range from a small valve pit fire up to involvement of 25 percent of the tank circumference. The release/fire diameter shown in Table 1 is the apparent width of the maximum fire (25 percent of the tank circumference involved) as viewed from the receptor, consistent with the methodology in NIST 2000. ASDs in Table 1 were interpolated from Figure 11 in NIST 2000 (attached) using the indicated Release/Fire Diameter and a Heat Release Rate of 1900  $\text{kW}/\text{m}^2$  for crude oil). The calculated ASD is the distance from the minor release with fire scenario at which the 31.5  $\text{kW}/\text{m}^2$  and 1.4  $\text{kW}/\text{m}^2$  thermal flux for structures and persons, respectively, would be expected to occur. If a fire occurs that is not promptly extinguished, the thermal flux would build up to this level over the period of time it takes for the incipient release and fire to expand to the configurations shown for the scenarios evaluated (Figures 1 through 4). No thermal flux hazard would occur offsite unless and until flames to begin substantially exceed the height of the secondary containment features that would otherwise obstruct the heat radiation. As shown in Table 1, for the most likely fire scenarios, the separation distance is greater than the HUD ASD for structures in all cases, and for people in all cases except for the ASD for people is not met in

the closest areas of Marina Park. If a fire were to occur at Tank No. 9 as depicted in Figure 2, heat flux could build up to a level in adjacent areas of Marina Park that could exceed the HUD thermal radiation flux standard for people in outdoor areas. If this fire scenario were ever to occur, it is anticipated that proximal areas of Marina Park would be evacuated for safety regardless of thermal flux levels.

Table 1 also includes a Shortest Distance Scenario that is unlikely, but is considered as a worst-case scenario for a small release with fire. The Shortest Distance Scenario also considers that up to 25 percent of the tank circumference may be involved in the fire, but the placement is as close as possible to the receptor within secondary containment (refer to Figures 3 and 4). As shown in Table 1, for the most Shortest Distance Scenario, the separation distance is greater than the HUD ASD for structures in all cases. The separation is also greater than the HUD ASD for people at nearby schools and the extended care facility, but is less than the HUD ASD for people at Marina Park, Pittsburg Marina, Riverview Park, and the closest residence receptor. If a fire were to occur on the proximal side of the tank closest to any of these receptors, heat flux could build up to a level in adjacent areas that would exceed the HUD thermal radiation flux standard for people. If this fire scenario were ever to occur at one of these locations, it is anticipated that adjacent areas would need to be evacuated.

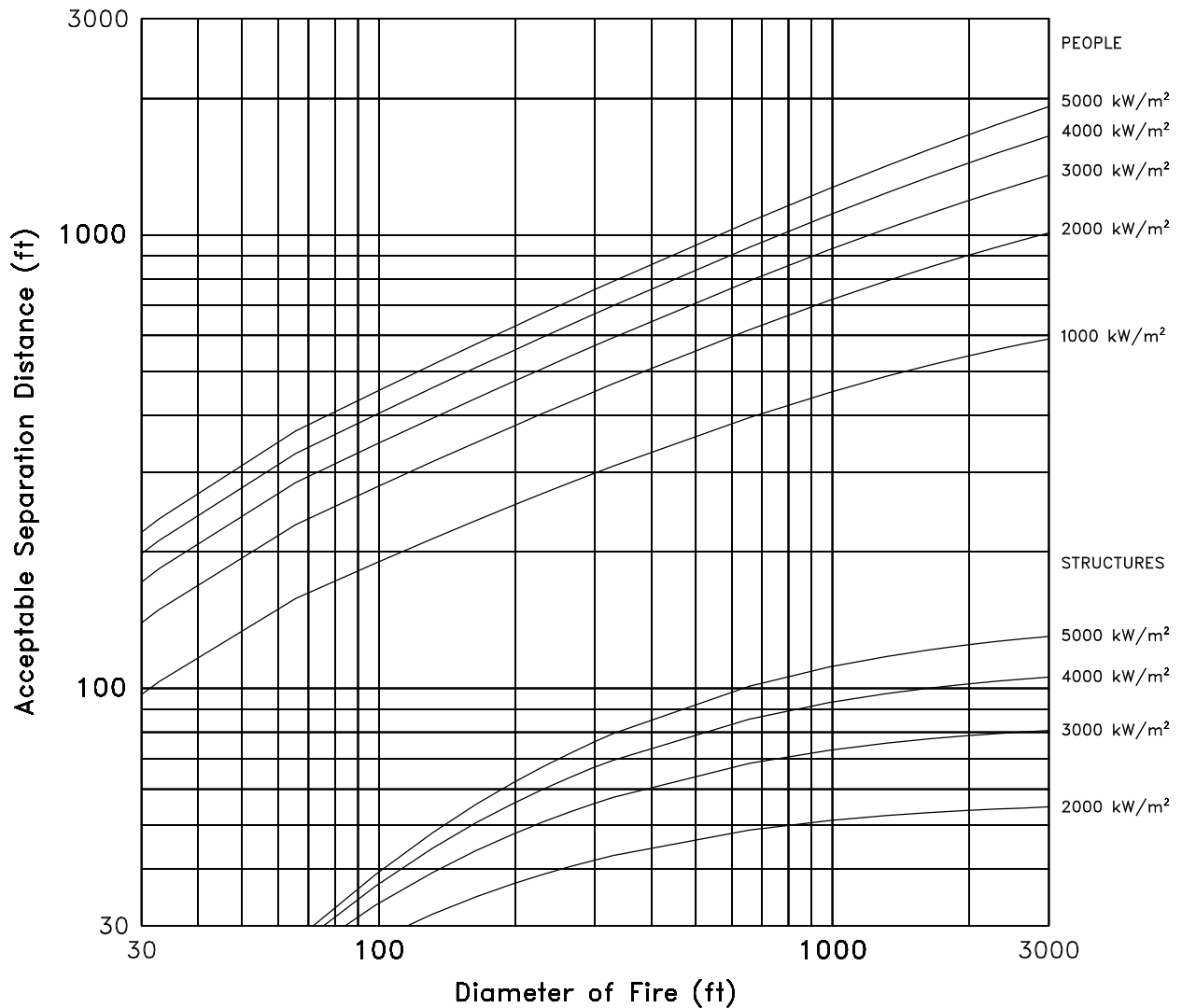
**Table 1: U.S. Department of Housing and Urban Development Acceptable Separation Distances for Minor Release with Fire Scenarios**

Release Location	Receptor Location	Release/Fire Diameter (feet)	Acceptable Separation Distance (feet)		Release Scenario Distance (feet)	Acceptable Separation Distance Achieved (Yes/No)	
			Structures	People		Structures	People
<i>Most Likely Scenario<sup>1</sup></i>							
South Tank Farm	Marina Park	220	40	400	260	Yes	No
South Tank Farm	St. Peter Martyr School and Extended Care Facility	220	40	400	650	Yes	Yes
East Tank Farm	Marina Park	70	30	230	290	Yes	Yes
East Tank Farm	St. Peter Martyr School and Extended Care Facility	70	30	230	580	Yes	Yes
East Tank Farm	First Baptist Head Start	70	30	230	510	Yes	Yes
East Tank Farm	Pittsburg Marina	70	30	230	330	Yes	Yes
East Tank Farm	Riverview Park	70	30	230	420	Yes	Yes
East Tank Farm	Nearest Resident	70	30	230	300	Yes	Yes

Release Location	Receptor Location	Release/Fire Diameter (feet)	Acceptable Separation Distance (feet)		Release Scenario Distance (feet)	Acceptable Separation Distance Achieved (Yes/No)	
			Structures	People		Structures	People
<i>Shortest Distance Scenario</i>							
South Tank Farm	Marina Park	220	40	400	150	Yes	No
South Tank Farm	St. Peter Martyr School and Extended Care Facility	220	40	400	550	Yes	Yes
East Tank Farm	Marina Park	200	40	380	150	Yes	No
East Tank Farm	St. Peter Martyr School and Extended Care Facility	200	40	380	380	Yes	Yes
East Tank Farm	First Baptist Head Start	200	40	380	380	Yes	Yes
East Tank Farm	Pittsburg Marina	200	40	380	170	Yes	No
East Tank Farm	Riverview Park	200	40	380	300	Yes	No
East Tank Farm	Nearest Resident	200	40	380	150	Yes	No

Source: U.S. Department of Housing and Urban Development

<sup>1</sup>Most likely scenario considers release occurring on the tank side where the fill suction lines and isolation valves are located.



**Figure 11: Acceptable Separation Distance (ASD) from nearly cylindrical fires resulting from spills of hazardous liquids, English units. The upper curves are ASDs for people, the lower curves for combustible structures. The numbers associated with each curve are heat release rates per unit area of burning surface,  $\dot{q}_f''$ , in units of kW/m<sup>2</sup>. These values for various fuels are obtained from Table 1.**