UNIT 7 Procedures and precautions

- Describing health and safety precautions
- Emphasising the importance of precautions
- Discussing regulations and standards
- Working with written instructions and notices

Describing health and safety precautions

1 **Some engineering or industrial activities are especially dangerous. In pairs, think of more examples to add to the following list.**

- Manufacturing processes using dangerous chemicals
- Casting and welding involving high temperatures

2 a **In pairs, discuss what is meant by the items on the Health and Safety meeting agenda.**

b ▶7.1 **Rosana, the assistant manager at a Dorian Food Processing plant, is chairing the weekly Health and Safety meeting. Listen to four extracts from the meeting and match each extract (a–d) to an agenda item (1–7).**

a _____ c _____

b _____ d _____

Dorian Food Processing
Health & Safety Meeting Agenda

Wednesday 16 April, Conference Room, 2.00pm – 4.00pm

To: RM, MA, DB, SM, BP, LJ
Chair: Rosana Martinez

1 Hazardous substances & Personal Protective Equipment (PPE)
2 Harmful gases/fumes & asphyxiation hazards
3 Fire/Explosion hazards
4 Machinery: guards and safety devices
5 Access ways, guardrails and emergency exits
6 Electrical installations
7 Noise hazards

c ▶7.1 **Listen again and match the words from the meeting (1–8) to the definitions (a–h).**

1	confined spaces	a	burns the skin
2	CO_2 detector	b	contact (with a danger)
3	exposure	c	sources of ignition
4	irritant	d	small areas without ventilation
5	toxic	e	measures carbon dioxide
6	corrosive	f	poisonous
7	flammable	g	causes skin to react
8	naked flames/sparks	h	catches fire easily

d **Which four types of PPE shown in the photos are mentioned at the meeting?**

e **In pairs, discuss the hazards in the following situations and the precautions that should be taken.**

1 Working inside a container with limited air circulation
2 Cleaning metal using acid that can burn the skin and which gives off fumes
3 Using a grinder to cut through a steel plate
4 Applying paint that can cause painful rashes on the hands

3 **a** **Stephanie, Dorian's senior safety officer, is attending a meeting on standard procedure for some engineering work that will be carried out at several of Dorian's plants around the world. Before the meeting she made notes. Read her notes and answer the following questions.**

1 What is meant by *hazard analysis*?
2 What is another way to say *safe system of work*?
3 What type of work is going to be carried out, and where?
4 What is meant by *access to silos*?
5 What are the specific hazards relating to confined spaces in this situation?

Hazard analysis & safe system of work
Operation: Maintenance to grain silos involving welding (with oxy-acetylene)
Location: Interiors of empty silos (approx 3m diameter x 15m deep), at bottoms
Main safety issues: Access to silos for workers & equipment. Confined space hazards

b ▶7.2 **Stephanie is discussing some of the hazards with Ben, one of Dorian's engineering managers. Listen to the conversation and note the hazards that they mention.**

1 Access hazards: _____
2 Confined space hazards: _____

c ▶7.2 **Listen again and answer the following questions.**

1 What safety precautions are discussed?
2 Which precaution might make one of the hazards worse, and how?

4 **In pairs, discuss suitable health and safety precautions and PPE for the following operations on an existing steel petrol storage tank at a processing plant. Student A, you are a safety officer; Student B, you are an engineering manager. Use the phrases in the box. Swap roles and practise again.**

- An opening needs to be cut through the wall.
- A new steel outlet pipe must then be welded onto the opening.
- The existing paint must then be removed from the external surface of the tank, by shot-blasting.
- The tank must then be repainted.

The main danger/hazard is ...	They'll have to take care that ...
Another danger/hazard is ...	They'll have to be (very) careful ...
There's a risk of ... -ing	To be safe, they'll need to ...

Viktor: Now, the problem is, these bolts won't have much play.

Rajesh: How do you mean?

Viktor: Well, they've got to fit quite tightly in the holes, so they won't be able to move much. There won't be much space around them, to adjust their position.

Rajesh: I see.

Viktor: So that means the holes have got to be positioned very precisely. If they're slightly out of position on the wall, they won't match up with the holes that have been pre-drilled through the steel beams, at our factory.

Rajesh: Sure.

Viktor: That's the main technical issue, in terms of deciding how we form these holes. Obviously, the technical side's not the only consideration. There's also the question of timescales – given that there are a lot of these holes to do. And, obviously, the question of cost, as well.

6.5

Viktor: In terms of cost, preforming is obviously a lot cheaper, because all you need are plastic tubes, which are cheap to buy, and quick to put in. If we do it that way, it'll be dead easy, and it'll cost peanuts. Whereas core drilling will be slow, it'll be quite a painstaking job. But ...

Rajesh: But core drilling's more accurate, clearly.

Viktor: A lot more accurate. I mean, sometimes, you can get away with preforming. If you need to get within twenty mil, then it's perfectly feasible. Ten mil is – it's achievable, but it's stretching it. Anything less than ten mil, and there's no way you can do it.

Rajesh: And what sort of tolerance are you looking for?

Viktor: About ten mil.

Rajesh: So it's borderline, then.

Viktor: It's a tall order. The safe bet would be going for core drilling.

Rajesh: The problem is going to be the schedule, though.

Viktor: Exactly. I mean, to diamond drill the number of holes we're talking about will take, um ...

Rajesh: It'll take forever and a day, won't it? Whereas if they're preformed, they'd be ready as soon as the walls are cast.

Viktor: But if half of them are in the wrong place, it'll cost an arm and a leg to put them right. Because if they're wrong, it's not just a question of drilling new ones in the right place. If they're slightly out of position, they have to be filled in, first, with cement, to avoid having two holes overlapping. So putting them right is easier said than done.

Rajesh: Sure. So as I see it, the key issue here, in terms of feasibility, is the tolerance. If the holes can be bigger, and there's more play for the bolts, we won't have this problem.

6.6

Marta: So, to be clear about how far we can go with this redesign, we're not aiming to reinvent the wheel, in terms of the main components and how they fit together. The reasons for that are firstly, from a hardware point of view, the existing design has proved to be effective. And secondly, we don't have the resources at this point in time to make fundamental changes to the production process.

Engineer 1: So the overall internal layout needs to remain the same?

Marta: Yes. We're looking for an evolution, rather than designing the whole thing from the ground up. Presumably, there is room for improvement?

Engineer 2: Well, this model has been revamped once before, of course. But, no doubt we can refine it a bit more.

Marta: However, given that software redesign isn't an assembly issue and has been the Achilles heel of the existing model, it would make sense to rethink that whole system.

Engineer 1: So for software, back to the drawing board, then?

Marta: Well, er, whatever we do, we need to make a quantum leap. Whether that means designing the system from scratch, I don't know. We need to make the whole thing much simpler to use.

7.1

a

Rosana: Next week they're due to start maintenance work on the grain silos in Zone 4. We need to make sure that everyone's aware that all those silos are classed as confined spaces. In other words, no one should go inside them without first doing an air test. And we need to keep a check on dust levels, as well.

Marc: We've got a CO_2 detector here, haven't we?

b

Rosana: If you walk past that machine while it's running, and you're trying to talk to someone, you have to shout to be heard. And as a rule of thumb, that means it should be an ear protection area.

Marc: Yeah, but the regs differentiate between brief exposure, when you're walking past something, and continuous exposure, don't they?

c

Marc: So is it harmful if it splashes on your skin?

Rosana: According to the notice it's an irritant, and it's toxic.

Marc: But it's not corrosive?

Rosana: Not as far as I'm aware.

Marc: So you don't need gloves and eye protection and masks and all the rest of it? If you get any on your skin, you just wash it off.

Rosana: Hm, I'm not sure about that.

d

Rosana: We need to enquire whether or not this maintenance involves welding. There are forklift trucks going through that area carrying flammable liquids. If there are going to be any naked flames or sparks, we'll need to put a proper procedure in place.

Marc: Right. I'll get in touch with their people, then.

7.2

Stephanie: So in terms of access, theoretically, there's a risk of someone falling, as they climb up a silo, or down into one. But there's always an external staircase with a guardrail, leading to the top, and there are permanent ladders, with protective hoops around them, fixed to the insides, leading down to the bottom. So workers should be able to access these silos fairly safely. The big problem will be getting the welding equipment, the gas bottles, down into the bottom.

Ben: They can be lowered down by rope.

Stephanie: Won't they be too heavy?

Ben: Not if they use the smaller-sized bottles.

Stephanie: We'll need to specify the bottle size in the procedure, then.

Ben: Yeah. They'll have to take care that the bottles don't fall onto someone, as well. That no one's standing in the bottom of the silo, while they lower them down.

Stephanie: True. That's another point to mention. OK, so access isn't really a problem, then. The main danger is the fact that it's a confined space. Especially given that they're welding, with an oxy-acetylene torch burning, which will produce a fair amount of CO_2.

Ben: So they'll need a CO_2 detector.

Stephanie: I mean, to be safe, they'll need to test the air before they go down, anyway. But we should probably specify that they need to keep the detector with them while they're working, and keep it switched on.

Ben: Yeah. Another hazard is there'll be metal fumes given off as they're actually welding, which is a different problem to the CO_2 issue.

Stephanie: Sure. So really, they'll need a ventilation system down there, some kind of air extractor.

Ben: Probably, yeah. And there's the problem of dust, as well. They'll have to be very careful about that. If they're welding and there's grain dust in the air, there's going to be an explosion hazard.

Stephanie: Yeah. Would a ventilator clear the dust, or make it worse? I suppose if there's a lot lying around, it'd keep blowing it up into the air, wouldn't it?

Ben: Mm. I'm not sure.

7.3

Stephanie: Restricted areas are places where a serious danger is present. So it's essential that these should be kept locked at all times. Under no circumstances should anyone be able to access them, unless they have a permit to work, in other words, a written form giving permission to work in the restricted area.

Lin: And permits to work, and the keys to restricted areas, can only be issued by the electrical supervisor?

Stephanie: That's right. So that one individual is responsible for electrical safety for the whole plant. Only that person is authorised to issue permits to work.

Lin: Presumably, it's important that permits are issued every single time someone enters a restricted area – each time they do a new job, they need a new permit.

Stephanie: Exactly. They shouldn't be issued for any longer than a full shift.

Lin: OK.

Stephanie: And it's crucial that there's just a single key to each restricted area. The whole idea of having a lock-out system is to ensure that only one person has access to switchgear at any given time. So whatever happens, someone cannot switch on a circuit at a switchboard while somebody else is working on it somewhere else in the plant.

Lin: Mm, if we imagine a technician needs to, let's say they're going to change a motor on one of the lines, they get a permit to work, and obtain the key to the switchboard from the electrical supervisor. Then they take the key, unlock the door to the switchboard, switch off the circuit-breaker for the motor, to isolate it, then lock the door again.