

BLEVE – SAFETY PRECAUTIONS

Use with caution The following table gives a summary of tank properties, critical times, critical distances and cooling water flow rates for various tank sizes. This table is provided to give responders some guidance but it should be used with caution.

Tank dimensions are approximate and can vary depending on the tank design and application.

Minimum time to failure is based on **severe torch fire impingement** on the vapor space of a tank in good condition, and is approximate. Tanks may fail earlier if they are damaged or corroded. Tanks may fail minutes or hours later than these minimum times depending on the conditions. It has been assumed here that the tanks are not equipped with thermal barriers or water spray cooling.

Minimum time to empty is based on an engulfing fire with a properly sized pressure relief valve. If the tank is only partially engulfed, then time to empty will increase (i.e., if tank is 50% engulfed, then the tanks will take twice as long to empty). Once again, it has been assumed that the tank is not equipped with a thermal barrier or water spray.

Tanks equipped with thermal barriers or water spray cooling significantly increase the times to failure and the times to empty. A thermal barrier can reduce the heat input to a tank by a factor of ten or more. This means it could take ten times as long to empty the tank through the Pressure Relief Valve (PRV).

Fireball radius and emergency response distance is based on mathematical equations and is approximate. They assume spherical fireballs and this is not always the case.

Two safety distances for public evacuation. The minimum distance is based on tanks that are launched with a small elevation angle (i.e., a few degrees above horizontal). This is most common for horizontal cylinders. The preferred evacuation distance has more margin of safety since it assumes the tanks are launched at a 45 degree angle to the horizontal. This might be more appropriate if a vertical cylinder is involved.

It is understood that these distances are very large and may not be practical in a highly populated area. However, it should be understood that the risks increase rapidly the closer you are to a BLEVE. Keep in mind that the furthest reaching projectiles tend to come off in the zones 45 degrees on each side of the tank ends.

Water flow rate is based on $5(\sqrt{\text{capacity (USgal)}}) = \text{USgal/min}$ needed to cool tank metal.

Warning: the data given are approximate and should only be used with extreme caution. For example, where times are given for tank failure or tank emptying through the pressure relief valve – these times are typical but they can vary from situation to situation. Therefore, never risk life based on these times.

WARNING:

The data given are approximate and should only be used with extreme caution. These times can vary from situation to situation LPG tanks have been known to BLEVE within minutes. Therefore, never risk life based on these times.

**BLEVE
(USE WITH CAUTION)**

| Capacity | | Diameter | Length | Propane Mass | Minimum time to failure for severe torch | Approximate time to empty for engulfing fire | Fireball radius | Emergency response distance | Minimum evacuation distance | Preferred evacuation distance | Cooling water flow rate | |
|------------------|---------------|---------------|--------------------|--------------|--|--|-----------------|-----------------------------|-----------------------------|-------------------------------|-------------------------|-----------|
| Litres (Gallons) | Meters (Feet) | Meters (Feet) | Kilograms (Pounds) | Minutes | Minutes | Meters (Feet) | Meters (Feet) | Meters (Feet) | Meters (Feet) | Meters (Feet) | Litres/min | USgal/min |
| 100 (26.4) | 0.3 (1) | 1.5 (4.9) | 40 (88) | 4 | 8 | 10 (33) | 90 (295) | 154 (505) | 307 (1007) | 97 | 26 | |
| 400 (106) | 0.61 (2) | 1.5 (4.9) | 160 (353) | 4 | 12 | 16 (53) | 90 (295) | 244 (801) | 488 (1601) | 195 | 51 | |
| 2000 (528) | 0.96 (3.2) | 3 (9.8) | 800 (1764) | 5 | 18 | 28 (92) | 111 (364) | 417 (1368) | 834 (2736) | 435 | 115 | |
| 4000 (1057) | 1 (3.3) | 4.9 (16.1) | 1600 (3527) | 5 | 20 | 35 (115) | 140 (459) | 525 (1722) | 1050 (3445) | 615 | 163 | |
| 8000 (2113) | 1.25 (4.1) | 6.5 (21.3) | 3200 (7055) | 6 | 22 | 44 (144) | 176 (577) | 661 (2169) | 1323 (4341) | 870 | 230 | |
| 22000 (5812) | 2.1 (6.9) | 6.7 (22) | 8800 (19400) | 7 | 28 | 62 (203) | 247 (810) | 926 (3038) | 1852 (6076) | 1443 | 381 | |
| 42000 (11095) | 2.1 (6.9) | 11.8 (38.7) | 16800 (37037) | 7 | 32 | 77 (253) | 306 (1004) | 1149 (3770) | 2200 (7218) | 1994 | 527 | |
| 82000 (21662) | 2.75 (9) | 13.7 (45) | 32800 (72310) | 8 | 40 | 96 (315) | 383 (1257) | 1435 (4708) | 2200 (7218) | 2786 | 736 | |
| 140000 (36984) | 3.3 (10.8) | 17.2 (56.4) | 56000 (123457) | 9 | 45 | 114 (374) | 457 (1499) | 1715 (5627) | 2200 (7218) | 3640 | 962 | |