# Pre- and Post-Test Key with Brief Explanations

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| 1. Answer - c | There are approximately 30-40 documented entrapments per year. The peak was 59 in 2010. |
| 1. Answer – d | First responders face a wide variety of potential hazards at the scene of a grain entrapment including: falls, exposure to toxic dust and atmospheres, over exertion, heat stress, and even secondary entrapment. |
| 1. Answer – b | The most common grain involved with entrapment has been corn which has a greater tendency to go out of condition. |
| 1. Answer – a | Nearly all on-farm grain storage structures are considered exempt from compliance with OSHA safety regulations, including the provisions of CFR 1910.272 – Grain Handling Standard. |
| 1. Answer – d | A grain entrapment victim may experience a variety of injuries that will need attention at the scene. These include: dust inhalation and blocked air ways, hypothermia due to the low temperature of the grain, high levels of anxiety, and possible injuries due to contact with augers found in or on the floor of the structure. |
| 1. Answer – c | The most frequently identified cause of death due to grain engulfment is asphyxiation due to the grain blocking the nose and mouth. |
| 1. Answer – a | There are documented cases in which victims have been fully engulfed in grain for periods exceeding an hour and survive. These are, however, extremely rare. |
| 1. Answer – a | Attempting to forcefully pull an entrapped victim from grain has the potential of causing severe injuries to the joints and spine. The grain should be removed from around the victim prior to victim extrication. |
| 1. Answer – b | The most common type of grain entrapment is when the victim is drawn into the inflowing grain directly over the outlet in the floor. Incidents in which the victim falls through a crusted surface of grain are relatively rare. |
| 1. Answer – a | Grain when piled or allowed to stand freely forms an angle of repose of 25-30⁰. This angle can vary due to the type of grain and its moisture content. |
| 1. Answer – d | When cutting grain bin panels, first responders must wear appropriate personal protective equipment to avoid injury. This includes eye and face protection due to flying debris, hearing protection if power saws are used, and respiratory protection due to the zinc coating found on the grain bin panels. |
| 1. Answer – c | Of the steps listed, the first that should be taken at the scene of a grain entrapment is to shut down, turn off, and lockout all grain handling equipment to prevent further entrapment of the victim or secondary entrapments. |
| 1. Answer – b | The unloading grain moves fastest directly over the opening or well in the floor of the structure. The grain flow is slowest around the wall or outer edges of the grain mass. |
| 1. Answer – d | Almost no on-farm grain storage bins were designed with anchor points that meet the current OSHA regulations for fall protection or lifeline use. Bin ladder rungs or supports, roof supports, or grain distributor supports are not strong enough to be used as an anchor point for rescues or fall protection. |
| 1. Answer – d | A grain rescue tube serves several functions including reducing the horizontal grain pressure on the victim, isolating the victim from the surrounding grain so that less grain needs to be removed to extricate the victim, and protecting the victim from deeper entrapment due to avalanching grain disturbed by first responders |
| 1. Answer – d | Cutting open a large capacity grain storage structures, over 100,000 bushels can lead to unintended consequences with the potential of causing injuries or deaths. These include a catastrophic failure of the structure, unintended movement of the victim within the grain making locating more difficult, and secondary entrapment of first responders either in the structure or on the ground. |
| 1. Answer – b | The use of heat generating cutting equipment, such as a torch to cut open the steel panels of a grain bin has been a controversial topic. However, it has been the most frequently used technique in the past to rapidly remove grain from smaller bins to expedite rescue. No incident has been documented in which the use of a torch has caused an explosion. As with all heat generating equipment precautions, however, are needed. |
| 1. Answer – b | At no time should the unloading system of a grain storage structure be used to move grain from around an entrapped victim. Not only will the victim be drawn deeper into the grain, but the forces on him or her while in a body harness may cause bodily injury. |
| 1. Answer – c | The type of auger most frequently involved in entrapments inside a grain bin are unguarded, in floor augers installed under the bin floor. When the opening above the auger is unguarded, a worker can step into the opening resulting in entanglement. Most entanglements of this type result in amputations. Entanglements can also occur in sweep augers used to remove residual grain from the bin. |
| 1. Answer – b | Even a small capacity grain vacuum machine used at grain storage and handling facilities has the ability to remove grain fast enough to cause entrapment. The use of a grain vacuum during a rescue attempt needs to be done with care to prevent secondary entrapment. |