

## **2009 Summary of Grain Entrapments in the United States**

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Purdue University's Agricultural Safety & Health Program has been documenting grain entrapment<sup>1</sup> cases since 1978. Nearly 800 fatal and non-fatal grain entrapment cases have been documented and entered into a National Grain Entrapment Database, with the earliest case dating back to 1964. This article summarizes reported grain entrapment cases documented during 2009 with observations concerning the increasing frequency of these events.

Based upon the cases documented to date, no fewer than 38 grain entrapments occurred in 2009. This is the highest recorded number since 1993 when 42 were documented. The total compared to 33 and 34 cases documented during 2007 and 2008 respectively.

Disturbingly, the trend for this type of incident, unlike many other types of farm-related injuries and fatalities, is not improving. Between 1994 and 2002, the five-year average decreased from a record of 29.2 recorded entrapments per year to 18.8 (the lowest since 1987). Since 2002, however, the five-year average has increased steadily to 28.4 incidents per year in 2008 and 31.2 in 2009 which is an increase of nearly 66%.

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<sup>1</sup> Flowing grain entrapments include both fatal engulfments and partial entrapments that required assistance in order for the victim to be extricated.

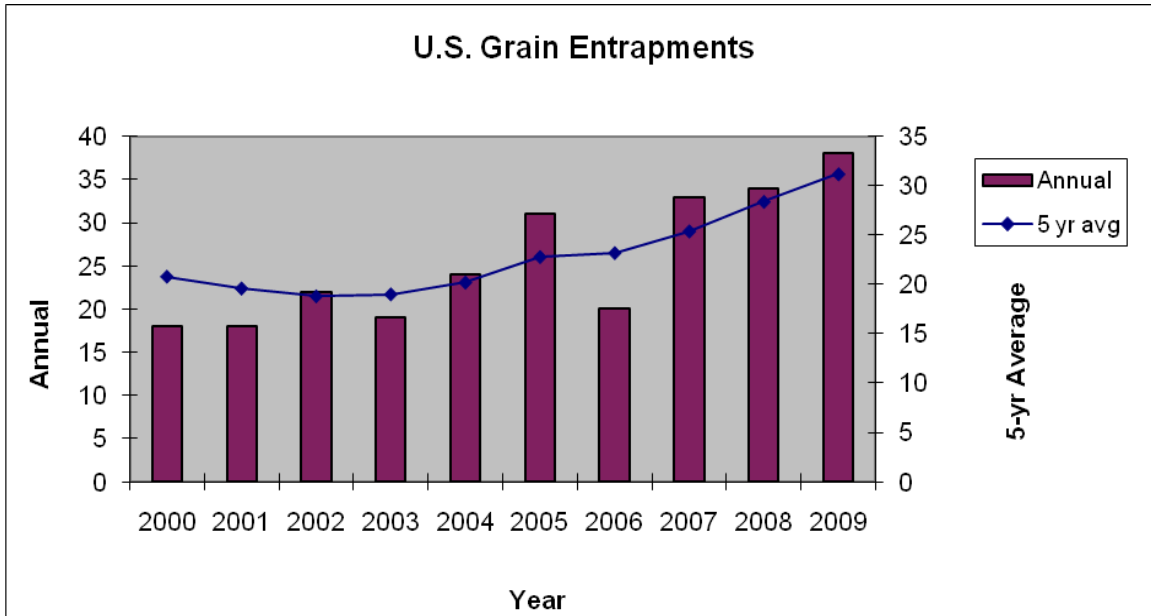


Figure 1. Number of annual grain entrapments recorded in the National Grain Entrapment Database and 5-year average between 2000 and 2009.

As in past years, it should be noted that this summary does not reflect all grain-related entrapments, fatal or non-fatal that have occurred, due to the lack of a comprehensive reporting system and a continued reluctance on the part of some victims and employers to report partial entrapments where extrication was required but no public report was made. Based upon the ratio of non-fatal to fatal incidents documented in Indiana over the past 30 years, which has had an aggressive surveillance program to identify these events, the total number of actual cases could be 20-30 percent greater nationwide.

In 2009, the states with the most grain documented entrapments, fatal and non-fatal, were Minnesota (9), Iowa (5), Illinois (5), and Indiana (5). This geographic distribution parallels the long-term trend for these events to occur primarily in the Corn Belt. Overall, entrapments were documented in 13 states in 2009.

Historically, 70% of all documented entrapments have occurred on farms with the balance taking place at commercial grain facilities. Beginning in 2007 and 2008 this distribution of cases has changed substantially with 49% now occurring on farms and 51% taking place at commercial sites. In 2009 the cases reflect more historic trends. Where the locations was known, the 11 (37%) entrapments occurred at commercial facilities and 19 (63%) entrapments were on farms; the location was unknown for 8 cases.

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All documented victims were male, and there is a trend towards more managerial level employees/operators/owners being involved in entrapments.

In 2008 and 2009 the ratio of fatalities to non-fatal incidents decreased when compared to earlier years. From 1964-2005, 74% of entrapments resulted in death. During 2008, 45% of the entrapments resulted in death. In 2009, 42% of the entrapments resulted in death. It is believed that more victims may be surviving these incidents due to increased emphasis on safer confined space entry procedures, such as, using an observer during confined space entry, and an increased emphasis on first responder training on grain entrapment extrication. At least three of the incidents documented in 2009 involved extrication using commercially available grain rescue tubes which were not widely available until 2007/2008.

During 2009, the primary medium of entrapment remained yellow corn. Over the past thirty years corn has been involved in approximately 45% of the grain-related entrapments where the medium was known. Other bulk materials that were documented in entrapments included soybeans, wheat, milo, processed feed, and soybean meal.

The primary causes leading to entrapment of most victims were identified as entering a bin to loosen crusted, spoiled or frozen grain while unloading equipment was running, or falling into grain transport vehicles while they were being either loaded or unloaded. There continues to be a direct relationship between out-of-condition grain and a greater probability of entrapment.

The 2009 crop was record in size<sup>2</sup> and in several regions was harvested under less than ideal conditions, resulting in more reports of out-of-condition or spoiled grain in storage and increased incidents of plugged flow. In addition, the domestic corn demand for ethanol has resulted in the largest build up of storage capacity across the Midwest in history. These factors will result in more corn being stored for longer periods of time than in past years and possibly an increased potential for grain entrapments unless there is a change in current work practices. An industry wide consensus should be reached on the need for and development of an engineering safety standard for grain storage structures. The commercial grain industry and grain bin manufacturers are urged to increase their

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<sup>2</sup> According to USDA, corn harvested in 2009 amounted to 13.15 billion bushels and soybeans harvested were 3.36 billion bushels.

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employee and farmer/customer education efforts to prevent grain entrapments from occurring. In addition, there is the need to strengthen employee and emergency responder training efforts to assure having in place appropriate response strategies in case of grain entrapments. Excellent training resources such as the videos “Don’t Go with the Flow” and “Your Safety Matters” are available from the National Grain & Feed Association ([www.ngfa.org](http://www.ngfa.org)), which were developed in response to the observed upswing in grain entrapment incidents at commercial fatalities during the early 1990s. More farmer/producer oriented safety resources are now available from many county-level Extension offices and at sites, such as [www.grainquality.org](http://www.grainquality.org).

Every flowing grain entrapment is a preventable incident. The record 2009 crop should be a reason to celebrate and not the cause for tragedy and sorrow. The grain entrapment problem can be addressed through the use of appropriately designed storage facilities, proper use of personal protective equipment, implementation of safe work practices and having in place effective emergency response capabilities.

*Note: This summary was compiled by Matt Roberts and Bill Field, Department of Agricultural & Biological Engineering, Purdue University. For additional information on grain entrapments, contact Bill Field at 765-494-1191.*