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Agricultural Storage Fires

FINDINGS

- 11,500 agricultural storage fires each year have a very high dollar loss per fire, both because of the cost of the structure and because of the loss of its contents.
- Open flame is the leading cause (24%) of agricultural storage fires. Arson is also a major cause (17%).
- 61% of all storage fires are in barns or stables.
- Storage fires often start in the structure's framing.
- Silo fires, which may be prone to spontaneous combustion of stored goods, are particularly dangerous and difficult to extinguish.

Nearly 11,500 fires in agricultural storage facilities—barns, stables, silos, grain elevators—are reported each year. These fires cause an average of 100 injuries, 10 fatalities, and $249.7 million in property loss.[1] Silo fires are particularly difficult for firefighters and have proved deadly in the past.

Agricultural storage fires are less deadly than other fires, but they cause five times more damage (Figure 1). This may be due to the loss of revenue that results from the destruction of agricultural goods in combination with structural damage to the storage facility itself.

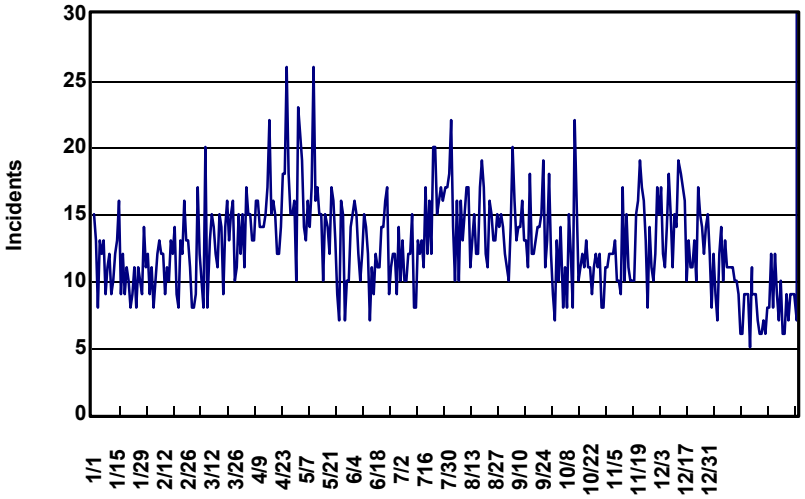
Figure 1. Loss Measures for Storage Fires
(3-year average, 1996–1998 NFIRS data, all reported fires)

MEASURE	ALL FIRES	AGRICULTURAL STORAGE FIRES
Dollar Loss/Fire	$5,619	$28,136
Injuries/1,000 Fires	15.7	8.6
Fatalities/1,000 Fires	2.4	1.2

The incidence of agricultural storage fires is relatively consistent during the year, with some fluctuation from season to season (early spring, summer, and fall) (Figure 2). April experiences the highest incidence of agricultural storage fires, and December has the lowest.

Figure 2. Agricultural Storage Fires

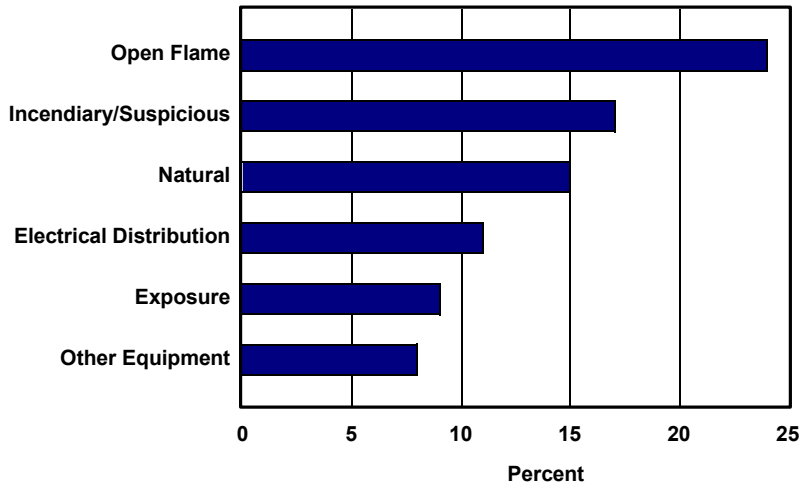
(all fires, adjusted %, 3-year average (1996–98) from NFIRS data)



The leading causes of agricultural storage fires, shown in Figure 3, are incendiary/suspicious (arson); open flame, including candles, matches, bonfires, and welding equipment; and natural sources, including spontaneous combustion and lightning. Agricultural storage fires are more likely to involve a natural ignition source than other fires on agricultural properties. One explanation for this is that stored grain is inherently combustible and prone to spontaneous ignition.

Figure 3. Leading Causes of Agricultural Storage Fires

(all fires, adjusted %, 3-year average (1996–98) from NFIRS data)



Because of the high incidence of electrical fires in storage facilities, the structure framing is one of the leading areas of fire origin. A possible scenario is that when a fuse short circuits, it causes a spark that ignites the structural members surrounding it. More than half of all agricultural fires occur in barns or stables, which helps explain the high incidence of fires involving structural framing (Figure 4).

Figure 4. Where Agricultural Storage Fires Start

(all fires, adjusted %, 3-year average (1996–98) from NFIRS data)

AREA	PERCENT
Barns, Stables	61
Seeds, Beans, Nuts (Processing)	15
Supply Storage	11
Grain Elevators	6

As noted, silo fires are particularly challenging to firefighters. In August 1993, two firefighters were killed when they applied water and firefighting foam to a fire in an oxygen-limited silo.

The resulting explosion blew off the silo's roof, throwing one firefighter more than 100 yards and another through the roof of an adjacent building.[2]

Silos enclose and protect silage—a combination of corn, legumes, and grasses used for animal feed. To avoid fermentation and spoilage, silos are designed to keep air and water out. Some silos are sealed to prevent oxygen from entering. Openings at the top and bottom are normally sealed with rubber gaskets. When these hatches are tightly closed, the oxygen concentration in the silo should be insufficient to support a fire. If they are left open or are not properly maintained, however, spontaneous combustion can occur. This situation causes a smoldering fire, which then causes the accumulation of combustible gasses. Any additional increase in oxygen content creates an explosive atmosphere. Opening the top of a silo or applying water to extinguish a fire can cause an explosion.[3]

NOTES

1. National estimates are based on National Fire Incident Reporting System (NFIRS) data (1996–1998) and the National Fire Protection Association's (NFPA) annual survey, *Fire Loss in the United States.*
2. Prather, Timothy, *Silo Fire—Costly, Frustrating, and Even Deadly*, University of Tennessee Agricultural Extension Service, August 1993.
3. *Preventing Fatalities Due to Fires and Explosions in Oxygen-Limiting Silos*, NIOSH Alert, July 1986.

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