

# Grain silo safety

## Why there needs to be a safe system of work for confined spaces

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**O**n August 1, 2014, nineteen-year-old Zach Fox tragically died after being engulfed in oil seed rape whilst trying to clear a blockage in a grain bin at Deanfoot Farm, Denholm, in the Southern uplands of Scotland. A Health and Safety Executive (HSE) investigation into the incident found that the system of

work in place to clear blockages in the grain bin was inherently and obviously unsafe, most notably because the task could have been completed from outside of the silo.

At Jedburgh Sheriff Court on February 22, 2016, Seamore Farming was fined UK£45,000 (US\$58,700) after it pleaded guilty to breaching Sections 3(1) of the Health and Safety at Work Act, which requires employers to protect those other than their employees, so far as is “reasonably practicable”.

It was stated that Seamore Farming failed to carry out a risk assessment for clearing blockages in the bins at Deanfoot Farm, and also failed to recognise the risk of asphyxiation from that task.

### A storage capacity of 25 tonnes

The silos on Deanfoot farm stored various grains and seeds throughout the year. At the time, the silo in question was storing oilseed rape; a black spherical seed about 1.5mm in diameter which Zach Fox was discharging, so the grain bin could be

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cleaned and prepared for oats. The bins were always cleaned out before a change of grain or seed to another.

The silo was open topped, rectangular in shape, and had been manufactured with a dividing wall in the middle to form two bins. Each bin was 2.95m wide by 2.95m deep by 4.82m tall and the lower part of each side wall sloped towards the centre of the bin to create a 1.4m long V-shaped funnel.

As the rapeseed was pouring out of the discharge point at the bottom of the silo, which comprised three diamond-shaped holes, it became blocked with straw and chaff that accumulated around the bottom and restricted the flow.

To access the vessel, Zach Fox climbed up the outside via the fixed ladder and inside using horizontal support bars and a rope. He then used a long metal pole to push the seeds through the discharge holes and clear the blockage. The solids started flowing

freely again and Mr Fox became immersed.

According to the HSE, Zach Fox entered the silo at around 0830 and was heard shouting by the partner of the business around 15 to 20 minutes later. Despite frantic efforts to save him, they weren't successful. It is thought the bin, which had a storage capacity of 25 tonnes, was about a quarter full when the accident happened.

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### **A hierarchy of control**

Under the Confined Spaces Regulations (1997), there is a hierarchy of control which employers must follow to manage risks associated with working in restricted areas such as a grain silo.

Where possible, working in a confined space should be avoided by either modifying the space itself or doing the work outside. If



this not reasonably practicable then a safe system of work must be followed. Appropriate arrangements should also be made for rescue in an emergency.

In the case of Seamore Farming, the HSE stated that it was reasonably practicable for them to make minor modifications to the silos in order to avoid anyone having to enter to clear the blockages.

Following the accident, Seamore Farming implemented a safe system of work for clearing blockages in the grain bins by installing an access door that prevented workers climbing inside.

This particular access hatch had both horizontal and vertical bars welded across it to prevent anyone from entering it, so that when blockages occurred, the door could be removed, and a long pole placed through the bars by someone standing outside the bin and directed down to the three diamond discharge holes to clear the blockages.

### **Always aim to work outside**

Under the 'The Confined Spaces Regulations 1997' the HSE states that a confined space is any place which is completely or partly enclosed and where it is foreseeable that hazardous substances or conditions, either inside it or nearby, may cause a risk of:

- Loss of consciousness from poisonous gases or lack of oxygen.
- Asphyxiation by free-flowing solids.
- Drowning in an increasing level of liquid; or
- Serious injury by fire or explosion.

Examples of confined spaces where there is a danger from gases include slurry pits, dirty water-treatment tanks, inspection chambers associated with weeping wall systems, forage tower silos, areas where rapid composting is encouraged, and moist grain silos. Asphyxiation by free-flowing solids can occur in feed silos, grain reception pits or storage bins when they are being emptied.

HSE guidance and advice states that the first rule for preventing these accidents is to always aim to work outside a confined space and design it so that there is no need for anyone to enter. This means avoiding the need to enter the grain silos to deal with bridged material by using rotating flails operated from outside.

Similarly, removable pumps eliminate the need for entry into slurry stores to clear blockages. Where you can achieve this aim, you should close off and secure the area and put-up signs to warn of the danger. This is particularly important where children or others who do not understand the danger might otherwise enter.

Follow a safe system of work, if entry into a confined space is unavoidable, you must make sure that everyone working in the danger area is thoroughly familiar with and follows the safe system of work and emergency procedures.

The HSE further states that your system for dealing with bridging in the grain must exclude entry into the silo for any reason because of the danger of asphyxiation if the blockage clears. Bridging can be reduced by proper management and following manufacturers' instructions.

Where it does occur, and it cannot be cleared with remotely operated flails, augers or other unloading systems, you should seek advice from the silo manufacturer or other suitably qualified person.

For work other than clearing bridged grain, entry should only be made when essential. This means that entry should be made through the bottom door but only once the grain in the silo has been extracted to below the door and an authorised and competent person has checked that the grain in the silo has not bridged.

### **Avoiding further fatalities**

No entry should be made through the top access door, which should be permanently obstructed by welding or bolting in a grid or bars. Both the top and bottom doors must be fully opened to allow changes of air before entry. The HSE states that the silo must be either naturally ventilated for at least 24 hours or ventilated with an air blower for a period which achieves the same effect.

Where there is any doubt that the atmosphere inside the silo will support human life, air testing should be done at levels down to the lowest point inside the silo to ensure that the oxygen and carbon dioxide concentrations are harmless. Tests should take place through the open bottom door at grain level before entry. If the atmosphere fails this test, further ventilation and monitoring should take place until it is safe.

To avoid further fatalities such as the one which occurred in 2014 to Zach Fox, farms and organisations that operate grains silos should review their design and structures (have they all got access hatches and fall prevention methods / bars) as well as ensuring that they have written down Safe Systems of Work (SSOWs).

These must be briefed to everyone involved in the work on the farms and supervised by a competent person. There must always be a rescue plan in place which is created following an in-depth risk assessment prior to creating the SSOW.