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Grain storage fires continue to be hazardous for both farm and commercial grain operations. A fire that begins in stored grain can adversely affect the storage structure in which the grain is stored and the stored grain itself. Improper response to a grain storage fire can lead to a complete loss of the grain or a complete loss to the storage structure in which the grain is stored.

The purpose of this document is to help familiarize grain industry operations in how to properly respond to a grain structure fire. A proper response can potentially help retain (salvage) the grain and save the integrity of the structure. Just as each structure and grain handling operation is unique, so are grain fires. Therefore, Nationwide and our Grain Advisory Board offer these recommendations for the most common grain fires. The plan may need to be modified for your individual operation or circumstances.



Why is this important?

Grain structure fires are costly to family grain farms and commercial grain operations. Many of these aspects are not considered - until it happens to you or your operation.

1. It Costs Money

A grain operation and a family grain farm is in business to take grain, dry grain as needed, move, blend or store grain, and ultimately, sell grain for a profit. When that operation has a grain fire, everything stops. A grain fire will likely disrupt grain

movement on the farm or grain operation. In some cases, the facility must either send grain to another neighboring location or sell to a competitor until the facility can resume grain operations.

Insurance will pay for some costs associated with a grain fire – but not all. These uninsured costs (soft costs) associated with grain fires include but are not limited to:

- Management and employees taken away from their primary duties to handle the actual fire
- Equipment costs not associated with the actual fire
- Lost revenue generated from incoming to outgoing grain
- Movement of other grain away from the facility until the facility is back to operational levels
- Overall down time at the facility while the facility and equipment are being rebuilt could continue to cost the grain operation or farm money
- Commercial operations could incur large costs due to fines from rail lines being closed if they are next to or involved in the fire.

This is not an all-inclusive list but identifies the most frequent costs associated with a grain fire loss. It could be that insurance rates also increase due to repeated losses.

2. Injury or Death

A grain fire can cause injury or death to family members, employees and customers, or first responders. Many factors can contribute to injury or death. These include, but are not limited to: blast concussions, flash fire, falling debris, smoke, and hazardous atmosphere.

In some cases, farmers or grain operations personnel rush into a grain vessel to put out or work around a grain fire – without checking oxygen content (O₂), carbon dioxide (CO₂) or carbon monoxide (CO) levels. The occupant then enters the grain storage structure without proper personal protective equipment (PPE) and is overcome by lack of oxygen or too much carbon dioxide – either is lethal. No one should ever enter a grain structure without first understanding breathable oxygen levels and address all other occupational safety precautions (including Lockout/Tagout, proper harness and lifeline, etc.).

3. Collateral Damage

A grain fire can cause internal or external collateral damage to other buildings, grain storage structures, bucket elevators, conveyors, spouts, railroad lines, and grain dryers located around grain fires. This collateral damage on property may be due to excessive heat, fire, smoke, damage caused by collapse or on-fire structures, etc. The same collateral damage could also be sustained to stock which is stored in storage structures close to or around the grain fire. In some cases, grain operations are co-located next to other businesses which could be negatively impacted by smoke or fire - like human or animal food businesses.

Collateral damage can also include loss of customers, reputation, and financial support from lending institutions.

Indicators for managing grain fires

To understand how to manage a grain fire, it is important to know the indicators that trigger a fire. Following are the common indicators to look for with upright storage structures and Steel Bunker Storage / Ground Pile Storage.

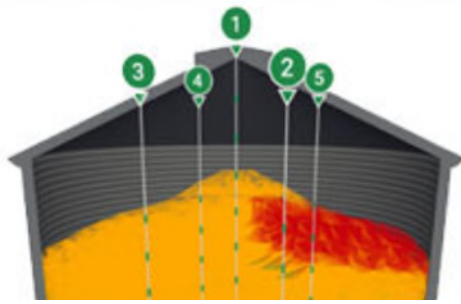
Upright Storage Structures – The following are indicators of a grain fire in upright steel and concrete storage:

- **Smoke** – A visual indication of a grain storage structure fire would include smoke coming out of either the aeration fans or J-Vents on the roof of the grain storage structure. Smoke will indicate that there is a hot spot currently smoldering within the grain.

****Concrete grain storage structures can be inner vented and tied together with the aeration system. This means that a fire in one grain storage structure could allow smoke to travel throughout the elevator or annex and escape at multiple exhaust points. Once identified, multiple grain storage structures in that concrete elevator or annex should be assessed by flipping the grain storage structure roof lids to help determine the source of the fire.**



- **Smell** – Out of condition grain may be an indication that a grain fire or smoldering core has begun in your grain storage structure. The aeration system exhaust points on a grain storage structure is where the grain operator can identify either a sour or smoke smell from the grain if a fire is occurring. This would prompt further testing of the grain to determine if the grain is just out of condition or is smoldering.
- **Rising Temperatures** – A temperature cable system or CO2 system can alert an operator that a potential hot spot is located in the grain storage structure. High temperatures or high CO2 readings will indicate that the hot spot has potentially begun to smolder within the grain storage structure.



Steel Bunker Storage / Ground Pile Storage -The following indications of a grain steel bunker and ground pile can be identified by a grain operator:

- **Smoke** - A visual indication of flat grain storage would include smoke coming out either the aeration fans, the roof of the flat, or directly off the pile itself. Smoke will indicate that there is a hot spot currently smoldering within the grain. Smoke is not required for a fire to be present.



- **Smell** - Out of condition grain may be an indication that a grain fire or smoldering core has begun in your steel flat or ground pile. The aeration system exhaust points on a flat or pile are where the grain operator can identify either a sour or smoke smell from the grain if a fire is occurring. This is especially true of ground piles that use air to pull the tarp down upon the grain. Any indication of sour or smoke smells would prompt further testing of the grain by using a hand- or power-probe to determine if the grain is just out of condition or is smoldering.

How to contain the fire

Once it has been determined that a fire is in progress (or about to start), it is important to take proactive steps in containing the fire and limit spreading. A grain fire burns extremely hot and is slow-burning. The following are the steps most recommended in the industry and which can be completed by grain complex personnel.

1. Turn off power to the structure.
2. Attempt to shut off the supply of air to the fire.
3. Cover all aeration ducts.

4. Do not seal the top of the grain storage structure as that will cause pressure to build.
5. Be mindful of continuing issues with dust explosions as well as steam explosion when spraying hot spots.

***Avoid putting water on a grain storage structure fire.** Be safe and call a salvage expert – if for no other reason than to provide situation analysis and advice.*

Who should be notified?

It is important to ensure all workers are accounted for and potential injuries are assessed along with the need for possible rescue. If the facility has an emergency action plan, it should be activated immediately.

After containment actions are taken, it is important to notify all appropriate parties. One of the first calls made should be to the insurance company. This should be done immediately if one or more indicators of a grain fire are present. Report your claim through normal channels, whether through your agent or directly with the insurance company. Prompt reporting is critical to allow the insurance company to respond with important instructions and to initiate the claims handling process. Having a claims representative who is knowledgeable about grain can be extremely helpful and can be requested when the insurance company contacts the insured.

Contacting the insurance company early will also help minimize further damage or harm to the farm or business (e.g. being unable to operate). It also helps get the operation up and running as soon as possible. Providing specific details including indicators and any mitigation steps already taken are an absolute necessity. The insurance policy may require mitigation steps to be taken to meet the “duties and conditions” provision. Chances are very good that the insurance company has dealt with similar conditions and can provide valuable counsel. The insurance company can also provide contacts with salvage companies that have experience with grain fires.

What does a salvage company do to manage a grain fire?

A salvage company will safely help the insured to retain (salvage) as much good grain from the grain storage structure as possible. The following are different methods the salvage company will use to retain good grain. Because salvage company professionals have been trained in these activities, **it is important that operators not attempt any of these actions without direction from a salvage company.**

1. If the unloading auger is still working, unburned grain can be unloaded from the grain storage structure to the outside.



2. If the unloading auger is not working, cuts can be made in the sides of the grain storage structure to remove good grain.



3. Cut holes on opposite sides at about the same level and the same size (8inches-12 inches square) to accommodate unloading.



4. Watch for the level of the grain to be below the entry door.
5. When it is, an air-vac can be used to remove the unburned grain.
6. Carefully consider running the fan to ventilate the grain storage structure and eliminate smoke. Remember, forced airflow can feed the fire and make extinguishing more difficult. Fans should be shut down when operators are closest to the burning level with hose streams which can be used to extinguish the remaining burning grain. Never enter a burning grain storage structure unless it can be done safely.
7. Self-contained breathing apparatus (SCBA) gear should be considered before entering a grain storage structure to air-vac or use some other mechanical means. Do not enter if there is danger that an operator may fall into a pocket of burning grain.
8. Never enter a grain storage structure when the unloader, sweep-auger or stirators are running.
9. Before operators enter, all lockout/tagout procedures must be followed.
10. Do not air-vac blackened or burning grain.



11. Closer to the fire, the grain may be heated and be caramel colored.
12. Black, smoldering grain will produce a flame when exposed to air. Extinguish burning grain as it is exposed.



13. If possible, probe the burning grain with a piece of hollow steel pipe with a sharpened point and holes in it, and pump water through the pipe.
14. Burning grain is hard to put out and rekindles are common. When possible, blackened grain should be removed from the grain storage structure, spread on the ground or a concrete pad at least 50 feet away from buildings or other combustibles.



Always keep close assessment on collateral issues...other grain storage structures, equipment and PEOPLE.

Talking with the Fire Department

Everyone needs to understand that according to incident response protocols when the fire department arrives at the site, they are in charge of the incident response. All fire fighters have been trained to put water on fires. If you are wanting a different response, the fire department needs to know why a different response is appropriate.

1. Location operators should have discussions about how to handle grain fires during the annual fire department tour of the facility, not after a grain fire has started.
2. Make the fire department aware that trying to put out a grain fire in a grain storage structure or pile with a water spray will not put out the fire and will damage the grain that is not burning. In some cases, no amount of water can be used to put out the grain fire. Other methods (e.g. at the direction of a salvage company) are the only way to stop the fire.
3. Make sure the fire department is aware that grain dust is explosive. If a water spray is used, there is potential for a grain dust explosion because grain dust may be put into suspension.
4. Inform the fire department that they are needed on site in case the fire spreads out of the grain to adjacent structures. At that time, conventional methods could be used to fight the fire that is outside of the grain storage structure.
5. The preferred method of fighting grain fires is to limit oxygen to the fire and control the site, if it can be done safely, until the salvage contractor arrives.
6. When the salvage contractor arrives at the site, the fire department should jointly develop an action plan for addressing the fire and the roles and responsibilities of each team.

There are many different variables to consider when handling a grain fire. Each grain fire can be different. Sometimes, putting large amounts of water on a grain fire is not the best approach. It is best to understand all options. The Nationwide Grain Advisory Board hopes this document provided insight about these available options and ideas that will cause the least damage to your property structures and stock. As always, consult professional advice and direction for your particular circumstances and concerns. If you have questions, please email them to GrainTaskForce@nationwide.com.

Sources

The Nationwide Grain Advisory Board consists of a team of agribusiness experts from within Nationwide and nine grain industry representatives from business operations (coops, grain manufacturers, salvage, and millwright), Ag-focused universities, engineering, and the Iowa Institute for Cooperatives. Representing five Midwest states, this team contributed their knowledge to develop this document based on their many years of experience. Their names are listed below.

Paul Stevenson (Chair) – Sr. Consultant, Risk Management Services, Nationwide
Larry Bennett – Specialist, Agribusiness Underwriting, Nationwide
Phillip Deal – CEO and General Manager, Wheaton Dumont Coop
Mark Drake – Maintenance Manager and former Grain Superintendent, Landus Cooperative
Collin Gregerson – Owner, Gregerson Salvage, Inc
Dr. Dirk Maier – Professor, Iowa State University
Randy Mehrer – General Adjuster, Claims, Nationwide
Scott Mitlying – Co-Owner, JD Construction
Randy Robeson – Former General Manager, Frontier Cooperative
Jess Seeley – Consultant, Risk Management Services, Nationwide
Tracy Spencer – Vice President, Mid Kansas Cooperative
Randy Tinker – Property Engineer, Risk Management Services, Nationwide
Al Tweeten – Manager, Risk Management Services, Nationwide
Stacy Webster – Director, Iowa Institute of Cooperatives
Chris Wortmann – Owner, NOHR Wortmann Engineering

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