

# Hot rolling mill - General safety instructions

## 1. Beginning

### 1.1 Course start

**Hot Rolling Mill**  
General safety instructions

[Start the course](#)

 Course duration: About 1 hour	 Make sure your audio is turned on.	 Complete the test to pass the course.
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outokumpu

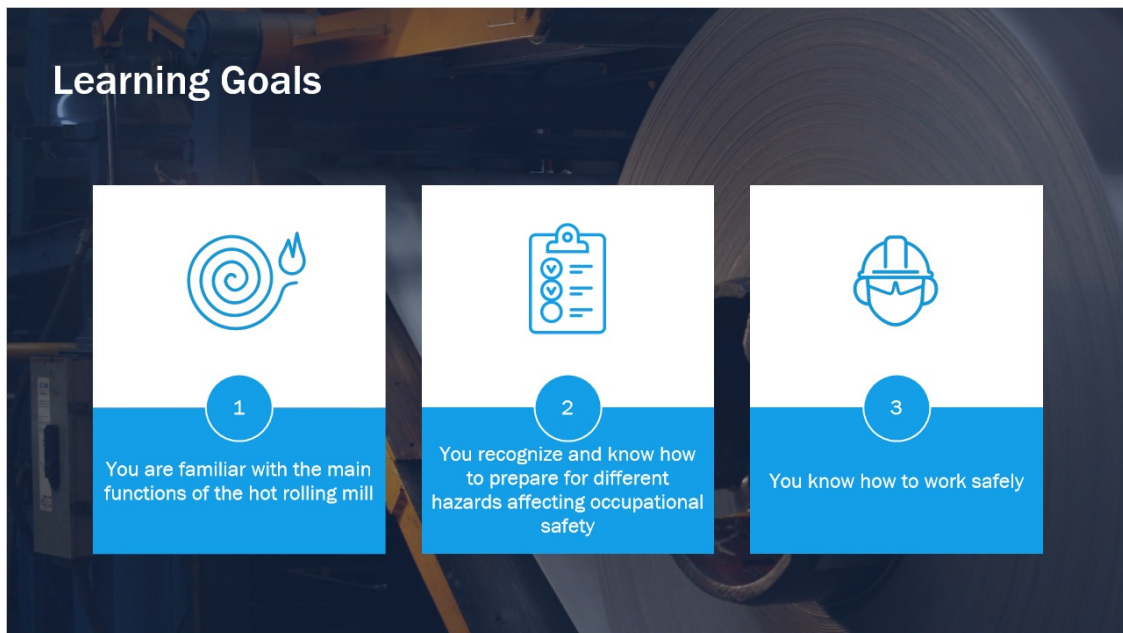
#### Notes:

Welcome to the Hot Rolling Mill.

This course takes about an hour to complete. Check again that you have your headphones or your speaker is turned on.

Carefully review all the materials so that you can take the mandatory test at the end of the course.

## 1.2 Learning Goals

A graphic titled "Learning Goals" set against a dark background of a hot rolling mill. It features three white rectangular boxes arranged horizontally. Each box contains a blue icon, a blue circle with a white number, and a blue bar at the bottom with white text. The first box has a spiral and flame icon, the second has a clipboard icon, and the third has a hard hat icon.

**Learning Goals**

- 1**  
You are familiar with the main functions of the hot rolling mill
- 2**  
You recognize and know how to prepare for different hazards affecting occupational safety
- 3**  
You know how to work safely

### Notes:

In this course, you will familiarise yourself with the operation of the hot rolling mill and learn how to identify various risks and hazards that affect occupational safety.

After completing the course, you will understand how important it is to follow occupational safety guidelines and know how to work safely.

Welcome aboard!

## 2. General

### 2.1 General



#### Notes:

Here you can see the contents of the course. First, you will get to know the hot rolling mill in general, after which you will look at the factors affecting occupational safety one topic at a time.

After completing all the sections, you will take the final test. When you pass the test, you will be allowed to work in the hot rolling mill.

## 2.2 Welcome to the hot rolling mill



### Notes:

The first hot strip coil in the hot rolling mill was rolled on November 2, 1987.

In May 1990, the hot rolling mill switched to a five-shift system.

Today, the annual production volume is around 1.4 million tonnes.

The product strip is a so-called black hot strip coil with a thickness ranging from 2.4mm to 12.7mm and a width of 1000mm to 1,600mm.

The hot rolling mill currently employs about 130 people.

## 2.3 The hot rolling mill

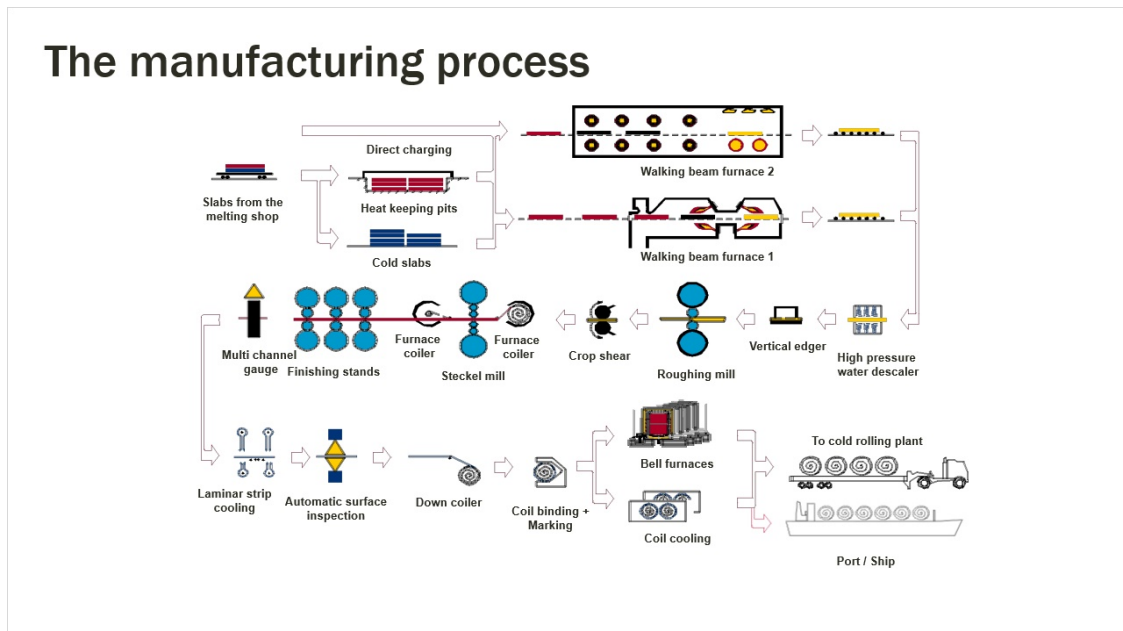


### Notes:

On this map, you can see the location of the hot rolling mill in the factory area. It's marked on the map in blue.

The Linde Group's air gas plant is located in the immediate vicinity of the hot rolling mill. Access to the area of the air gas plant is prohibited.

## 2.4 The production process



### Notes:

Let's take a closer look at the hot rolling mill's production process.

Slabs or rental slabs from the steel melting shop can be loaded directly into the walking beam furnaces, stored in heat keeping pits or stored on the floor of the furnace hall. In the walking beam furnaces, the slabs are heated to rolling temperature, i.e. 1260 degrees, using carbon monoxide and natural gas as fuel.

After about three hours of heating time, the slab is moved from the walking beam furnaces to the roller table.

The slab is transferred along the roller table to the high-pressure water descaler, where scale is removed from the slab's surface. After that, the slab moves along the roller table to the roughing mill.

In the roughing mill, the slab is rolled back and forth 5-7 times into a 20-25mm thick pre-strip. The roughing mill's vertical edger keeps the slab at the desired width.

From the roughing mill, the pre-strip moves to strip rolling.

Strip rolling consists of a Steckel mill and three finishing stands. On both sides of the Steckel is a furnace coiler that slows the decrease in the strip's temperature between passes. The furnace coilers use natural gas as fuel.

During strip rolling and after F5-F7 rolling, the product strip reaches target thickness. After rolling, the temperature of the product strip is about 900 degrees.

After strip rolling, the strip advances along the roller table through the laminar strip cooling zone to the down coiler.

After coiling, the roll is weighed, marked, tied and transferred to water pools or dry places to cool down. After cooling, the hot strip coils are transferred directly to the customer as black hot strip coils, to the cold rolling plant for further processing, or to the Bell furnaces.

Some ferritic steel grades are manufactured using Bell furnace annealing, in which case coils are brought by crane to the Bell furnace hall. Hydrogen and nitrogen are used in the process. The coils are annealed with electrical resistors to a temperature of about 800 degrees. The entire process takes about two days.

Other stainless and titanium-stabilized coils finish up in cooling water pools.

### 3. Exposures and protective equipment

#### 3.1 Exposures and protective equipment



**Notes:**

Great! Now you have an idea of how the hot rolling mill works. Let's take a look next at the most common exposures and protective gear.

## 3.2 Exposures

### Exposures

The main exposures at the hot rolling mill are:

- Dust
- Noise
- Thermal radiation
- Fats
- Oils
- Abrasive fluids



### Notes:

The main exposures at the hot rolling mill are rolling dust, noise and thermal radiation, as well as fats, oils and abrasive fluids.



### 3.3 Protective equipment

#### Protective equipment

##### Use

- protective helmet
- Protective clothing
- Gloves
- Protective footwear
- Goggles
- Hearing protectors
- (respiratory masks)

##### Wearing hearing protectors is mandatory

- in the mill hall
- in the furnace hall
- in the mill grinder, and
- in maintenance areas



#### Notes:

To protect yourself from these exposures, wear a protective helmet, ant flame protective clothing, protective gloves, protective footwear, goggles and hearing protectors.

If necessary, other personal protective equipment is used specific to the task, such as respirators.

The use of personal protective equipment is mandatory throughout the hot rolling mill both during production and shutdown, with the exception of the cab and office spaces.

## 4. Process handling

### 4.1 Process handling



#### Notes:

Now that you know the necessary protective equipment, we can move on to the different parts of process handling in more detail.

In this section, you will learn what to take into account at different processing stages.

## 4.2 Slab handling

### Slab processing

Pay attention to the transportation of slabs. Slabs can fall, drop from tongs or crash.

Service providers must have portable meters with them.



Cover or turn off laser sensors when working in their area of operation.



#### Notes:

Slabs are brought to the hot rolling mill from line 1 of the steel melting shop along the roller table, and from line 2 by a slab transport wagon. Slabs can also be loaded via cold routes from slab stacks.

Remote-controlled equipment move around the slab handling area, such as an automatic crane, a furnace hall crane, a slab transport wagon and lid transfer devices for the heat keeping pits.

The automatic areas are equipped with a security gate system. Pay attention also to the transportation of slabs, as they can fall over, fall out of tongs or collide with something.

All service providers must have their own portable multigas meters.


Remember that roller tables have laser sensors that should be covered or turned off when you work in their operating area.

### 4.3 Walking beam furnaces

#### Walking beam furnaces


Take the multigas meter with you when registering.

There are laser sensors that could cause eye damage on the loading roller table for the walking beam furnaces, on the loading table for walking beam furnace No. 1, and inside the furnaces.



Cover or turn off the laser sensors while working within their operating range.

Service providers must have their own portable multigas meters with them.



#### Notes:

There are two walking beam furnaces. Their job is to heat the slabs. Natural gas and carbon monoxide gas are used as fuel.

To work in the area of the walking beam furnaces, take a carbon monoxide alarm or multigas meter when registering in the control room.


There are laser sensors that may cause eye damage on the loading roller table, on the loading table for walking beam furnace No. 1, and inside the furnaces.

The laser sensors must be covered or turned off when working within their operating range.

Service providers must carry portable meters.


## 4.4 Roughing mill

### Roughing mill



Beware of splashes from the high pressure water descaler, which has a pressure of 180 bar.

Avoid staying in the basement areas.



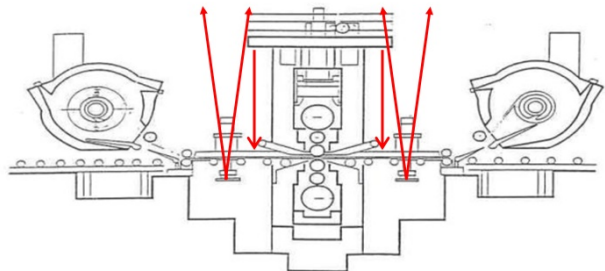
### Notes:

The roughing mill rolls the slab into a pre-strip.


When you move around in the roughing mill area, beware of splashes from the high pressure water descaler. The high pressure water descaler's pressure is 180 bar. During rolling, avoid staying in basement areas.

## 4.5 Strip roller and Finishing stands F5-F7

Strip milling and finishing stands F5-F7




The diagram shows a cross-section of a strip rolling mill with measuring devices on both sides. Red arrows point from the measuring devices towards the strip. Below the diagram are three icons: a yellow lightbulb for 'Radiation', a red lightbulb for 'Shutter Open', and a green lightbulb for 'Shutter closed'.



In the strip rolling area, measuring devices are used to measure the thickness of the strip. The devices cause a **radiation risk**.

Keep the measuring devices **in safe mode**, when working within less than 5m of the measuring devices. You must carry a radiation alarm and a film dosimeter. In addition, the training provided in the area must be completed.

Pay attention to the roof **fenced radiation hazard area**.



Working in the vicinity of the strip roller is strictly prohibited while driving, without a separate permit.

### Notes:

In the strip rolling area, measuring devices are used to measure the thickness of the strip. These measuring devices pose a radiation hazard. On both sides of the Steckel mill and after the last roller unit, there are lights indicating the state of the radiation source.

When working within less than 5 metres of the measuring devices, the devices must be in safe mode. You must also carry a radiation alarm and a film dosimeter. In addition, you must have undergone the training provided in the area.

Also take into account the fenced and marked radiation hazard area on the roof of the hot rolling mill.

Working in the vicinity of the strip roller is strictly prohibited while driving, without a separate permit.

## 4.6 Cooling roller table and multi channel gauge

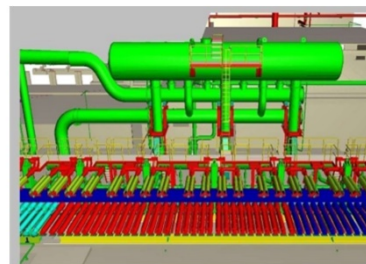
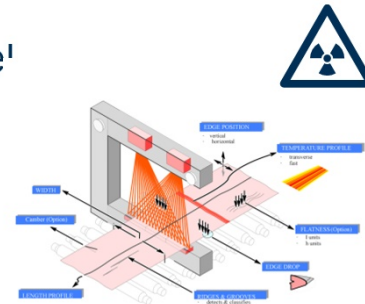
### Cooling roller table and multi channel gauge

The multi channel gauge is used to measure the thickness profile, width, flatness and temperature of the steel plate



At the top of the multi channel gauge c-frame there are two high-activity X-ray sources. The radiation they emit from is directed downwards.

Observe sufficient safety distance when moving around the laminar cooling area of the cooling roller table.



#### Notes:

The multi channel gauge is used to measure the thickness profile, width, flatness and temperature of the steel plate.

There are two high-activity X-ray sources at the top of the device's c-frame. The radiation they emit is directed downwards.

Usually in thickness measurements, radiation is directed from the bottom up. The multi channel gauge is therefore an exception to this.

When moving around the laminar cooling area of the cooling roller table, observe sufficient safety distance in case, for example, of water splashes.

## 4.7 The multi channel gauge's protective hood and service room

### Multi channel gauge protective dome and service room

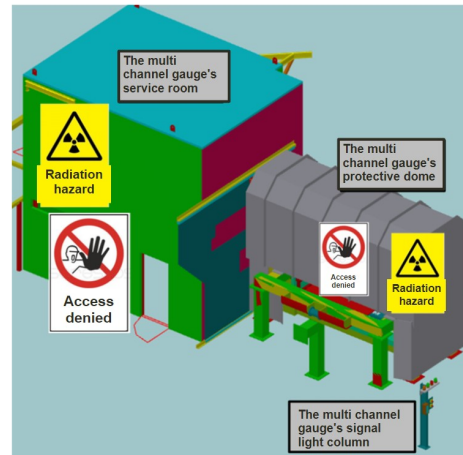


The c-frame of the multi channel gauge is located inside the protective dome. You cannot work inside **the protective dome** without permission, even briefly.

The multi channel gauge has its own service room. It is located behind the roller table. Do not work in the maintenance room without permission.



Due to the radiation hazard, do not work underneath the thickness measuring devices in the descaling water canal without permission.



#### Notes:

The c-frame of the multi channel gauge is located inside the protective dome. You may not work inside the protective dome even for a short time without permission.

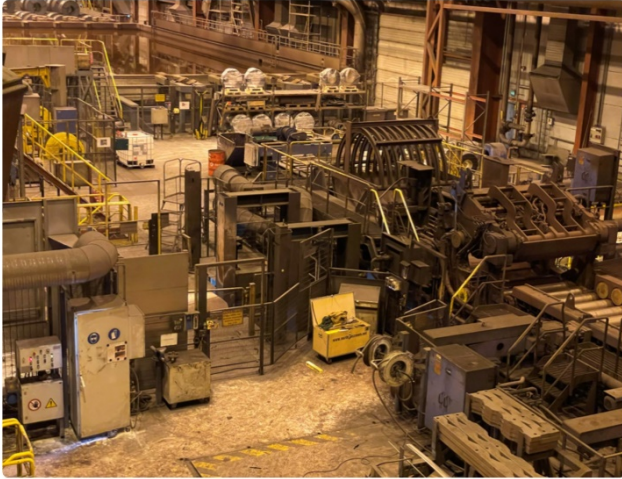
The multi channel gauge also has its own service room. It is located behind the roller table. You cannot work in the maintenance room without permission.

Due to the radiation hazard, do not work underneath the thickness measuring devices in the descaling water canal without permission!



## 4.8 Down coiler

### Down coiler



When working in the down coiler area, the operating range of the walking beam, banded and marking machines must be taken into account.

Near the roller table, there is also a scrap cutter, laminar cooling and automatic surface inspection station.

#### Notes:

When working in the down coiler area, observe the operating range of the walking beam, banded and marking machines.

In addition, a scrap cutter, laminar cooling and automatic surface inspection station are located in the vicinity of the mill roller table.

## 4.9 Handling the hot strip coils

### Handling the hot strip coil



In the coil storage area there are **automatic cranes**.

Do not use the roller ramp doors. Use the personnel doors.

If you are working in the roller ramp area, lower the lifting door and turn the door safety switch to zero. Notify the driver.

#### Notes:

Hot strip coils are transported from the coil storage with the help of heavy load vehicles. Beware of hot coils and consider the movements of coil transport vehicles. Automatic cranes operate in the coil storage area.

Do not enter the hall through the roller ramp doors, as the openings have light cells that stop the crane. Use the personnel doors instead.

If you are working in the roller ramp area, lower the lifting door and turn the door safety switch to zero. In addition, inform the driver of the coil vehicle that no driving is allowed on that ramp.

## 4.10 Roll grinding shop (muutetaan alla olevaan kuvatekstiin myös)

### Mill grindery

The mill grindery has five grinding machines.

Pomini 1 and Pomini 2 are automatic and located in the safety zone

Safe zone



Pomini 1



Pomini 2



WS1100



### Notes:

The **Roll grinding shop** has five grinding machines. Two of them are automatic and are located in the safety zone.

## 4.11 Roll grinding shop

### Mill grindery



Also take into account the automatic crane and the radio-controlled cranes operating in the safety zone.



Be careful not to slip!

#### Notes:

There is also an automatic crane and two radio-controlled cranes operating in the safety area.

When moving around the **Roll grinding shop** area, beware of slippery grease and oil!

## 4.12 Water treatment plants



### Notes:

The two water treatment plants in the hot rolling mill handle the water needed for the process equipment.

Water treatment plants are controlled from different cabs by remote control.

Water treatment plants are very loud, so take care of your hearing protection.

In addition, the floors of the plant can be slippery.

When opening pipe connections, make sure that the pipe is unpressurized and that unexpected start up of the work site is reliably prevented.

Chemicals are used in water treatment. In other words, protect yourself from chemical splashes with protective equipment in accordance with work instructions.

Only tools and lamps intended for wet spaces can be used for work in wet rooms.

## 4.13 Bell furnaces

### Bell furnaces



In the **Bell process** hydrogen and nitrogen are used. Therefore, repair and maintenance work in the area always requires a **written work permit**.

When working in the Bell furnace pit, bring a portable **multigas meter**.



Do not look at the crane alignment laser.

Outsiders are forbidden in the Bell area.

#### Notes:

Next, let's get to know the Bell furnaces. Hydrogen and nitrogen are used in the Bell process. Therefore, repair and maintenance work in the area always requires a written work permit.

Gases used in the process can displace oxygen in the air. When working in the Bell furnace pit, bring a portable multigas meter.

There is an automatic crane and a radio-controlled crane operating in the Bell area. The radio-controlled crane has an alignment laser that can cause eye damage, so do not look at the laser beam.

Outsiders are forbidden in the Bell area.

## 5. Gases, laser sensors and warning sounds

### 5.1 Gases, laser sensors and warning sounds



#### Notes:

The hot rolling mill uses a wide range of gases and laser sensors. In addition, we use warning sounds that are good to recognize and take into account. In the next section, we will take a closer look at these.

## 5.2 Gases

The infographic is titled "Gases" and lists the main gases used: Natural gas, Carbon monoxide, Oxygen, Hydrogen, and Nitrogen. It includes two safety instructions: one for reporting leaks and another for the location of oxygen-dispensing devices.

**Gases**

The main gases are:

- Natural gas
- Carbon monoxide
- Oxygen
- Hydrogen
- Nitrogen

Any leaks must be immediately reported to the nearest control room.

**Oxygen-dispensing devices are located** in the control room of the walking beam furnaces, near the furnaces and the Bell area.

### Notes:

Large quantities of different gases are used in the hot rolling mill.

- 1) The main gases are natural gas, carbon monoxide gas, oxygen, hydrogen and nitrogen.
- 2) Any leaks must be reported immediately to the nearest control room.
- 3) Oxygen-dispensing equipment can be found in the control room of the walking beam furnaces, near the furnaces and the Bell area.



## 5.3 Gas cylinders

### Gas cylinders

Take the cylinders to a safe place, out of the thermal radiation and splash areas

Store only in transport cages

Don't leave them loose and standing upright



#### Notes:

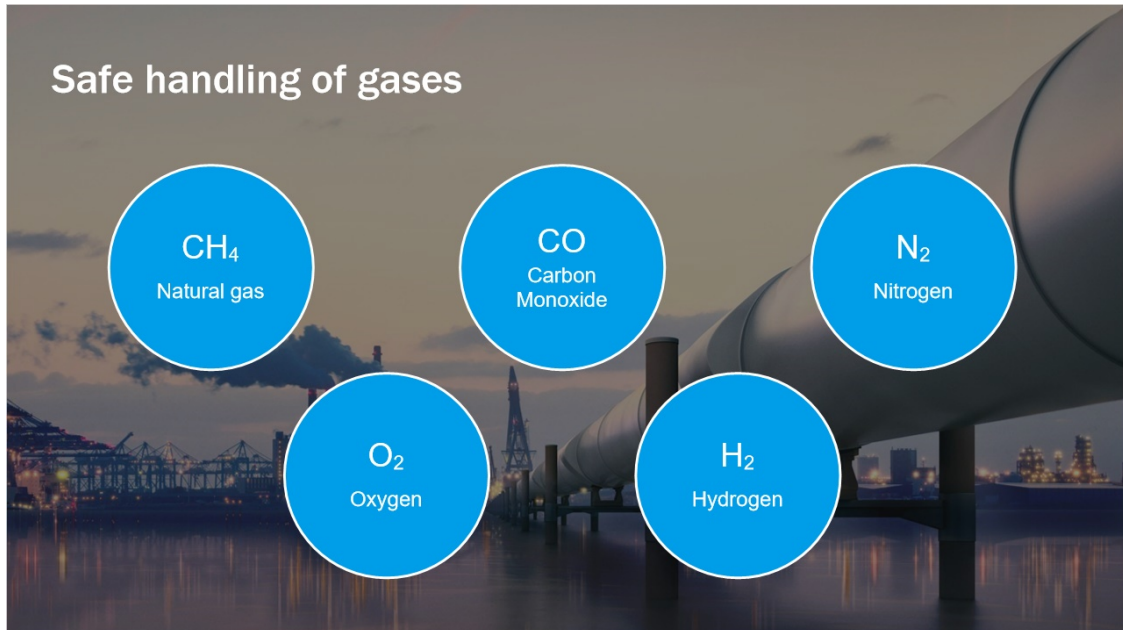
Always take the cylinders out of the thermal radiation or splash area to a safe place whenever you stop or halt work. Store the gas cylinders only in transport cages.

Remove empty cylinders from the work site immediately and return them to the replacement point, i.e. the transport cage for empty cylinders.

Do not leave gas cylinders loose and standing upright.

During use, cylinders removed from a transport cage or cart must be kept horizontal or attached to structures using a fire-resistant, durable metal fastener, such as a chain.

## 5.4 Safe handling of gases



### Notes:

Next, let's learn about the gases and their handling instructions. Click on the sections to explore the gases.

### Natural gas

Natural gas is lighter than air and rises upwards in the event of a leak. It is a highly flammable gas and can explode when heated.

In the event of a gas leak, move away from the area affected by the gas cloud and close the gas shut off valve if possible.

If possible, save those in immediate danger. Do not enter the gas hazard area without a compressed air respirator.

### Carbon monoxide

Carbon monoxide is used in the walking beam furnaces. It is an odourless, highly toxic and highly flammable gas.

Carbon monoxide cannot be seen, smelled or tasted, so toxic concentrations cannot be detected by smell. Therefore, it is monitored from both fixed and portable meters.

The first effects of excessive concentration are headache, nausea and dizziness.

## **Nitrogen**

Nitrogen is used in pressure batteries, rinsing gas pipelines, controlling valves in the Bell area, and rinsing both gas pipes and inner hoods, i.e. inertification.

Nitrogen is an odourless gas that displaces oxygen in the air and poses a choking hazard.

## **Oxygen**

Oxygen is used as a fuel gas.

Increase in oxygen concentrations strongly accelerates combustion. At high oxygen concentrations, many normally non-combustible materials burn intensely when ignited.

Oxygen reacts explosively with fat and oil.

When using an oxygen lance, make sure that your protective gloves and suit are clean.

Cleaning clothes with oxygen is strictly forbidden.

## **Hydrogen**

Hydrogen gas is used for Bell annealing.

Hydrogen is a highly flammable gas and can cause an explosive mixture with air.

High concentrations pose a risk of suffocation.

Hydrogen burns with an invisible flame, so never test hydrogen burning with your hand.


In the event of a fire, do not extinguish the burning leakage, but close the gas flow if possible.

## Natural gas 1 (Slide Layer)

Safe


### Natural gas (LNG, Liquid Natural Gas)

Common features



Natural gas is lighter than air and rises upwards in the event of a leak.

The self-ignition temperature of natural gas is higher than 590 C.



**Danger!**

H220 Highly flammable gas.  
H280 Contains pressure gas, may explode when heated


→

## Natural gas 2 (Slide Layer)

Safe


### Natural gas (LNG, Liquid Natural Gas)

Safe handling




Forms a flammable and explosive gas-air mixture if methane content is in the air n. 5–15%.

Natural gas is perfumed to detect leakages.



In the event of a gas leakage, the following shall be operated in accordance with the general gas hazard situation:

- Move away from the gas cloud's affected area
- Close the shut-off valves if possible.
- If possible, save those in immediate danger.
- Do not enter the gas hazard area without a compressed air respirator.



**Safety data sheets and chemical cards** provide more information on how to handle natural gas safely.


→

## Carbon monoxide (Slide Layer)

Safe


### Carbon monoxide

Common features



Carbon monoxide is used in walking beam furnaces.

It is an odourless, very toxic and flammable gas.



**Danger!**

The first effects of carbon monoxide gas in humans are headaches, nausea and dizziness.


→

## Nitrogen (Slide Layer)


Safe

### Nitrogen

Common features



Nitrogen is used in pressure batteries, rinsing gas pipelines, **Bell** – area valve control, and rinsing both gas pipes and inner hoods, i.e. inertization.



**Warning!**

Nitrogen is an **odourless** gas that displaces oxygen in the air and causes a **suffocation risk**.


→

## Oxygen (Slide Layer)

Safe



### Oxygen

Common features



Oxygen is used as a fuel gas.

When using an oxygen lance, make sure that the protective gloves and suit are **clean**.



**Danger!**

Oxygen reacts **explosively** with fat and oil.

Cleaning clothes with oxygen is strictly forbidden. Cleaning clothes with compressed air is also prohibited.


→

## Hydrogen (Slide Layer)

Safe


### Hydrogen

Common features



Hydrogen gas is used **Bell**-annealing.

Hydrogen is a **highly flammable** gas and it may cause an **explosive** mixture with air.



**Danger!**

Hydrogen burns with an invisible flame, so **never** test hydrogen burning with your hand.

**In the event of a fire, do not extinguish a burning leak, but close the gas flow.**

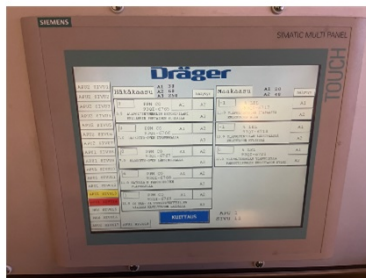
→

## 5.5 Gas concentration measurement system

### Gas concentration measurement system

In addition to personal portable gas concentration meters, the hot rolling mill has a **fixed leakage gas measure- and alarm system**.

The control centre is in the cab of walking beam furnace No. 2.



#### Notes:

Measuring gas concentrations is important. In addition to personal portable gas concentration meters, the hot rolling mill has a fixed leakage gas measure and alarm system.

When the flash alarm is sounded or when you hear a beeping alarm, leave the danger area to the nearest control room.

## 5.6 Initial extinguishing equipment

### First extinguishing equipment

In the vicinity of workstations,  
**initial extinguishing equipment**

In the event of a fire, extinguish with the nearest initial extinguisher.

Always inform the shift supervisor of the extinguishing device you are using and its location.

Do not use the initial extinguishing equipment in guarding hot work.



**Strip- and roughing mill:**  
Water extinguishing system

**Finishing stands:** Sprinkler system

**Down coiler:**  
Water canons

**Binders:**  
Fire water flushing

### Notes:

Initial extinguishing equipment has been located near the workstations.

In the event of a fire, extinguish with the nearest initial extinguisher.

Always inform the shift supervisor of the extinguishing device you are using and its location!

Do not use the initial extinguishing equipment in guarding hot work.

The strip and roughing mill have a water extinguishing system that can be triggered by hand from the controls to extinguish fires in the mill.

The finishing stands also have sprinkler systems that can be triggered from the control room.

There are three water cannons in the down coiler area that can be fired simultaneously from the control room

In addition to these, the binding machines have three fire water rinses that can be triggered from the control room.



## 5.7 Laser sensors



### Notes:

Let's take a look at the laser sensors next.

The hot rolling mill has several radiation-based measuring instruments and laser sensors that are used for example to measure thickness and quantity. The location of the measuring instruments is indicated by warning signs and symbols.

Do not look at the beam of the laser sensor, as this is dangerous for your vision.

It is prohibited to enter the operating area of the measuring devices. In case of maintenance, make sure that the measuring device is switched off or protected.

Now, click on the names of the devices to explore them in more detail.

### Sapotech APU 2 PRR1-PRR2

Lasers are used, for example, on loading roller table 2 (PRR2) near the control room for the walking beam furnaces. On its south side are two lasers and an overhead camera.

The system is connected to Outokumpu's security gate system, which means that when you enter its area of operation, the camera system goes into safety mode. When the gate is set off, the Sapotech system is also set off.

The system is secured through a cabinet under the control room.

### **Sapotech APU EXIT**

In addition, lasers are used below the roller table, on the west side of walking beam furnace no. 1, to the west of access level 5. Below the roller table, there are cameras on the engine side and at the front.

You can secure the system either from the device cabinet or from the field switches.

The cabinet is located in the hydraulics area at the end of walking beam furnace no. 1.

The field switches (so-called satellite) are in the immediate vicinity of the camera system.

### **Sapotech roughing mill camera system**

Lasers are also used before strip rolling. Cameras are attached to the cutter's overpass level and below the roller table. Both the front and the motor sides have cameras at the top and at the bottom.

These lasers are 3B-class lasers up to 1000 mm. In addition to these, an infrared camera has been installed in the overpass level, which has not yet started to be deployed.

Safety zones are under construction. Before entering these zones, the equipment must be made safe before it is possible to open the door.

The system can be secured from a field panel located in the immediate vicinity of the overpass level. The same switch will turn off all lasers.

### **APU1 combustion cutting machines**

Flame cutting machines are used to cut pre-strip scraps. Behind both walking beam furnaces, next to the furnace roller table, there are two walking beam furnaces.

### **The rolling mill's crop shear 3IR**

The rolling mill's crop shear is located at the end of the middle roller table, before strip rolling.

The shear cuts the ends of the pre-strip straight to make it easier and more manageable to roll the strip and thread it into the furnace coilers.

The cutter has a 3IR laser sensor. Please note this when carrying out maintenance and repair work with the cutter.

## APU 2 (Slide Layer)

Laser sensors

Sapotech APU 2 PRR1-PRR2 



The slide displays three photographs related to the Sapotech APU 2 PRR1-PRR2 laser sensors. The leftmost photo shows a close-up of industrial rollers. The middle photo shows a large orange control cabinet with a 'SAPOTECH' label. The rightmost photo shows a wide view of the industrial facility with multiple roller lines.

## APU EXIT (Slide Layer)

Laser sensors

Sapotech APU EXIT 



The slide displays three photographs related to the Sapotech APU EXIT laser sensors. The leftmost photo shows a control panel with a sign that reads 'SAPOTECH LASEREIDEN OHJAUSKOTELO' and a green indicator light. The middle photo shows a large orange control cabinet with a '93RK32' label and a 'SAPOTECH' logo. The rightmost photo shows a view of industrial machinery with a bright light source.

## APU EV camera system (Slide Layer)

**Laser sensors**

Sapotech roughing mill camera system 

There are cameras at the cutter's overpass level and below the roller table. They are on the front and motor sides, above and below.

Security areas under construction (front and engine-basement)




## APU 1 (Slide Layer)

**Laser sensors**


APU1 flame cutting machines

Flame cutting machines are used to cut pre-strip scraps.



### 3IR (Slide Layer)


**Laser sensors**

The rolling mill's crop shear 3IR 

The rolling mill's crop shear is used to cut the ends of the pre-strip straight.

Pay attention to the laser sensor when performing maintenance and repair work!

Strip s





### 5.8 Warning sounds


**Warning sounds**


Observe the warning sounds related to functions and situations:

- **Starting slab removal**
- **Starting up the cranes**
- **Movement of the mill's changing wagons**
- **Gas leak**

 Click to hear the sound of the slab's removal

 Click to hear the cranes starting

 Click to hear the warning sound for the changing wagons' movement

 Click to hear the sound of the gas alarm

Notes:

Production is accompanied by warning sounds, which should be recognized and taken into account. Warning sounds are connected for example to the following functions and situations:

Starting slab removal – stay at a sufficient distance from the roller table. Do not cross the roller table while rolling is in progress.

A warning sound is given before the bridge cranes start up. Leave the danger area and do not pass under the crane's load.

When the mill's changing wagons are moving, a warning sound is heard. Take special care in the vicinity of the changing wagons.

A gas leak is indicated by a flashing light and the sound of a buzzer. If this happens, exit the danger area.

### Gas leak (Slide Layer)

• Gas leak

Häkäkaasuu		Maakaasuu	
A1	A2	A1	A2
0	0	0	0
9302-6569	9302-6569	9302-6569	9302-6569
7.8 TAKASU & YLÄPÖLTTÄSU	A3	11.5 TAKASU & YLÄPÖLTTÄSU	A3
0	0	0	0
9302-6561	9302-6561	9302-6561	9302-6561
7.8 TAKASU & YLÄPÖLTTÄSU	A3	11.5 TAKASU & YLÄPÖLTTÄSU	A3
0	0	0	0
9302-6562	9302-6562	9302-6562	9302-6562
7.8 KÖNNÖNEN & YLÄPÖLTTÄSU	A3	11.5 KÖNNÖNEN & YLÄPÖLTTÄSU	A3
0	0	0	0
9302-6563	9302-6563	9302-6563	9302-6563
7.8 KÖNNÖNEN & YLÄPÖLTTÄSU	A3	11.5 KÖNNÖNEN & YLÄPÖLTTÄSU	A3
0	0	0	0
9302-6564	9302-6564	9302-6564	9302-6564
7.8 KÖNNÖNEN & YLÄPÖLTTÄSU	A3	11.5 KÖNNÖNEN & YLÄPÖLTTÄSU	A3

KUITTAUS APU 2  
SIVU 3

Click to hear the sound of the gas alarm

## 6. Radiation safety

### 6.1 Radiation safety



#### Notes:

Great! You're now familiar with gases and laser sensors.

Radiation is one of the dangers in a hot rolling mill. In the next section, you will learn more about this.

## 6.2 Radiation safety in the vicinity of thickness measuring devices

Radiation safety in the vicinity of thickness measuring devices



Before starting work with or near the c-frame, monitor leakage radiation from the thickness measuring devices.

Measure leakage radiation with a long-stemmed meter.

During work, use both a radiation alarm and a film dosimeter.



### Notes:

Always measure leakage radiation from the thickness measuring devices before starting work near the c-frame.

In particular, this rule applies to a situation where maintenance work is carried out on the c-frame itself or on the equipment inside it.

Before measuring leakage, make sure that steps have been taken to ensure that the thickness measuring device is safe.

Since radiation cannot be sensed in any way when radiation exposure occurs, leakage radiation must be detected by measuring. Leakage radiation measurements are made with a long-stemmed meter.

During work, use both a radiation alarm and a film dosimeter.



### 6.3 Radiation hazard in the descaling water canal

#### Radiation hazard in the descaling water canal



The descaling water canal is located below the rolling conveyor. The loose mill scale must be removed from time to time.

Before you start working in the canal, make sure the thickness measuring devices are made safe.

Inform the mill's shift supervisor **of the work's beginning and end**, who will inform **electrical maintenance**.

Hot rolling mill shift supervisor tel. +358 50 500 500 000 040 5732347



#### Notes:

At the hot rolling mill, the descaling water canal is located below the roller table. Mill scale that has been removed from the slabs accumulates in the canal and must be removed from time to time.

Working in the descaling water canal is dangerous if the thickness measuring devices are in operation above the work site, as they spread radiation to the descaling water canal.

Before you start working in the canal, make sure that the thickness measuring devices have been made safe and that you have informed the shift supervisor and the mill's electrical maintenance about the work.

## 7. Cleanliness of the working environment

### 7.1 Cleanliness of the working environment



#### Notes:

Great! Radiation is one of the dangers of a hot rolling mill. In the next section, you will learn more about this.

## 7.2 Cleaning the work site



### Notes:

When working in a hot rolling mill, it is especially important that everyone takes care of cleaning up after their work. Excess material on worktops increases the risk of accidents and fires.

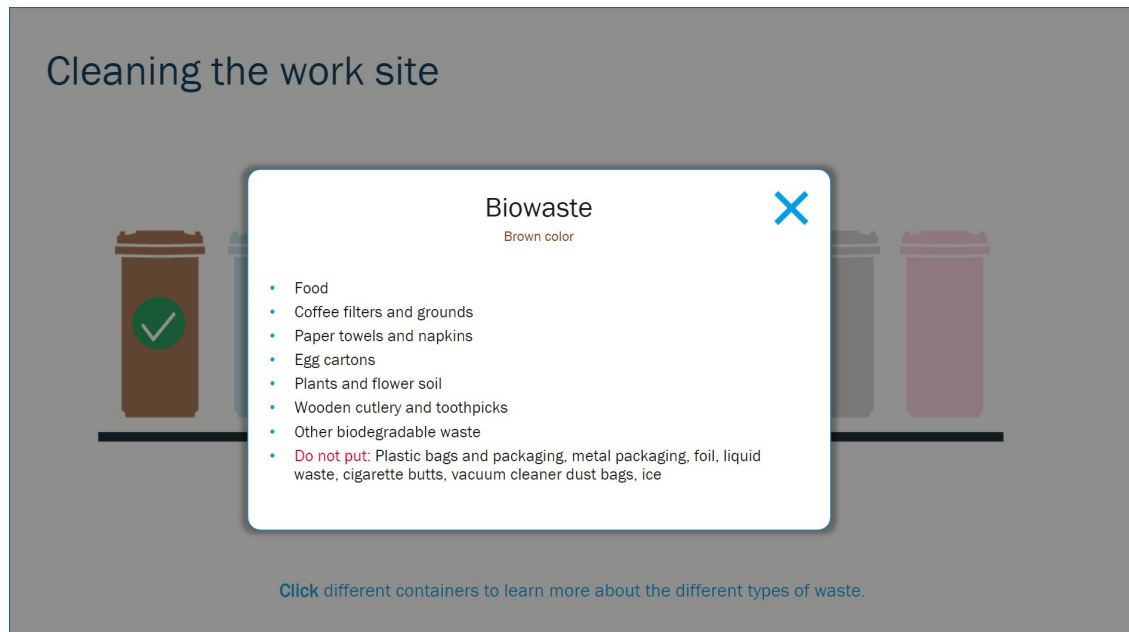
Waste from work is sorted according to the factory-specific sorting instructions.

Please note that wood, welding sticks or other waste must not be dropped into the descaling water canal.

Click on the different containers to learn more about the different types of waste.

## Biowaste (Slide Layer)

Cleaning the work site



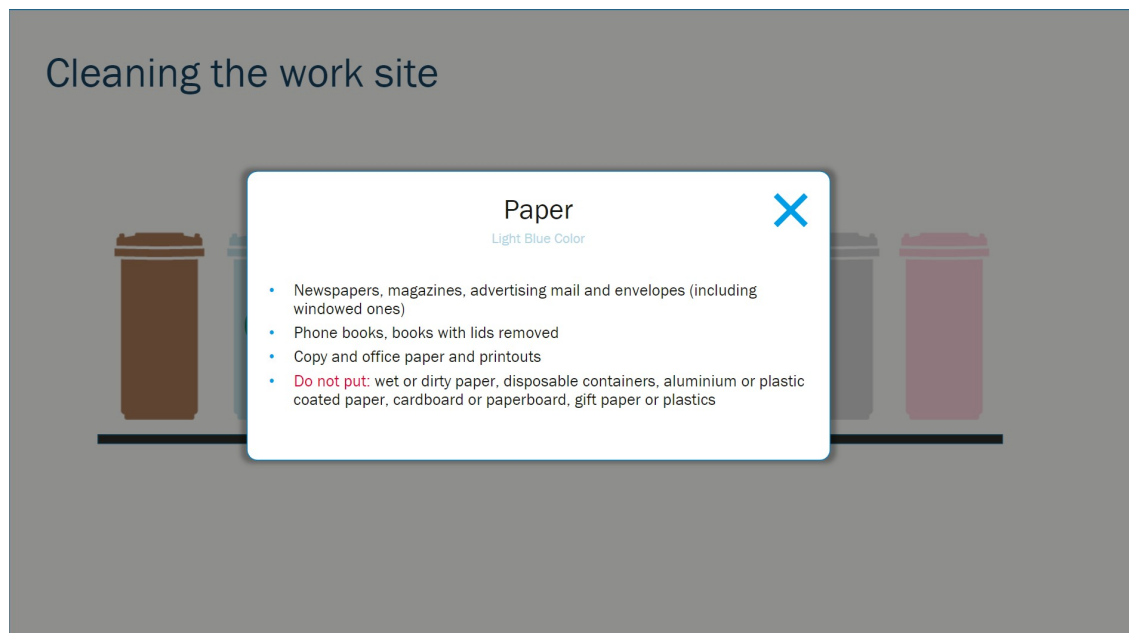
**Biowaste**  
Brown color

- Food
- Coffee filters and grounds
- Paper towels and napkins
- Egg cartons
- Plants and flower soil
- Wooden cutlery and toothpicks
- Other biodegradable waste
- **Do not put:** Plastic bags and packaging, metal packaging, foil, liquid waste, cigarette butts, vacuum cleaner dust bags, ice

[Click different containers to learn more about the different types of waste.](#)

## Paper (Slide Layer)

Cleaning the work site

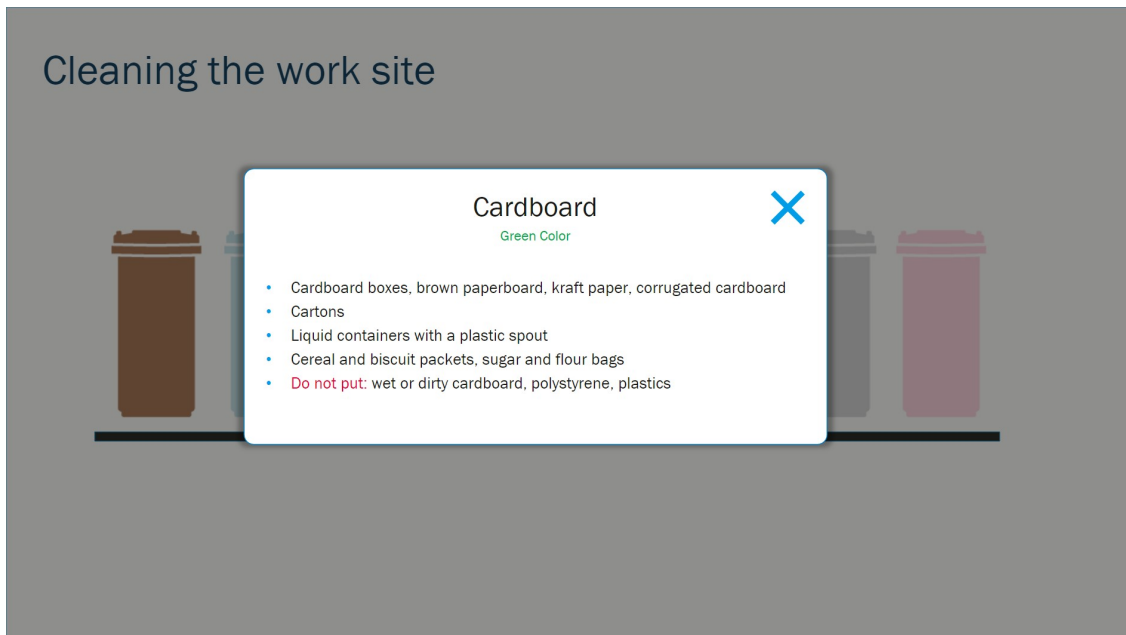


**Paper**  
Light Blue Color

- Newspapers, magazines, advertising mail and envelopes (including windowed ones)
- Phone books, books with lids removed
- Copy and office paper and printouts
- **Do not put:** wet or dirty paper, disposable containers, aluminium or plastic coated paper, cardboard or paperboard, gift paper or plastics

## Cardboard (Slide Layer)

Cleaning the work site

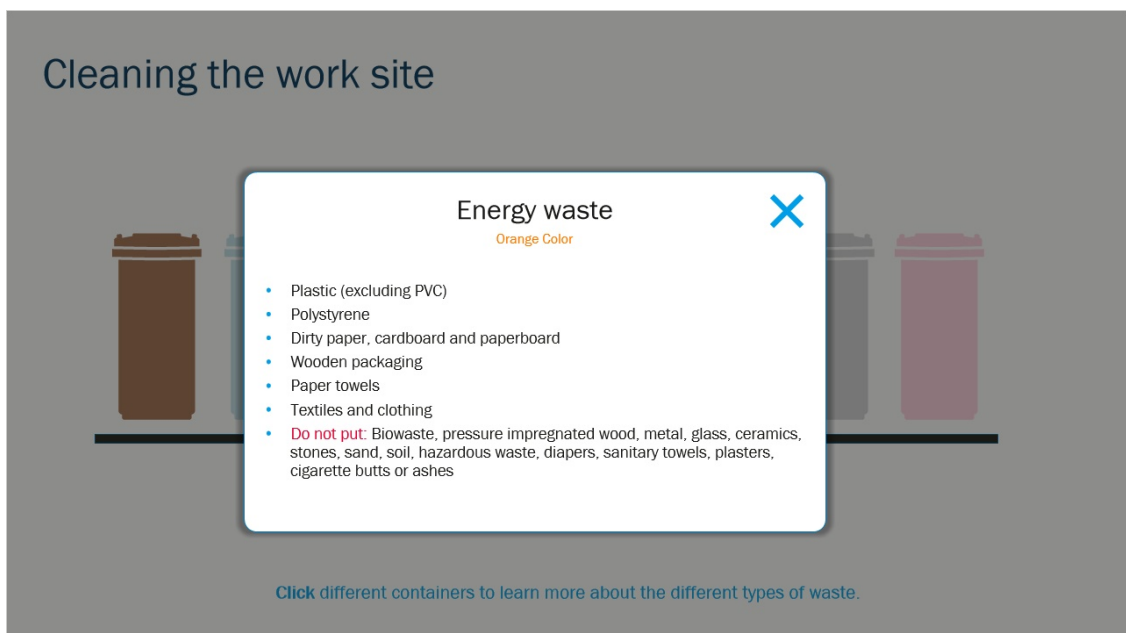


**Cardboard**  
Green Color

- Cardboard boxes, brown paperboard, kraft paper, corrugated cardboard
- Cartons
- Liquid containers with a plastic spout
- Cereal and biscuit packets, sugar and flour bags
- **Do not put:** wet or dirty cardboard, polystyrene, plastics

## Energy waste (Slide Layer)

Cleaning the work site



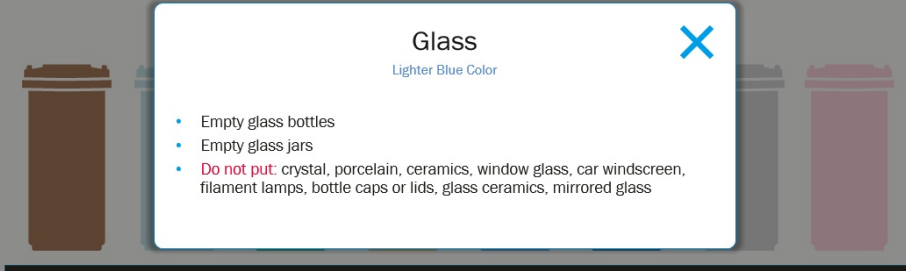
**Energy waste**  
Orange Color

- Plastic (excluding PVC)
- Polystyrene
- Dirty paper, cardboard and paperboard
- Wooden packaging
- Paper towels
- Textiles and clothing
- **Do not put:** Biowaste, pressure impregnated wood, metal, glass, ceramics, stones, sand, soil, hazardous waste, diapers, sanitary towels, plasters, cigarette butts or ashes

[Click different containers to learn more about the different types of waste.](#)

## Glass (Slide Layer)

Cleaning the work site



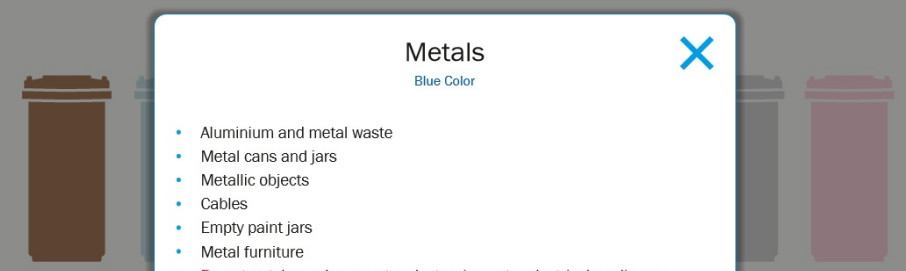
**Glass**  
Lighter Blue Color

- Empty glass bottles
- Empty glass jars
- **Do not put:** crystal, porcelain, ceramics, window glass, car windscreen, filament lamps, bottle caps or lids, glass ceramics, mirrored glass

[Click different containers to learn more about the different types of waste.](#)

## Metals (Slide Layer)

Cleaning the work site



**Metals**  
Blue Color

- Aluminium and metal waste
- Metal cans and jars
- Metallic objects
- Cables
- Empty paint jars
- Metal furniture
- **Do not put:** hazardous waste, electronic waste, electrical appliances, mixed waste, paint containers, air conditioning pipes

[Click different containers to learn more about the different types of waste.](#)

## Mixed waste (Slide Layer)

Cleaning the work site

### Mixed waste

Gray Color

- Unsorted mixed waste
- **Do not put:** biowaste, hazardous waste, electrical waste, recyclable waste (paper, cardboard, glass, energy waste), car tyres

Click different containers to learn more about the different types of waste.

## Hazardous waste (Slide Layer)

Cleaning the work site

### Hazardous waste

Red Color

- Lubricant
- Oily wastewater
- Solvent waste
- Solid and paste-like oily wastes
- Paints, inks, lacquers, varnishes, glues and waxes
- Liquid coolant
- Clutch and brake fluids
- Acids
- Bases
- Waster accumulator
- Battery waste
- Mercury vapor lamps and fluorescent tubes
- Aerosol cans
- All e.g. hazardous waste in its own collection bins



Click different containers to learn more about the different types of waste.

## 7.3 Fiber work – Before starting work

### Fiber work – Before starting work

Fibers can cause irritation, of the skin, eyes or respiratory tract.

Use a **positive-pressure respirator, disposable overalls, knee-high foot protection and protective gloves** when you are carrying out or in the vicinity of

- Repair work to wall, roof or beam insulation
- Demolition or installation work inside the furnace
- Turning and insulating work on the covers of the heat keeping pits
- Replacing the seal of the furnace coiler drum

Location of protective equipment: Protection booth between APU1 and APU2, bay C5-C6.



#### Notes:

Ceramic fiber is used in the hot rolling mill.

Ceramic fibers may cause mechanical skin, eye and/or respiratory irritation. Special care and concern should therefore be taken when cleaning and handling fibers.

Appropriate protective equipment shall be used for fiber work, both during installation and demolition.

This includes a positive pressure respirator equipped with a P3 particulate filter, disposable overalls and knee-high protective footwear over which trouser legs are pulled.

The hands should also be protected with gloves.

This protective equipment must be worn while you are carrying out or in the vicinity of

- Repair work to wall, roof or beam insulation
- Demolition or installation work inside the furnace
- Turning and insulating work on the covers of the heat keeping pits, or
- Replacing the seal of the furnace coiler drum

The protective equipment can be found in the fiber work protection booth between APU1 and APU2, bay C5-C6.



## 7.4 Fiber work – After work

### Fiber work – After work

Seal the respirator tightly in a plastic bag.  
The supervisor takes care of sending the protective equipment to protective equipment services.

Disposable overalls and gloves are put in the trash after each use.

Make sure that the ceramic fiber is bagged in garbage bags and marked with a note.

Vacuum all ceramic fiber with a fine filter vacuum cleaner or use wet cleaning. **Do not vacuum** fiber dust with a vacuum cleaner with a normal filter!

Final cleaning the site carefully.



#### Notes:

The used respirators are tightly sealed in a plastic bag and delivered to protective equipment services for maintenance and disinfection.

The user is responsible for bagging, while the work area supervisor is responsible for dispatching the respirators to protective equipment services.

Disposable overalls and gloves are put in the trash after each use and new ones are put on for the next visit.

Prevent large-scale introduction of ceramic fiber into the airspace of the furnace or rolling mill. When dismantling the insulation, fiber is put into garbage bags. Do not overfill the garbage bags, so they stay easy to close tightly. Close the bags tightly and mark "ceramic fiber" with a separate note.

If ceramic fiber gets outside the furnace, it must be collected into bags in the same way. Finally, the area must be vacuumed using a fine-filtered vacuum cleaner, so that the dust remains in the garbage bags. This can also be done by suction truck or wet cleaning. It is strictly forbidden to vacuum ceramic fibrous dust using vacuum cleaners with normal filters.

Careful final cleaning of the site after the work has been completed.

## 8. Registration practice, working in a security area and LOTOTO

### 8.1 Registration practice, working in a security area and LOTOTO



**Notes:**

Next, we'll take a look at important practices related to our activities.

## 8.2 Registration practice

### Registration practice

Always inform the supervisors and the operating staff in the area.

Always go to the work site through the area control room.

Together, check that the necessary verifications and locks are complete.

When going to the roof, report to the control room of walking beam furnace No. 2 and bring a multigas meter!



### Notes:

When you start or stop working in any work area, always notify the supervisor and the area's operating staff.

Always go to the work site through the area's control room.

While visiting the control room, together with the operating staff, check that the necessary verifications and locks have been made to prevent unexpected start-up.

Please note that when you go to the roof of the hot rolling mill, you must always report to the control room of walking beam furnace No. 2 and bring a multigas meter.

## 8.3 Working in the safety zone

### Working in the safe zone

**Working in a safety zone always requires Permission.**

The operator grants authorisation in special situations.

In other cases, the operator informs the shift supervisor of the worker, task and duration of the work.

**The shift supervisor gives permission to work in the security area.**

**When the job's over,** report to your manager and the operating staff of the control room in the area.



#### Notes:

The hot rolling mill's production line is divided into separate safety zones. Working in a safety zone in automatic mode is prohibited without special reason. Working in a safety zone always requires a permit.

The operator may grant a permit in certain special situations. Here you can see the situations in which the operator can grant permission to work in a zone.

In other cases, the operator informs the shift supervisor which worker is going to the zone, what to do and an estimate of the duration of the work. The shift supervisor gives permission to work in the safety zone.

Also inform when you have finished working in the zone.

## 8.4 Moving to a safety zone

### Transition to a safety zone

Request permission to open the gate from the panel next to the security gate

Attach a lock to the gate and a no-start sign. Write a name and phone number.

Make sure that the devices are made safe with the help of locks and no-start signs before starting work.



#### Notes:

When the security gate to a safety zone is closed, ask for permission to open it from the panel next to the gate. The operator opens the electrical lock from the control room, after which the gate can be opened.

After opening the security gate, attach a lock and a no-start sign to the gate. Write your name and phone number on the sign.

Opening the safety zone gate does not replace measures to prevent unexpected start-up. A person working in a safety zone must ensure that the equipment in the area has been made safe by means of locks and no-start signs before starting work.

## 8.5 LOTOTO

### LOTOTO

The risk of unexpected start-up may be caused by:

- Electricity
- Flowing substances such as chemicals and gases
- Hydraulics and pneumatics
- Mechanical energy

Measures to prevent unexpected start-ups are backed up by the use of a personal safety lock and a no-start sign.

**LOTOTO = Log-Out Tag-Out Try-Out**



### Notes:

Risk of unexpected start-up can be caused by many factors, such as electricity, chemicals, gases or hydraulics.

Measures to prevent unexpected start-ups are always backed up by use of a personal safety lock and a no-start sign.

## 8.6 Working during shutdown

### During work shutdown

Sign in according to the TKuYht009 registration practice and make sure that the devices have been made safe to prevent unexpected start-up (section 1).

You can obtain permission for commissioning from the area work supervisor.



#### Notes:

Sign in according to the registration practice and make sure that you have taken the necessary steps to prevent unexpected start-ups.

The area work management authorises the commissioning of a device after maintenance or repair work and ensures the safety of the commissioning. The supervisor inspects the persons who have registered for the area before commissioning.

In annual maintenance shutdowns lasting more than 4 days, the safety zones are opened to security gate bypass mode at the time indicated in the shutdown plan. Bypass mode is terminated at the time indicated in the shutdown plan.

## 8.7 Working while production is running

### Working while production is running

Working in automatic mode is prohibited without separate written permission, which is granted if necessary **by the operation manager or maintenance manager**. Outside office hours, authorisation may be granted: **by the shift supervisor**.

If the work can be done while the line is stopped, permission to work in the safety area in automatic mode **must not** be written.



#### Notes:

Working in a safety zone in automatic mode is prohibited without separate written permission.

In exceptional cases, a written permit may be granted by the operation manager or maintenance manager of the hot rolling mill. After office hours, the permit can be granted by the shift supervisor.

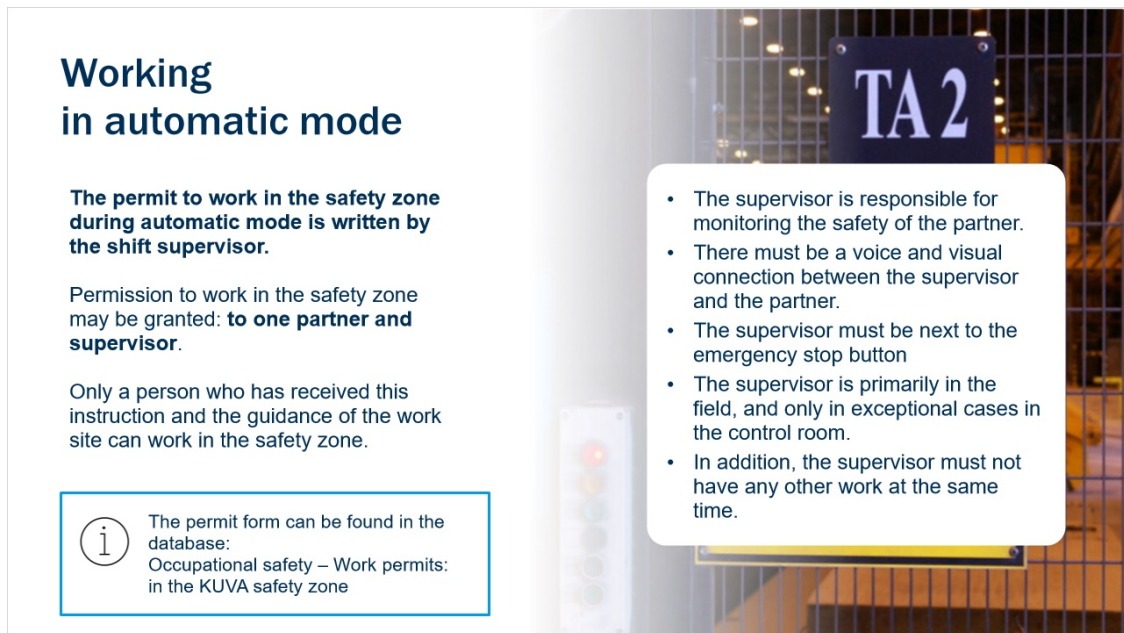
If the work can be done while the line is stopped, permission to work in the safety zone in automatic mode must not be written.

An example of work subject to authorization is a troubleshooting process in which the fault occurs only in automatic mode.

Only the previously mentioned persons are allowed to carry out repairs in automatic mode.



## 8.8 Working in automatic mode




### Working in automatic mode

**The permit to work in the safety zone during automatic mode is written by the shift supervisor.**

Permission to work in the safety zone may be granted: **to one partner and supervisor.**

Only a person who has received this instruction and the guidance of the work site can work in the safety zone.

 The permit form can be found in the database:  
Occupational safety – Work permits:  
in the KUVA safety zone

- The supervisor is responsible for monitoring the safety of the partner.
- There must be a voice and visual connection between the supervisor and the partner.
- The supervisor must be next to the emergency stop button
- The supervisor is primarily in the field, and only in exceptional cases in the control room.
- In addition, the supervisor must not have any other work at the same time.

### Notes:

The permit to work in the safety zone during automatic operation is written by the shift supervisor.

Permission for one safety zone can be written for one partner and a supervisor who is Outokumpu Tornio BL personnel.

Here you can see the supervisor's responsibilities. The supervisor's task is solely to monitor the safety of the partner and to be next to the emergency stop button. The supervisor must not have any other simultaneous work.

The shift supervisor is obliged to provide guidance for the zone concerned before writing the work permit.

Only a person who has received this instruction and work site guidance can work in the safety zone. Only a person who has received guidance on the safety zone can work as a supervisor.

## 8.9 Working in the event of a fault in the safety zone system

### Working in the event of a fault in a safety zone system

A single faulty device in a safety zone system can be bypassed in a controlled manner, e.g. by overriding locks.

This may only be done with the permission of the operation or maintenance manager. The lock override is recorded in the VTJ journal and a work order is placed on the faulty device.

Lock override is performed **by the shift supervisor:**  
**Tel. 2720 or 040 573 2347**

The shift supervisor marks the override in the journal and places the work order.



#### Notes:

If, due to a faulty device, the equipment in a safety zone does not work according to functional descriptions, and the fault cannot be immediately repaired or removed, the individual device can be bypassed in a controlled manner.

This is done, for example, through Lock override.

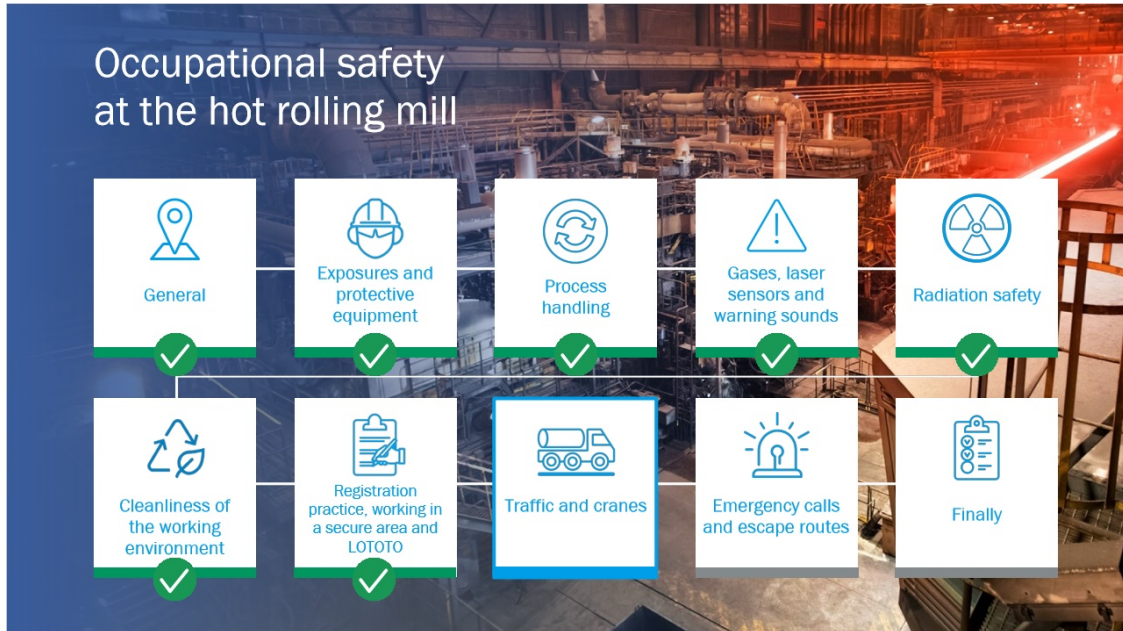
Lock override can only be carried out with permission from the operation or maintenance manager. After office hours, the permit can be granted by the shift supervisor.

The lock override is performed by the shift supervisor.

The shift supervisor always marks the lock override in the VTJ journal of the KUTI system. In addition, the shift supervisor places a KUTI work order for the faulty device.

## 9. Traffic and cranes

### 9.1 Traffic and cranes



#### Notes:

Great, now you know how to work safely in a safety zone. The next section deals with hot rolling mill traffic.

## 9.2 Traffic

### Traffic

**Beware of heavy vehicles** and observe the sound and light signals.

Vehicles are parked **in the marked parking places**.

**Crossing the roller track** when the crossing gate is down is absolutely **forbidden**.

Use **the personnel door**.

Cross the rolling table **along the overpass bridges** and comply with the **traffic lights**.



### Notes:

The hot rolling mill uses a number of different vehicles that can move by remote control, automatically or be driven. Pedestrians are also involved in the traffic. Special care should be taken in the vicinity of heavy duty vehicles, as they do not stop quickly.

There are changing wagons in the hall that cut traffic in the mill grindery and on the roller line. The movement is indicated by sound and light signals.

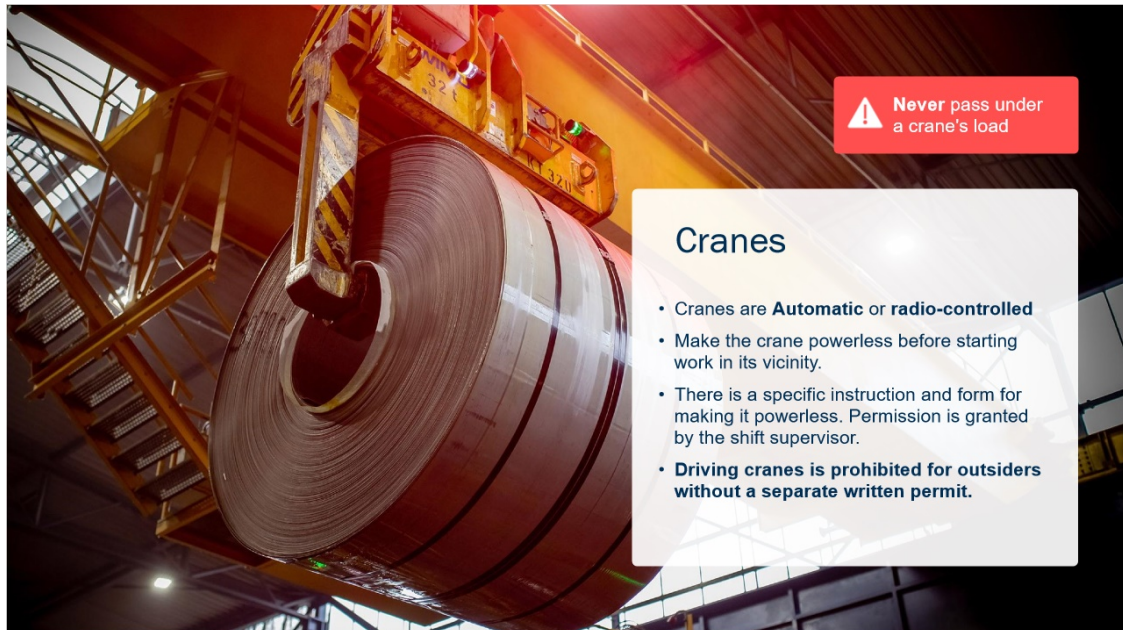
The introduction of external vehicles into the hall without a permit is prohibited. Vehicles must be parked in marked parking spaces outside the hall.

Crossing the roller track when the crossing gate is down is strictly prohibited. When you walk in and out of the hall, always use doors meant for personnel movement. Lifting doors are only intended for work machines.

Cross the roller table only along overpass bridges designed and built for crossing. Do not cross the roller table when a slab is on the track.

There are traffic lights next to the bridge at the west side of the walking beam furnace. You can cross the roller table along the bridge when the light is green.

## 9.3 Cranes



### Notes:

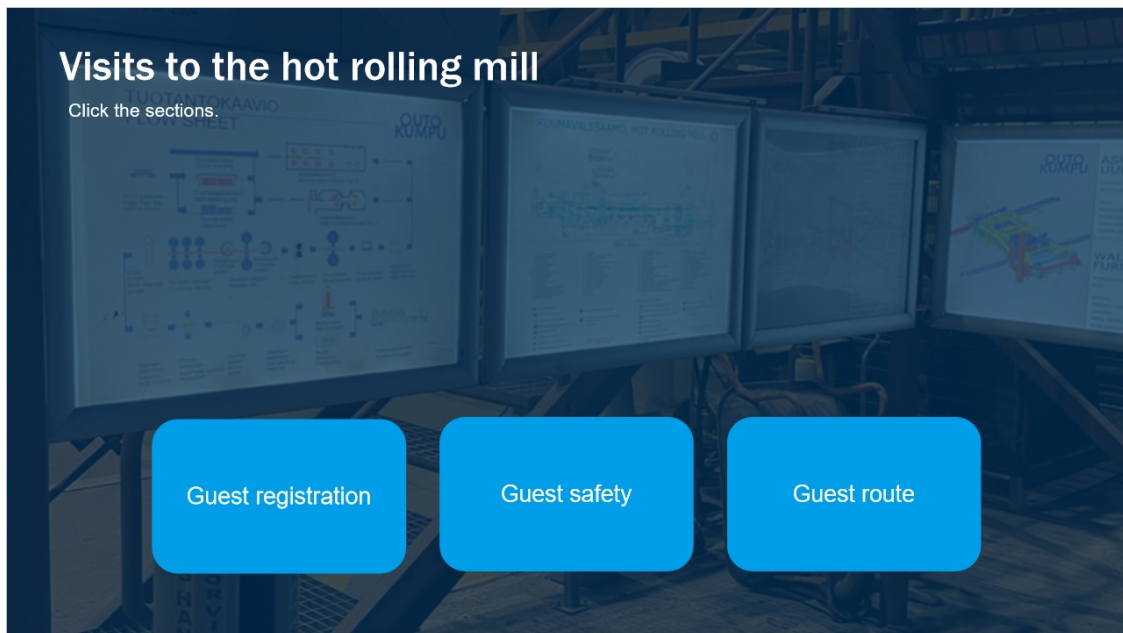
The mill's walking beam furnace and down coiler cranes are automatic or radio-controlled. Observe the movements of the cranes and never pass under their load.

Before starting work near a crane's power rails or on the bridge in a crane's pathline, it is very important to ensure that the crane is rendered powerless.

This involves a specific form and instructions to ensure adequate information flow and security measures. The permit can only be granted by the shift supervisor of the hot rolling mill.

Driving cranes is prohibited for outsiders without a separate written permit.

## 9.4 Visits to the hot rolling mill



### Notes:

If you arrange visits to the hot rolling mill, you need to take care of the safety of guests. Click on the sections to read more.

### Guest registration

All upcoming visits to the factory area must be registered. The guests' host is responsible for their safety throughout the visit.

If needed, a guide should be arranged for the guests. The guide is responsible for guests' safety and must always also inform the hot rolling mill's shift supervisor of the visit.

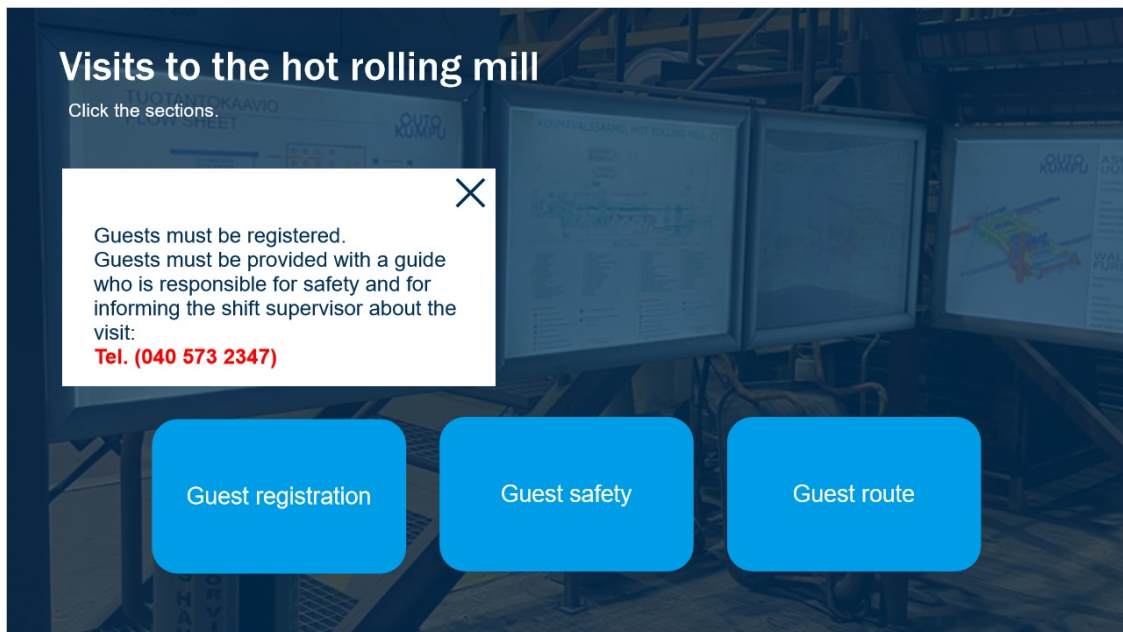
### Guest safety

Before going on the guest route, the guide instructs guests on the conditions of the hot rolling mill. Guest protective equipment includes a guest jacket, a protective helmet, hearing protectors, goggles, protective gloves, as well as a FFP-3 class respirator for visits to the so-called "tourist level". When using stairs, handrails must be held.

### Guest route

The mill's guest route starts at door 204 and runs along the footbridge on the wall of the hall to the strip crop shear (after which we return to door 204). Caution must be taken along the route. Deviations from the normal guest route must be agreed with the department's representative.

## Guest registration (Slide Layer)



## Guest safety (Slide Layer)

**Visits to the hot rolling mill**  
Click the sections.

Guide guests on the conditions of the hot rolling mill and the guest protective equipment:  
Guest jacket, protective helmet, hearing protectors, goggles, protective gloves.  
"Tourist level" also includes an FFP3 respirator.

Hold the handrails when walking on the stairs.

Guest registration      Guest safety      Guest route

## Guest route (Slide Layer)

**Visits to the hot rolling mill**  
Click the sections.

The guest route starts at door 204 and continues along the footbridge to the strip crop shear (pillar 22), after which we return to door 204.

Agree on exceptions with the department's representative (e.g. head of department, operations manager, development engineer).

Guest registration      Guest safety      Guest route



## 10. Emergency calls and escape routes

### 10.1 Emergency calls and escape routes



#### Notes:

If an emergency happens despite working safely, it is important to know how to act.

## 10.2 Emergency call



### Notes:

In the event of an emergency, always report to the regional control centre.  
When you call, tell:

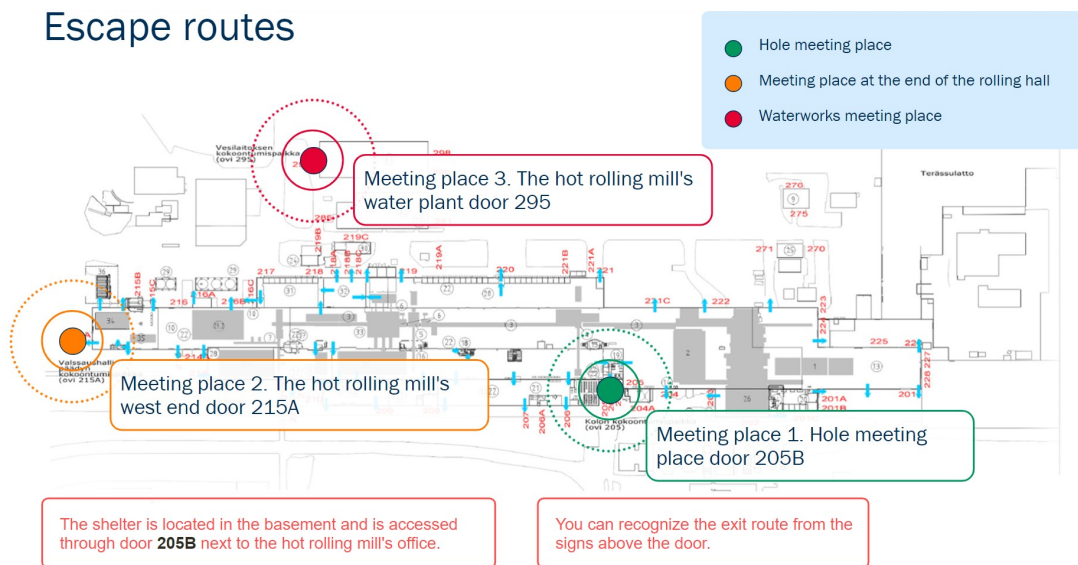
- your name and where you are calling from
- What has happened? Explain if it's a health emergency or an accident
- the number of patients and injuries
- the kind of help you need to the scene
- the exact scene of the incident and the nearest door number, and
- how guidance is organized

Speak calmly and clearly, and don't hang up until you have permission.

The factory emergency call number is +358 16 452 300.

**Save this number in your phone now and click on the box.**

## 10.3 Escape routes



### Notes:

In an emergency, exit information is provided through the internal alarm system.

Choose the most direct exit route to safely reach the meeting places or the shelter.

You can recognize the exit route from the sign above the door.

The meeting places are located in outdoor areas and their locations are marked with signposts.

Find a safe exit from your workstation to all the meeting places shown in the photo.

The shelter is located in the basement and is accessed through door 205B next to the hot rolling mill office.

## 11. Summary and final test

### 11.1 Finally



#### Notes:

In the last part of the course, we will review the most important information and take the final test.

## 11.2 Summary

**Finally**

- 1 Regardless of your work site, always make sure that the work can be done safely before starting.
- 2 Observe all safety regulations and safe working practices.
- 3 Everyone's behavior is important, including yours.
- 4 Always intervene if you detect dangerous activity.
- 5 Report incidents immediately.
- 6 Keep your safety expertise up to date by reviewing the instructions regularly.
- 7 Ensure information flow and prevent risks.

If you are not sure if the necessary measures have been taken for your safety, please contact your work supervisor.  
Always remember, **safety first!**

### Notes:

Each of us can influence both our own safety and that of our co-worker.

- Regardless of your work site, always make sure that the work can be done safely before starting.
- Observe all safety regulations and safe working methods.
- Everyone's behavior is important, including yours
- Always intervene if you detect dangerous activity
- Report incidents immediately
- Keep your safety expertise up to date by reviewing the instructions regularly
- The starting point for safe work is to ensure information flow, to identify and prevent task-related risks, and to complete adequate task-specific training.

If you are unsure if the necessary measures have been taken for your safety, please contact your work supervisor. Always remember, safety first!