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A SEALED SILO AND A FAMILIAR TACTIC.

Inherent safety lessons from the Searsmont silo explosion for Australian combustible dust plants

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ABSTRACT.

On 15 May 2026 an oxygen-limiting silo holding kiln-dried wood shavings and sawdust exploded at a lumber mill in Searsmont, Maine, while volunteer firefighters were putting water into its base to fight a fire at the unloader. Two firefighters and one of the mill's owners died. Eleven firefighters, both members of an ambulance crew and several mill staff were injured. The US National Institute for Occupational Safety and Health (NIOSH) found that neither the mill's staff nor the firefighters knew the silo was the sealed type, or that its contents were a combustible dust hazard, and that the water most likely drew air into the silo and raised the dust into an explosive cloud. This paper sets out the facility, the sequence of events, the mechanism and the eight contributing factors NIOSH identified, and reads the incident through the principles of inherent safety. The hazard was in the stored material, and in a sealed design that could starve a fire only while it stayed shut, depended on people knowing that, and confined the explosion when it came. The paper then sets out what the incident means for an Australian plant, drawing on AS/NZS 4745:2012, NFPA 660:2025, AS/NZS 60079.10.2:2016 and IEC 60079-10-2:2026: the limits of a hazardous area classification, emergency plans shared with the fire service, pre-incident planning, labelling of bulk storage, and self-heating materials such as grain, meal and wood.

KEYWORDS: COMBUSTIBLE DUST; OXYGEN-LIMITING SILO; INHERENT SAFETY; SELF-HEATING; EMERGENCY PLANNING; HAZARDOUS AREA CLASSIFICATION

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01 INTRODUCTION.

Silo fires are slow. A fire deep in stored organic material can smoulder for days or weeks, and NIOSH notes that this usually leaves time at the scene to find out what the silo is and to plan the response (NIOSH 2026, p 14).

At Searsmont the information that would have changed the plan existed. It was in the silo manufacturer's operator's manual. It was not in front of anyone who needed it on the day.

The people affected were volunteers and the mill's own staff. A firefighter with three and a half years in the fire service died at the scene. A senior officer with 60 years of service died of his burns four weeks later. Two of the mill's owners were seriously injured, and one of them died a month after the explosion.

Five firefighters were seriously injured and six more had minor injuries. Both members of the first ambulance crew were seriously injured, and several other mill employees were hurt, some of them seriously (NIOSH 2026, p 3). In all, 299 firefighters from 46 fire services across four counties attended before the fire was brought under control, and the local fire chiefs arranged peer support and mental health services for everyone who responded (p 13).

NIOSH has investigated six silo fires and explosions that killed or injured firefighters since 1985, and observes that the literature on silo fires has not changed in more than 40 years (p 14). The physics is understood. This incident shows how that understanding can fail to reach the people at the silo, which makes it a case study in inherent safety and in the documents a plant relies on to take hazard knowledge from the design to the emergency. We write for Australian plants that store combustible particulate solids in bulk, such as grain, flour, sugar, stockfeed, wood shavings and sawdust.

02 THE FACILITY AND THE SILO.

2.1 THE MILL AND ITS STORAGE

The mill occupied a 16 ha (40 acre) site and produced white pine boards and siding, with bandsaw mills, planer mills, dry kilns and an 8.5 MW biomass-fired cogeneration plant (NIOSH 2026, p 4). Wood shavings, a by-product, were kiln-dried and heat-treated and then conveyed by pipe to two bagging systems. Each bagging system had a silo. Shavings and residual sawdust entered at the top through an air-material separator and were drawn out at the base by an auger into a second pipe that took them to the bagging machine (p 4).

2.2 TWO SILOS OF DIFFERENT TYPES

The silo at the first bagging system was a conventional silo. The silo at the second, where the incident occurred, was an oxygen-limiting silo measuring 20 ft by 60 ft (about 6 m by 18 m). The mill bought it second-hand in 1993, and the facility engineer later modified it.

The silo was bolted to the top of a concrete room about 6.7 m by 3.2 m. An auger in the top of that room drew material into a 0.9 m (3 ft) diameter opening, which led through a square chute to the pipe and blower serving the bagging machine. The same room housed the electrical panels for the system (p 4).

NIOSH describes three types of upright silo (p 20). It advises that a modified oxygen-limiting silo, converted to conventional use, be treated as oxygen-limiting in any emergency until the structure, contents and situation have been assessed in detail. Table 1 compares the two types present at the mill.

TABLE 1. THE TWO SILO TYPES AT THE MILL

FEATURE	CONVENTIONAL SILO (FIRST BAGGING SYSTEM)	OXYGEN-LIMITING SILO (SECOND BAGGING SYSTEM)
Construction (p 20)	Typically concrete staves with steel hoops, and a domed roof or an open top	Poured concrete, concrete staves or enamel-coated steel, built to limit the contents' exposure to outside air. NIOSH describes the type as creating an oxygen-deficient environment inside
Unloading (p 20)	Often from the top, by an external chute	From the bottom, by auger. No outside chute. Hatches sealed with clamps and gaskets
Fire history at the mill (p 5)	Several fires in 20 years, venting from the top ("Roman candles"). Each controlled with a deluge system the mill had installed	None. All earlier fires were in the conventional silo
Response NIOSH sets out (pp 14–15)	Not addressed in the report beyond the mill's history	No water or foam into the silo. Keep hatches closed so it smothers itself, possibly over several weeks, under a fire watch. Consult the manufacturer

Source: NIOSH (2026), pages as shown.

2.3 PROTECTION AND EMERGENCY ARRANGEMENTS

A dry sprinkler system protected the room below the silo and the silo headspace, linked to local alarms. The mill's emergency evacuation and fire prevention plan required the bagging machines to be shut down in a fire, and employees were trained on it when they started and every year after. The site had a fire alarm system, eleven hydrants and hose stations, and each year the mill hosted a walk-through for the fire services on the first alarm (pp 4–5).

The plan listed wood dust as a hazard only where it built up on or around electrical panels and equipment. The employees NIOSH interviewed did not know that the silo contents were a combustible dust hazard, and neither they nor the firefighters knew that the silo at the second bagging system was oxygen-limiting (pp 4–5).

03 SEQUENCE OF EVENTS.

Table 2 summarises the timeline NIOSH compiled from dispatch records, audio recordings and witness statements. NIOSH notes that it is not an official record (p 6).

TABLE 2. TIMELINE, 15 MAY 2026

TIME	EVENTS
10.00–10.05 am	The automatic notification system reports a fire at the second bagging system, with the fire pumps running. Staff report smoke from the room under the silo.
10.06–10.08 am	Emergency call: smoke visible, no flames. Staff shut down the bagging system and run a hose towards the silo. Six fire services are dispatched.
10.09–10.21 am	Owners and staff see white smoke from the room below the silo. The room sprinklers have operated. Staff spray water into the room and scan the silo with thermal imagers. Power is isolated. The controls show the silo is more than 20 % full.
10.22–10.28 am	The first appliances arrive. A crew takes a hose line into the room. Staff tell an officer about a plexiglass access panel on the chute. Part of it has melted away. He places the nozzle in the opening and sprays water through the 0.9 m opening into the base of the silo.
10.29–10.39 am	An ambulance crew sets up beside the silo. In pauses in the water flow, crews see flames and an orange glow in the base. Water is also put into the blower from a step ladder.
10.40–10.42 am	Firefighters believe the fire is largely knocked down. NIOSH records “no sense of urgency”. The incident commander requests a ladder appliance to put water into the top of the silo. The hydrant chosen for its supply will not operate.
10.43–10.59 am	The room sprinklers are shut off and wedged. Thermal imagers read about 4 °C to 49 °C on the outside of the silo. Water continues into the base. Firefighters stand around the silo.
11.00 am	A “whoosh” is heard and smoke pours from the separator on the roof. The silo lifts into the air with a large plume of fire beneath it. Burning contents cover the area and the people thrown by the blast.
After 11.00 am	The injured are rescued and taken to hospital by road and air. Fire spreads to nearby structures and destroys three appliances. About two hours later a full accountability check finds one firefighter missing. He is found near the silo.

Source: NIOSH (2026), pp 6–13. Temperatures converted from °F.

Water was directed into the base of the silo for about half an hour before the explosion.

04 WHY THE WATER CAUSED THE EXPLOSION.

4.1 WHAT THE INVESTIGATORS FOUND

The State Fire Marshal's Office and the Bureau of Alcohol, Tobacco, Firearms and Explosives found in a preliminary investigation that the fire was accidental, that it began at the unloader mechanism at the base of the silo, and that the explosion was caused by combustible dust. The sprinkler in the silo headspace did not operate, because the temperature at the top of the silo never reached its activation point (NIOSH 2026, pp 5–6). NIOSH's finding on the mechanism is direct:

NIOSH FINDING

"The application of water into the silo in this incident likely entrained oxygen into the silo headspace, stirred up dust within the contents, and caused it to become suspended in an explosive concentration."

NIOSH 2026, P 14

The manufacturer's emergency procedure for the silo, which NIOSH obtained, states under its instructions for the fire service: "DANGER: Do not fight fire by adding water or foam to the structure." It warns that water or foam will force air into the silo and may create an explosive mixture (p 14).

4.2 THE MECHANISM IN THE CODES

Each part of that mechanism is described in the Australian code of practice for combustible dusts. AS/NZS 4745:2012 Clause 3.3.1 notes that a smouldering powder "may suddenly develop into a rapidly spreading fire after a long period of quiescence". Clause 5.14 deals with self-ignition in bins, silos and hoppers, which can take hours to months to develop, and notes that explosions can occur when a glowing nest is disturbed or when the ingress of air is suddenly increased. For firefighting, Clause 7.7 advises against any disturbance of the powder that could form a dust cloud, and against high-pressure water hoses for that reason.

The explanatory annex of NFPA 660:2025 makes the same point for fixed systems (A.9.9.6.3): a release of extinguishing material can suspend combustible dust that the original fire then ignites. A sealed silo limits the air that can reach a fire inside it, and anything that lets air in works against it.

4.3 EXPERIENCE AT THE OTHER SILO

Experience at this mill said that water works on a silo fire. On a conventional silo that vented at the top and had a deluge system, it had.

NIOSH records that the crews used similar tactics at the second silo because they had worked at the conventional one (p 14). By the time they reached the base, part of the plexiglass panel on the chute had melted away, leaving an opening into the silo (p 8). Experience with one structure was applied, reasonably, to another in the same process. Nothing at the second silo told them the two were different.

4.4 FLAMMABLE GAS

The investigation has not reported whether gas played a part. Burning organic material gives off carbon monoxide and other gases, some of them flammable (NIOSH 2026, p 14), and NFPA 660:2025 A.21.10.3 warns that water applied to a deep-seated smoulder in a bin, tank or silo can generate carbon monoxide that builds up and can explode.

A flammable gas mixed with a dust cloud is a hybrid mixture, a case both dust classification editions address (AS/NZS 60079.10.2:2016 Annex C.3, IEC 60079-10-2:2026 Annex D). Whether gas contributed at Searsmont is not known, and this paper takes the reported dust explosion as the cause. Either way, water put into a smouldering store can do more than raise dust.

05 CONTRIBUTING FACTORS.

NIOSH identified eight contributing factors, each with a prevention action (p 2, pp 13–19). Five are addressed to fire services and three to the plant and the bodies that write codes. Table 3 sets out each factor with the provisions an Australian plant can act on.

TABLE 3. NIOSH CONTRIBUTING FACTORS AND THE PLANT-SIDE PROVISIONS THAT CORRESPOND

CONTRIBUTING FACTOR (NIOSH)	NIOSH PREVENTION ACTION, IN SUMMARY	WHAT A PLANT CAN DO, AND WHERE IT IS SET OUT
1 Combustible dust explosion	Train fire officers and firefighters on silo types and the hazards of their contents	Train the plant's own people on dust explosibility and on the hazards of fighting dust fires (AS/NZS 4745:2012 Cl 4.2(a), (c)). The plant is the only party that knows which silo is which.
2 Fire suppression tactics	Never direct water or foam into an oxygen-limiting silo. Let it smother. Consult the manufacturer	Hold the manufacturer's emergency procedure and put it in the emergency plan. AS/NZS 4745:2012 Cl 7.7. Self-heating stores in Section 7.5.
3 Incident command	Establish unified command with representatives of the site	Name the person who meets the fire service and works with them (NFPA 660:2025 10.2.1.2(8)). Agree roles in advance (AS/NZS 4745:2012 Cl 8.2.2).
4 Personnel accountability	Use an accountability system for everyone on scene	A fire service matter. On the plant side, a preplanned evacuation assembly area (NFPA 660:2025 10.2.1.2(2)).
5 Pre-incident planning	Prepare a pre-incident plan for high-hazard sites such as lumber mills	Walk the fire service through each bulk store every year and give them the plan (NIOSH actions to echo, p 19). Joint exercises (NFPA 660:2025 A.10.2.1).
6 Emergency planning at the mill	Include combustible dust explosion hazards in the plan and share it with the fire service	A written plan that names the dust hazards and is shared with the fire service (Section 7.2).
7 Explosion prevention and mitigation	Operate and maintain silos properly and apply NFPA 660	A dust hazards analysis for every existing process (NFPA 660:2025 7.1.1.2). Bulk storage provisions (9.4.9) and self-heating provisions (9.6.10). Maintain the silo's sealing features as the manufacturer requires (NIOSH p 18).
8 Hazard identification	Codes and standards to require hazard labels on bulk storage holding combustible dust	No code requires labels now (NIOSH p 19). A plant can label its bulk stores without waiting for one. AS/NZS 4745:2012 Cl 4.2(f) includes signage in dust hazard training.

Sources: NIOSH (2026) p 2 and pp 13–19; clauses as shown.

Even the five factors addressed to fire services depend on information only the plant holds. A fire service cannot train for a silo type it does not know is there, choose tactics for contents it has not been told about, or write a pre-incident plan from a walk-through that never mentioned the difference between two silos.

Firefighters told NIOSH the walk-throughs helped them identify key hazards and the layout (p 17). They did not include the one fact that reversed the right response. Without a formal pre-incident plan, NIOSH found, site-specific tactics were “dictated by individual knowledge and memory” of the firefighters who had been to the mill (p 17).

06 INHERENT SAFETY: THE HAZARD WAS IN THE STORAGE.

6.1 THE PRINCIPLES

Inherently safer design removes or reduces a hazard so that it no longer has to be controlled by added equipment or procedures. The explanatory annex of NFPA 660:2025 sets out four principles (A.9.1 and Table A.9.1).

Minimisation is using less hazardous material and performing hazardous procedures as few times as possible. Substitution is replacing a material or procedure with a less hazardous one. Moderation is using a material in its least hazardous form or under less severe conditions. Simplification is designing processes, equipment and procedures so that opportunities for error are removed.

The annex refers to the CCPS book on inherently safer chemical processes (CCPS 2019) and to Amyotte, Pegg and Khan (2009), who link the four principles to dust explosion prevention and mitigation. Kletz and Amyotte (2010) treat the principles at book length. The same annex says inherently safer options should be considered in the dust hazards analysis wherever a fire, flash fire or explosion hazard is identified.

6.2 THE SEALED SILO AS A SAFEGUARD

A sealed silo limits the air that can reach its contents. NIOSH describes the oxygen-limiting type as creating an oxygen-deficient environment inside (p 20). Its guidance in a fire is to keep the silo closed and let the fire starve, for weeks if necessary, under a fire watch (p 15).

The report does not say the Searsmont silo was oxygen-deficient in service, and we read its headspace as holding air. It was filled pneumatically through an air-material separator on its roof, its contents were kiln-dried and heat-treated, and the mill had modified it (p 4). On that reading the sealing limited the air that could reach a fire. It did not keep the atmosphere below the limiting oxygen concentration, the inerting route that AS/NZS 4745:2012 Clause 6.5.1 gives for avoiding an explosive atmosphere.

That protection was conditional. It held only while the silo stayed sealed, and ordinary actions unseal it: opening a hatch, breaching a panel, adding water. Each of those is what a responder without the right information would naturally do.

A safeguard that the obvious emergency action defeats is only as reliable as the knowledge of whoever arrives at the vessel. At Searsmont that knowledge was in a 1993 operator's manual for a structure bought second-hand, and it had not reached the staff, the emergency plan or the fire services.

Sealing also changed what happened when the dust ignited. The conventional silo vented its fires through the top (Table 1). The sealed silo had no such relief, and the explosion lifted it into the air with a plume of fire beneath it (p 1).

AS/NZS 4745:2012 Clause 7.3.3 sets out explosion relief venting as a protection principle, and Amyotte, Pegg and Khan (2009) apply the inherent safety principles to mitigation as well as prevention. A vessel sealed to starve a fire also confines an explosion, and the dust hazards analysis has to weigh both.

Inherent safety is often treated as a design-stage idea. This incident shows the operating-stage half of it.

The hazard was not a novel process. It was a large inventory of dry, combustible particulate with a fire at its base, inside a structure whose correct emergency response was the opposite of the response that worked on the other silo in the same process. In the terms of simplification, the site had two vessels that needed opposite treatment in a fire, with nothing to tell them apart at the point of decision. That is an opportunity for error, built into the plant.

Change over time widened the gap. A second-hand silo, later modified, came with its own operating knowledge, and that knowledge did not pass into the site's procedures.

Management-of-change procedures under NFPA 660:2025 must address, before any change, the modifications needed to operating, maintenance and emergency response procedures (8.11.2(4)). NIOSH's advice that a modified oxygen-limiting silo be treated as oxygen-limiting until assessed in detail (p 20) points the same way. The type of a vessel is part of its hazard.

6.3 APPLYING THE PRINCIPLES TO BULK STORAGE

For bulk storage of a combustible particulate that can self-heat, the four principles become practical questions. Table 4 sets them against the measures AS/NZS 4745:2012 Clause 7.2.16 lists for substances with a tendency to self-ignite.

TABLE 4. INHERENT SAFETY PRINCIPLES APPLIED TO BULK STORAGE OF SELF-HEATING COMBUSTIBLE SOLIDS

PRINCIPLE	QUESTION FOR THE STORE	MEASURES IN AS/NZS 4745:2012 CL 7.2.16 AND OTHER SOURCES
Minimisation	How much is stored, for how long, in how large a vessel?	Reduce the volume stored (b)(iv). Limit residence times (b)(ix). Divide the material into smaller portions to improve heat dissipation (b)(iii).
Substitution	Does this material, in this form, need to be stored in bulk at all?	Avoid substances with a tendency to self-ignite wherever possible (a). Avoid construction materials that react with the stored product.
Moderation	Can conditions in the store be made less favourable to self-heating and combustion?	Cool product from heated plant before storage (b)(vi). Limit temperature and pressure (b)(v). Inerting (b)(i). Shade storage from the sun in hot climates (b)(x).
Simplification	Can every vessel take the same emergency response, or can the difference be made unmistakable?	One storage type for a duty where practicable. Where a sealed or inerted vessel is needed, its type and required response shown on the vessel, in the drawings and in the emergency plan. IEC 60079-10-2:2026 Cl 4.4 asks for relied-upon controls to be noted on drawings.

Sources: AS/NZS 4745:2012 Cl 7.2.16; NFPA 660:2025 Table A.9.1; IEC 60079-10-2:2026 Cl 4.4.

Detection comes next. AS/NZS 4745:2012 Clause 7.2.16(b)(viii) lists temperature sensors and smoke or ember detectors in storage silos, and NFPA 660:2025 A.9.6.10 adds temperature monitoring within the pile or silo and carbon dioxide monitoring in the silo.

The Searsmont detection was installed and working, as NIOSH records (p 18). The headspace sprinkler, though, depended on a fire showing itself at the top, and this fire began at the unloader, at the base. Where detection is placed matters as much as whether it is present.

6.4 WHEN DESIGN REACHES ITS LIMIT

Some stores will always need a sealed or inerted vessel, and some safeguards will always depend on people. Inherently safer thinking then turns to making the safeguard visible and the correct response the obvious one. NIOSH is clear that warning labels supplement design measures and do not remove the hazard (p 19). At Searsmont the response depended on memory, and the memory was of the other silo (pp 14, 17).

07 WHAT IT MEANS FOR AN AUSTRALIAN PLANT.

Australian work health and safety law deals with combustible dust directly, in the regulations made under the Acts. In the seven jurisdictions with the harmonised Work Health and Safety Regulations, regulation 51 requires a business to manage the risks of a hazardous atmosphere, and an atmosphere is hazardous where combustible dust "is present in a quantity and form that would result in a hazardous area" (r 51(2)(d)). Regulation 52 requires the risks of an ignition source in that atmosphere to be managed, and the dictionary defines a hazardous area to include one where combustible dust is present, or could reasonably be expected to be present, in a quantity that requires special precautions for plant.

Both regulations apply the general risk management requirements and name no standard (for example, Work Health and Safety Regulation 2011 (Qld) ss 51 and 52 and Schedule 19). Victoria's Occupational Health and Safety Regulations 2017 contain no equivalent provision. The method comes from the standards, and the points below are read from the editions named.

7.1 WHAT THE CLASSIFICATION COVERS, AND WHAT IT LEAVES TO OTHER DOCUMENTS

A hazardous area classification is often the only formal dust document a plant holds, and it is easy to expect more of it than it was written to give. AS/NZS 60079.10.2:2016, the classification standard in force in Australia, states its purpose in its preface and Clause 1: to identify and classify areas where explosive dust atmospheres may be present, "in order to permit the proper assessment of ignition sources in such areas". IEC 60079-10-2:2026 is more explicit. Classification facilitates the selection of equipment so that sources of ignition can be avoided (Cl 4.1.1), and its purpose is the proper selection, installation and operation of equipment to control ignition sources (Cl 4.3).

Both editions place several things outside the classification. Neither takes into account consequential damage following a fire or explosion (Clause 1 of each). Catastrophic failures, such as the rupture of a silo, need not be accounted for (2016 Cl 3.20 and 5.3, 2026 Cl 4.7).

Activities outside normal operation, such as non-routine maintenance, may fall outside the classification and are left to a safe system of work (2026 Cl 4.6). The 2026 edition also states that it assumes air with normal oxygen content, typically 21 % by volume (Cl 1), and that the method for any risk assessment is outside its scope (Cl 4.1.1 Note 3).

The interior of a silo storing combustible dust will normally be Zone 20, and both editions list silos among the typical examples (2016 Annex A.1.2 and 2026 Annex B.1.2). That classification tells an electrical designer what equipment may be installed in and around the silo. It says nothing about how to fight a fire inside it, whether the contents self-heat, or whether the silo depends on staying sealed. Those belong to the dust hazard assessment (AS/NZS 4745:2012 Sections 3 and 7, and NFPA 660:2025 Chapter 7) and to the emergency plan.

There is one point of contact. Where a specific control, such as inerting, is relied on to classify the interior of equipment, the 2026 edition asks for it to be noted in the documentation, for example on the drawings (Cl 4.4), with reliability that matches the reduction claimed (Cl 4.1.4.2). An oxygen-limiting silo is not an inerted vessel in the standard's sense, but the same reasoning serves a plant well. A vessel whose safety depends on staying sealed or inerted should say so on every document that describes it.

7.2 EMERGENCY PLANS, SHARED WITH THE FIRE SERVICE

In the seven harmonised jurisdictions, regulation 43 of the Work Health and Safety Regulations requires every workplace to have an emergency plan that provides for an effective response, evacuation, "notifying emergency service organisations at the earliest opportunity" and testing, prepared with regard to "the nature of the hazards at the workplace" (for example, Qld s 43).

AS/NZS 4745:2012 Section 8 treats emergency planning as a process agreed between organisations. Clause 8.2.1(b) notes that the decisions made in the first five minutes determine the outcome over the following hours, and Clause 8.2.1 adds that because most emergencies involve outside agencies, the plan needs to fit state and federal emergency legislation and the local district plan. Clause 8.2.2 ends its list with documenting and distributing the plan, then testing and reviewing it.

NFPA 660:2025 Chapter 10 applies to existing facilities as well as new ones (10.1). It requires a written emergency response plan (10.2.1) that names a person to notify the fire service and a person to meet the responders and coordinate with them (10.2.1.2(3) and (8)). The plan is to be reviewed at least annually and when the process changes (10.2.2), and shared with local emergency response agencies (10.2.3).

The Searsmont plan existed, was trained and was refreshed every year. Its gap was content.

For an Australian plant, a useful test of the emergency plan is whether it names every bulk storage enclosure, what it holds, whether it self-heats, whether it relies on staying sealed or inerted, and what the fire service should and should not do at it. The plant's dust hazard assessment usually holds most of that information already. The task is to make sure it reaches the plan.

7.3 PRE-INCIDENT PLANNING AND WALK-THROUGHS

NIOSH named the mill's annual walk-throughs as an action to echo (p 19). The gaps were the pre-incident plan described in Section 5, and unified command with the people who knew the plant (pp 15–16). NFPA 660:2025 A.10.2.1 recommends annual emergency drills by plant personnel and periodic exercises with the public fire service, and notes that specialised training for the fire service can be warranted where a site's hazards call for methods outside normal firefighting.

For an Australian plant, the practical steps are to invite the fire service each year, walk them past each bulk store and explain what it holds and how it must be treated, give them the plan and the drawings, and agree in advance who from the site will stand with the incident controller. Action cards for that person, as AS/NZS 4745:2012 Clause 8.2.1(c) describes, keep the critical facts from depending on recall.

7.4 LABELLING BULK STORAGE

NIOSH recommends that codes and standards require hazard labels on bulk storage enclosures that hold combustible dust, and notes that neither NFPA 660:2025 section 9.4.9 nor other relevant codes require them at present (pp 18–19). Earlier NIOSH reports recommended placards stating the silo type, the facility's emergency contact and the correct firefighting approach (p 19). Nothing prevents an Australian plant labelling its bulk stores now. A label at the base of a silo, at the access points where responders arrive, puts the information where the decision is made.

7.5 SELF-HEATING STORED MATERIALS: GRAIN, MEAL AND WOOD

Many materials Australian plants store in bulk can heat themselves. AS/NZS 4745:2012 Clause 5.14 names the self-heating of feedstuffs induced by biological processes, and notes that smouldering in a stored deposit may go unnoticed until the reaction front reaches the surface. The explanatory annex of NFPA 660:2025 lists resinous sawdust and wet agricultural materials among materials known to self-heat (A.9.6.10).

NIOSH notes that fermentation in silos generates gases such as carbon dioxide (p 14). For grain, NFPA 660:2025 A.21.10.3 advises against water on a deep-seated smoulder for the reason given in Section 4, and suggests injecting inert gas to displace the oxygen.

A documented self-heating hazard evaluation is required under NFPA 660:2025 where 1000 kg or more of combustible particulate solids is stored or transported in bulk (5.3.1.1(1)). Material with self-heating characteristics must be managed or stored to control self-heating, or have self-heating detection (9.6.10.1). Where a self-heating hazard is identified, provisions must be in place to manage the consequences in storage silos and bins (9.6.10.2). A store that self-heats should have its self-heating evaluation, its detection and its firefighting method recorded together, and that record should be in the emergency plan.

08 CONCLUSIONS.

The Searsmont explosion was a combustible dust explosion inside a sealed silo, with the dust raised by firefighting water and ignited by a fire that had been smouldering at the base. The physics has been known for decades. What failed was the passage of knowledge from the silo's design to the people responding to it.

The case shows that a safeguard can be built into a vessel and still depend on people. A sealed store starves a fire only while it stays shut, confines an explosion when one occurs, and needs the opposite response to the conventional silo in the same process. For a plant, the first question is whether the hazard can be reduced: less material, stored for shorter periods, cooler, in fewer types of vessel. What cannot be designed out has to be visible at the vessel and in the plan the fire service holds (Section 7).

ACKNOWLEDGEMENT

We acknowledge the firefighters, ambulance crew and mill staff affected by this incident, and their families. Sections 2 to 5 draw on the NIOSH investigation report, which is the primary source for the facts of the incident.

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