

(ii) The containers are subdivided by intervening barriers, such as diking, that prevent mixing.

(iii) If paragraph (a)(2)(i) or (ii) of this section apply, a launch site operator shall use the quantity of propellant requiring the greatest separation distance pursuant to paragraph (b) of this section to determine the minimum separation distance between the explosive hazard facility and all other explosive hazard facilities and each public area.

(3) Where two or more containers of incompatible liquid propellants will be handled or stored together in an explosive hazard facility, a launch site operator shall determine the explosive equivalent in pounds of the combined liquids, using the formulas provided in appendix E, table E-2, to determine the minimum separation distance between the explosive hazard facility and other explosive hazard facilities and public areas unless the containers are separated one from the other by the appropriate distance as determined in paragraph (b)(3) of this section. A launch site operator shall then use the quantity of liquid propellant requiring the greatest separation distance to determine the minimum separation distance between the explosive hazard facility and all other explosive hazard facilities and each public area.

(4) A launch site operator shall convert quantities of liquid propellants from gallons to pounds using the conversion factors provided in appendix E, table E-3 and the following equation:

Pounds of propellant = gallons × density of propellant (pounds per gallon).

(b) A launch site operator shall use appendix E, table E-3 to determine hazard and compatibility groups and shall separate liquid propellants from each other and from each public area using distances no less than those provided in appendix E, tables E-4 through E-7 in accordance with the following:

(1) A launch site operator shall measure minimum separation distances from the hazard source in an explosive hazard facility, such as a container, building, segment, or positive cutoff point in piping, closest to each explosive hazard facility.

(2) A launch site operator shall measure the minimum separation distance between compatible liquid propellants using the “intragroup and compatible” distance for the propellant quantity and hazard group that requires the greater distance prescribed by appendix E, tables E-4, E-5, and E-6.

(3) A launch site operator shall measure the minimum separation distance between liquid propellants of different compatibility groups using the “public area and incompatible” distance for the propellant quantity and hazard group that requires the greater distance provided in appendix E, tables E-4, E-5, and E-6, unless the propellants of different compatibility groups are subdivided by intervening barriers that prevent mixing. If such barriers are present, the minimum separation distance shall be the “intragroup and compatible” distance for the propellant quantity and group that requires the greater distance provided in appendix E, tables E-4, E-5, and E-6.

(4) A launch site operator shall separate liquid propellants from each public area using a distance no less than the “public area and incompatible” distance provided in appendix E, tables E-4, E-5, and E-6.

(5) A launch site operator shall separate each explosive hazard facility that contains liquid propellants where explosive equivalents apply pursuant to paragraph (a)(3) of this section from all other explosive hazard facilities of a single customer using the intraline distance provided in appendix E, table E-7, and from each public area using the public area distance provided in appendix E, table E-7.

**§ 420.69 Solid and liquid propellants located together.**

(a) A launch site operator proposing an explosive hazard facility where solid and liquid propellants are to be located together shall determine the minimum separation distances between the explosive hazard facility and other explosive hazard facilities and public areas in accordance with one method provided in paragraphs (b), (c), or (d) of this section.

(b) A launch site operator shall determine the minimum separation distances between the explosive hazard facility and all other explosive hazard facilities and public areas required for the liquid propellants in accordance with section 420.67(b)(5), and add the minimum separation distances between the explosive hazard facility and all other explosive hazard facilities and public areas required for the solid propellants in accordance with section 420.65, treating the solid propellants as explosive division 1.1.

(c) A launch site operator shall determine the minimum separation distances between the explosive hazard facility and all other explosive hazard facilities and public areas required for the liquid propellants in accordance with section 420.67(b)(5), and add the minimum separation distances between the explosive hazard facility and all other explosive hazard facilities and public areas required for the solid propellants in accordance with section 420.65, using the explosive equivalent of the explosive division 1.3.

(d) A launch site operator shall conduct an analysis of the maximum credible event (MCE), or the worst case explosion that is expected to occur. If the MCE shows that there will be no simultaneous explosion reaction of the liquid propellant tanks and the solid propellant motors, then the minimum distance between the explosive hazard facility and all other explosive hazard facilities and public areas must be based on the MCE.

#### § 420.71 Lightning protection.

(a) *Lightning protection.* A licensee shall ensure that the public is not exposed to hazards due to the initiation of explosives by lightning.

(1) *Elements of a lightning protection system.* Unless an explosive hazard facility meets the conditions of paragraph (a)(3) of this section, all explosive hazard facilities shall have a lightning protection system to ensure explosives are not initiated by lightning. A lightning protection system shall meet the requirements of this paragraph and include the following:

(i) *Air terminal.* An air terminal to intentionally attract a lightning strike.

(ii) *Down conductor.* A low impedance path connecting an air terminal to an earth electrode system.

(iii) *Earth electrode system.* An earth electrode system to dissipate the current from a lightning strike to ground.

(2) *Bonding and surge protection.* A lightning protection system must meet the requirements of this paragraph and include the following:

(i) *Bonding.* All metallic bodies shall be bonded to ensure that voltage potentials due to lightning are equal everywhere in the explosive hazard facility. Any fence within six feet of a lightning protection system shall have a bond across each gate and other discontinuations and shall be bonded to the lightning protection system. Railroad tracks that run within six feet of the lightning protection system shall be bonded to the lightning protection system.

(ii) *Surge protection.* A lightning protection system shall include surge protection to reduce transient voltages due to lightning to a harmless level for all metallic power, communication, and instrumentation lines entering an explosive hazard facility.

(3) *Circumstances where no lightning protection system is required.* No lightning protection system is required for an explosive hazard facility when a lightning warning system is available to permit termination of operations and withdrawal of the public to public area distance prior to an electrical storm, or for an explosive hazard facility containing explosives that cannot be initiated by lightning. If no lightning protection system is required, a licensee must ensure the withdrawal of the public to a public area distance prior to an electrical storm.

(4) *Testing and inspection.* Lightning protection systems shall be visually inspected semiannually and shall be tested once each year for electrical continuity and adequacy of grounding. A licensee shall maintain at the explosive hazard facility a record of results obtained from the tests, including any action taken to correct deficiencies noted.

(b) *Electrical power lines.* A licensee shall ensure that electric power lines at its launch site meet the following requirements: