

# **Permit Required Confined Space/Boot Pit Evaluation Guide for Grain Elevators**



**National Grain and Feed Association**

**September 2013**

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**Disclaimer:** *The NGFA prepared this guidance document to assist grain handling facilities in evaluating their boot pits to determine whether they meet OSHA's definition of permit-required confined spaces.*

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*Grain handling facilities should contact experienced safety and health legal counsel or a third-party expert if they have questions about the proper way to determine if boot pits are permit required confined spaces under the OSHA standard. Also, boot pits may contain special or unusual hazards that are not addressed in this document, and grain handling facilities may be required to take additional steps to protect employees.*

# **EVALUATING BOOT PITS UNDER OSHA’S PERMIT-REQUIRED CONFINED SPACE PROGRAM**

## **INTRODUCTION**

OSHA’s Permit-Required Confined Space standard requires employers to evaluate their workplaces to determine if they contain any permit-required confined spaces (“PRCS”).<sup>1</sup> If PRCSs are present and employees will enter them, the OSHA standard requires certain safety procedures to be implemented.

The spaces in grain handling facilities that should be evaluated include boot pits. This procedure follows and elaborates on OSHA’s eLaws Confined Spaces Advisor, and also incorporates provisions of the OSHA standard and guidance.<sup>2</sup> The procedure provides a step-by-step process that grain handling facilities may use to determine whether individual boot pits meet the definition of PRCSs.

### ***The purpose of a boot pit***

Although there are many different types, the general purpose of a boot pit is to house the boot section of the elevating equipment. In general, a boot pit houses the bucket elevators and other conveying equipment that distributes grain in the elevator. Boot pits may also contain other equipment such as dust collection systems, sump pumps, and lighting. General housekeeping as well as equipment inspection and maintenance require periodic entry into boot pits. Most boot pits are below grade, but some are housed above ground rather than in a pit.

Many (but not all) boot pits are located in “priority housekeeping areas” under OSHA’s Grain Handling standard, 29 CFR § 1910.272. A “priority housekeeping area” includes “floor areas within 35 feet of inside bucket elevators.” 29 CFR § 1910.272(j)(2)(i)(A). An “inside bucket elevator” is defined as a “bucket elevator that has the boot and more than 20 percent of the total leg height (above grade or ground level) inside the grain elevator structure.” 29 CFR § 1910.272(c). Under the OSHA standard, fugitive grain dust accumulations in priority areas that exceed 1/8<sup>th</sup> of an inch must be removed “immediately.” Boot pits are inspected on a regular basis, in compliance with a facility’s maintenance and housekeeping program, and may be entered relatively frequently.

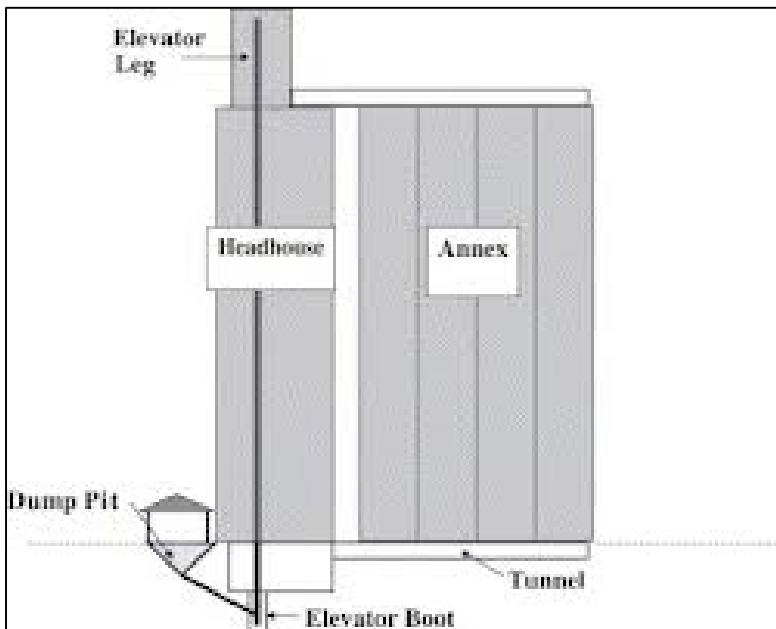
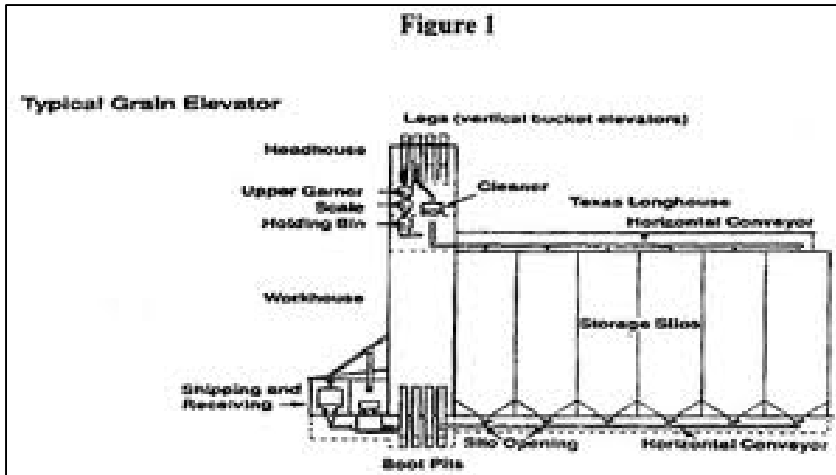
### ***The different types of boot pits***

As stated, there are many different types of boot pits. Diagrams depicting two of the more common types are set out below.

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<sup>1</sup> A link to OSHA’s Permit-Required Confined Space standard is here: [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=9797](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9797).

<sup>2</sup> A link to OSHA’s Confined Spaces Advisor is here: <http://www.osha.gov/dep/etools/eprcs/index.html>.



## **EVALUATING BOOT PITS UNDER THE OSHA STANDARD**

The OSHA standard contains two key definitions:

*Confined space:* A space that has *all three* of the following characteristics:

- Is not designed for continuous human occupancy.
- Has limited or restricted means for entry or exit; and
- Is large enough and so configured that an employee can bodily enter and perform assigned work.

*Permit-required confined space:* A confined space becomes a permit-required confined space if it has *one or more* of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized safety or health hazard.

***Step 1: Is the boot pit a “confined space”?***

A space must meet all three criteria listed in the definition to meet the definition of a “confined space.” Boots pits are almost always “large enough” and “configured” such that employees can enter them and perform assigned work. This is because boot pits often have to be entered on some periodic basis. The other two criteria are discussed below.

**Is the boot pit designed for continuous human occupancy?**

Most boot pits are designed for continuous human occupancy. The Advisor defines “designed for continuous human occupancy” as: “Intended as a place of regular work and supplied with ventilation and other conditions necessary to support life.” If the space is “designed as a place where employees are meant to work on a daily basis, including provision for adequate ventilation to preserve human life and health,” it does not meet the definition of a “confined space” because it is “designed for continuous human occupancy.”

OSHA has explained that the critical factor is whether the conditions in the space allow an employee to safely work in it – not the primary use of the space. *See e.g. 58 Fed. Reg. 4462, 4478 (January 14, 1993).* For example, a “vented telecommunications vault is typically designed for continuous human occupancy – the ventilation for the vault ensures the presence of a normal atmosphere for an occupant to breathe, and the working dimensions of the space are large enough to allow an adult to work and move about while erect.” *Id.* The fact that the “primary function of the vault is to house telecommunications equipment” is irrelevant. *Id.* The key is whether “a human can occupy the space under normal operating conditions.” *Id.* “If a space is truly designed for human occupancy, then the primary function of the space is irrelevant.” Miles letter to Freeman (June 22, 1995)

[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPRETATIONS&p\\_id=21842](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=21842)).

Boot pits are intended to be entered regularly to perform cleaning, equipment inspection and maintenance. Also, boot pits are designed to be entered under normal operating conditions. Unlike a grain bin or similar space, no preparations – such as locking out or emptying a bin – are required for the employee to enter. The natural ventilation in boot pits is typically adequate, and

many boot pits have pneumatic dust collection systems that result in additional ventilation. As long as the boot pit is adequately ventilated, it is considered designed for continuous human occupancy.

### **Does the boot pit have limited or restricted means for entry or exit?**

Boot pits may or may not have “limited or restricted means for entry or exit.” Although the OSHA standard does not have a definition, the Advisor states that a space has “limited or restricted means for entry or exit” when “an occupant must crawl, climb, twist, be constrained in a narrow opening, follow a lengthy path or otherwise exert unusual effort to enter or leave, or where the entrance may become sealed or secured against opening from the inside.”

According to the OSHA guidance, access and egress are “limited” if “an entrant’s ability to escape in an emergency would be hindered.” “Ladders” and “temporary, movable, spiral or articulated stairs” are considered a “limited or restricted means of egress.” Also, a space may have limited or restricted access/egress even if it has a regular-sized door. For example, “a space such as a bag house or crawl space that has a door leading into it, but also has pipes, conduits, ducts or equipment or materials that an employee would have to crawl over or squeeze around to escape, has limited or restricted means of exit.” Similarly, a door that is not big enough to allow an employee to walk through it upright would constitute limited access/egress.<sup>3</sup>

OSHA has also addressed spaces that have an open plane, such as pits. Open pits have limited means of access or egress such that they may be considered confined spaces if the means of access/egress would make it difficult to escape, or if the employee would have to crawl around equipment or other materials to get out.

Given OSHA’s guidance, the evaluation of the access/egress for boot pits typically involves three considerations:

- Does the boot pit have a door that is the standard-sized door?
- Does the employee have to climb up a ladder, articulated stairs, or use some other means of escape that would be more difficult than using regular, fixed stairs?
- Would the employee have to crawl through or around equipment to reach the door?

Even if the boot pit does have limited or restricted means of access/egress, the boot pit will not necessarily qualify as a “confined space” because it is designed for continuous human occupancy. As stated, all three factors in the definition must be met for a space to be considered a “confined space.”

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<sup>3</sup> See OSHA Compliance Directive CPL 2.100, [http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=DIRECTIVES&p\\_id=1582](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1582)

## **What if an employee has to go through a tunnel to exit the boot pit?**

OSHA has provided little guidance on situations where an employee must access a tunnel to exit the boot pit. OSHA offers the following in the Compliance Directive:

Can the distance an employee must travel in a space such as a tunnel to reach a point of safety be a determinant for classifying the space as a confined space?

Yes. The determination would most likely be a function of the time of travel to the point of safety.

OSHA offers no information about what sort of “time of travel” would render a space a confined space. At the same time, the Directive also points out that in determining whether the space has “limited or restricted means for entry or exit,” the employer should consider “whether, in light of the hazards posed by the particular space at issue, the configuration or other characteristics of the space would interfere with an entrant’s ability to escape or be rescued during an emergency situation.”

Given the general lack of hazards in boot pits, a tunnel through which an employee can walk upright to exit a boot pit will not generally be considered limited means of access or egress. Also, even if a tunnel does restrict access/egress, the space is not a “confined space” unless it also is not designed for continuous human occupancy.

## **DETERMINING WHETHER THE BOOT PIT IS A PERMIT-REQUIRED CONFINED SPACE**

Even assuming a boot pit is a “confined space,” many – or even most – boot pits do not meet the definition of a permit-required confined space. OSHA’s definition contains two characteristics that could be present in boot pits, but most often are not. First, a boot pit could contain a hazardous atmosphere or have the potential to contain a hazardous atmosphere. Second, the boot pit could contain another “recognized safety or health hazard.”

### ***Step 2: Does the boot pit contain or have the potential to contain a hazardous atmosphere?***

A confined space becomes a permit-required confined space if it “contains or has the potential to contain a hazardous atmosphere.” OSHA defines a “hazardous atmosphere” as exposing employees “to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury or acute illness” because one of the following is present:

- Flammable gas, vapor or mist in excess of 10 percent of its lower flammable limit (LFL);
- Airborne combustible dust at a concentration that meets or exceeds its lower explosive limit (LEL);

- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- Atmospheric concentration of any substance for which a dose of permissible exposure limit is published Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this part and Subpart Z, Toxic and Hazardous Substances, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit; or
- Any other atmospheric hazard that is immediately dangerous to life and health.

Three of the listed hazards are not normally present in boot pits. First, no potential for flammable gases at levels above the LFL would normally be present. Second, the substances listed in Subpart G (which relates to abrasive blasting, grinding, spray finishing operations, and similar operations) would normally not be present. Third, boot pits would not normally have oxygen concentrations above 23.5 percent.

**Does the boot pit contain or have the potential to contain a toxic level of a substance listed in Subpart Z or some other hazardous substance?**

Subpart Z of the OSHA standards contains permissible exposure limits (PELs) for a variety of toxic substances, including hydrogen sulfide and grain dust. It is critical to understand that the presence of a Subpart Z substance *does not mean* that the boot pit is automatically classified as a permit-required confined space. Rather, the atmospheric concentration of the toxic substance must be high enough to cause “death, incapacitation, impairment of ability to self-rescue, injury or acute illness due to its health effects.”<sup>4</sup>

These types of atmospheric concentrations are typically called Immediately Dangerous to Life and Health (“IDLH”) levels.<sup>5</sup> IDLH levels and PELs are different. For example, the acceptable ceiling concentration for hydrogen sulfide is 20 parts per million. The IDLH for hydrogen sulfide is 100 parts per million. In other words, a confined space must contain or have the potential to contain at least 100 ppm of hydrogen sulfide to be considered a permit-required confined space.

**When is there a “potential” for a hazardous atmosphere to exist?**

The Advisor includes guidance on when a “potential” exists, and states: “Some spaces may develop a hazardous atmosphere under certain circumstances. For example, a space with a normal atmosphere may be prone to accumulate deadly carbon monoxide from nearby equipment

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<sup>4</sup> If a boot pit has a toxic substance in it that exceeds the PEL in Subpart Z, then the employer must provide respiratory protection or some other means of ensuring that the employee is not exposed to levels above the PEL.

<sup>5</sup> The PRCS standard defines IDLH as “any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual’s ability to escape unaided from a permit space.” 29 C.F.R. § 1910.146(b).



during work in the space because of its location or shape. Careful assessment must be done to anticipate hazards that could arise.”

In other words, there must be a *realistic potential* for a hazardous atmosphere. To take a simple example, carbon monoxide could accumulate in a basement because of a furnace malfunction. The basement is not automatically considered a permit space because of the presence of a furnace.

### **What toxic substances could be present?**

Subpart Z of the OSHA standards has permissible exposure limits for many hazardous substances. The types of Subpart Z toxic substances that could be present in a boot pit are quite limited. Hydrogen sulfide – which is listed in Subpart Z – could form in a boot pit if a large amount of grain dust accumulates, mixes with water, and is allowed to sit for a substantial period of time. As stated, the level of hydrogen sulfide would have to rise to a level of at least 100 parts per million to render the confined space a permit space.

In evaluating boot pits, the facility should consider how often the boot pit is cleaned and whether it is water-tight. If the boot pit is cleaned frequently as required by Section 1910.272, then the dust and grain to mix with water and form hydrogen sulfide should be insufficient. Similarly, if water cannot enter the boot pit, then the formation of hydrogen sulfide would not be possible.

#### ***Step 3: Does the boot pit have the potential for an airborne combustible dust at a concentration that exceeds the LEL?***

Under normal operating conditions, dust will not be present in quantities that exceed the LEL, and no combustible atmosphere will be present outside of the leg. More specifically, the leg is enclosed, which means that there will not be enough dust in the boot pit that could be suspended such that the LEL is exceeded. Even when the conveyor is open rather than enclosed, a concentration that exceeds the LEL would be possible only in abnormal conditions.

If the leg is plugged or choked, then it must be emptied. This job will cause more dust and grain to enter the boot pit. An inspection door or access way that is accidentally left open during operations could also cause more dust and grain to enter the boot pit. The amount of dust resulting from these upset conditions is typically not enough to exceed the LEL if it becomes airborne.

#### ***Step 4: Does the boot pit have the potential to be oxygen deficient?***

A boot pit has the potential to contain an oxygen deficient atmosphere if carbon monoxide from vehicles or other equipment will enter the pit. As long as boot pits are not adjacent to loading and unloading areas or vehicle idling is prohibited while employees are in boot pits, the potential for an oxygen deficient atmosphere should not exist.

Also, rotting grain can form carbon dioxide, which may reduce oxygen levels. More specifically, if water is present in a bin and significant amounts of grain are in the boot pit, the

grain may begin to rot and form carbon dioxide. Carbon dioxide will normally form only if both of the following conditions are met: 1) the boot pit is not kept clean; and 2) water is allowed to accumulate in the boot pit. As such, a dry boot pit will not have the potential to be oxygen deficient, and – even if a boot pit has water in it – carbon dioxide normally will not form if the boot pit is cleaned regularly. The ventilation systems in some boot pits also reduce the possibility of condensate forming.

***Step 5: Does the boot pit have any “other recognized safety or health hazards”?***

OSHA generally defines “other recognized safety or health hazard as including: physical hazards, such as grinding, exposed moving parts, or trip/fall hazards; non-atmospheric chemical hazards, like corrosives; electrical hazards; or issues like snakes/rodents, poor visibility, and weather hazards.” These hazards must result in a potential impairment to escape.

If a boot pit qualifies as a “confined space,” the physical and other hazards in each boot pit must be evaluated to determine whether they would prevent an employee from escaping from the boot pit. A boot pit contains moving parts since it houses the leg and other equipment, but the equipment is often guarded. In the event maintenance is necessary, the equipment is locked out before any machine guarding is removed. As a result, boot pits, under normal conditions, will rarely have “other recognized safety or health hazards.”

**FREQUENTLY ASKED QUESTIONS**

1. ***Question:*** How are entries into other spaces at a grain handling site, such as bins, silos and tanks, treated differently than entries into boot pits?

***Answer:*** Section 1910.272(g) and (h) contain the applicable procedures for entering grain bins (1910.272(g)) and flat storage structures (1910.272(h)). The provisions in the Permit-Required Confined Space standard do not apply to grain bins and flat storage structures, and no assessment regarding whether these spaces are “confined spaces” or “permit-required confined spaces” is required. Instead, the provisions in Section 1910.272(g) and (h) must be followed.<sup>6</sup>

2. ***Question:*** Can an employer voluntarily perform air monitoring even if the space is not a permit space? If an employer voluntarily performs air monitoring, does that mean the space becomes a permit space?

***Answer:*** Employers can and do perform air monitoring voluntarily in non-permit spaces, and monitoring does not convert the space into a permit space. Since boot pits are frequently entered, some employers ask employees to monitor periodically as a practice exercise so that

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<sup>6</sup> OSHA’s Compliance Directive for the Inspection of Grain Handling Facilities, (CPL 02-01-004) provides helpful guidance on the requirements of Section 1910.272(g) and (h). ([https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=DIRECTIVES&p\\_id=1535](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1535)). OSHA also issued a memorandum discussing when Section 1910.272(g) applies as opposed to Section 1910.272(h). See also Fairfax letter to Demaray (February 9, 2005) ([https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=INTERPRETATIONS&p\\_id=25055](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=25055)) confirming that if Sections 1910.272(g) or (h) apply, Section 1910.146 does not.

when employees do enter a true permit-required confined space where monitoring is required, they are experienced at using the equipment. Other employers may perform monitoring because a local OSHA Area Office has recommended that they periodically re-confirm that no hazardous atmosphere exists in the space. This monitoring may be performed even where the boot pit is not found to be a confined space. In short, the definitions of “confined space” and “permit-required confined space” are set in the standard – a decision to perform voluntary air monitoring does not over-ride the definitions and convert the space into a confined or permit space.

3. **Question:** If an employer decides that a boot pit is *not* a permit-required confined space, what kind of training is required?

**Answer:** The PRCS standard does not require any training if the space is not a permit space. At the same time, training may be required under other OSHA standards. For example, an atmospheric hazard that does not reach IDLH levels may be present. In that case, the employee may be required to wear a respirator, and training on how to wear it properly is required. Similarly, an employee may be required to wear certain types of PPE while in a boot pit, and would have to be trained in how to wear and use the PPE. Also, employees will be trained in the topics listed in Section 1910.272 as well as other standards that may apply, such as OSHA’s Lockout/Tagout standard, 29 CFR § 1910.147.