



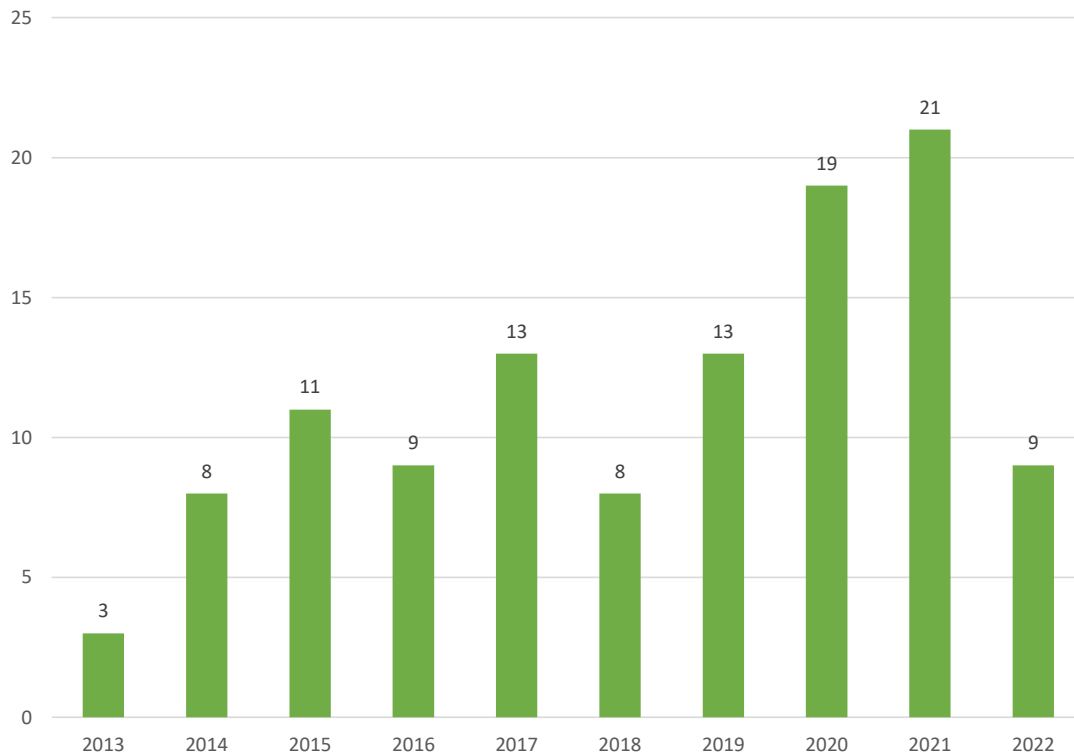
**FANUC**

FEDERAL AGENCY FOR  
NUCLEAR CONTROL

# Incidents at industrial facilities

## REX

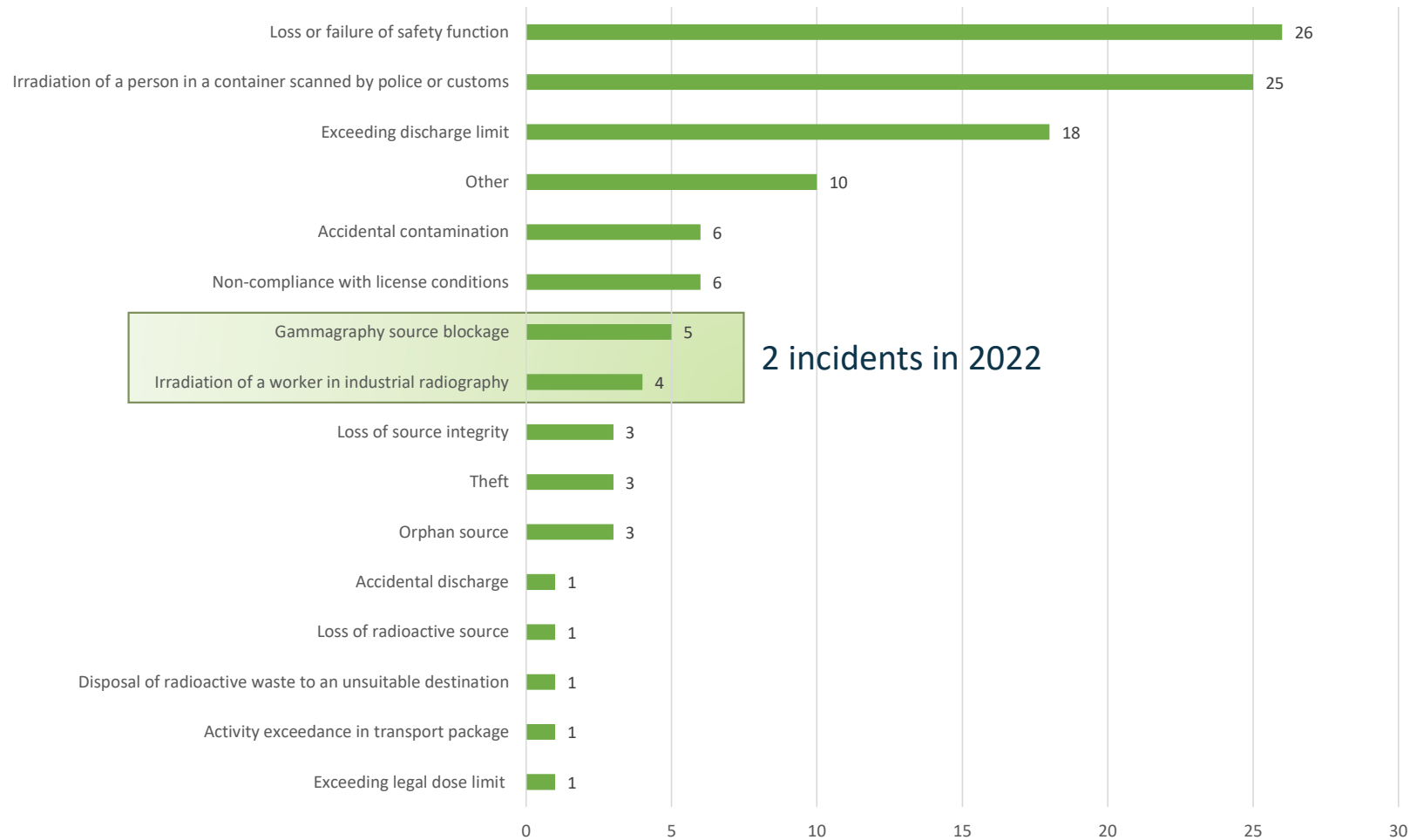
# Incidents at industrial facilities



Technical Regulation of 17/06/20 determining the criteria for reporting significant events to the FANC with regard to radiation protection and/or the safety of workers, the public and the environment during operations of class II and III, including transport

**114 notifications since 2013**

# Incidents/type



# Industrial radiography?

Industrial radiography (IR) is a type of non-destructive testing (NDT) of welds using radiation from a radioactive source or an X-ray machine.

## Use of

- Different radiation methods:
  - X-ray equipment (panoramic, directional)
  - Radioactive sources
    - $^{75}\text{Se}$ ,  $^{192}\text{Ir}$  = most common use
    - $^{60}\text{Co}$ ,  $^{137}\text{Cs}$  = few applications
- In different installation types:
  - Fully shielded enclosure
  - (failsafe) bunker
  - Fixed enclosure (bunker light)
  - Free on site (Portable)

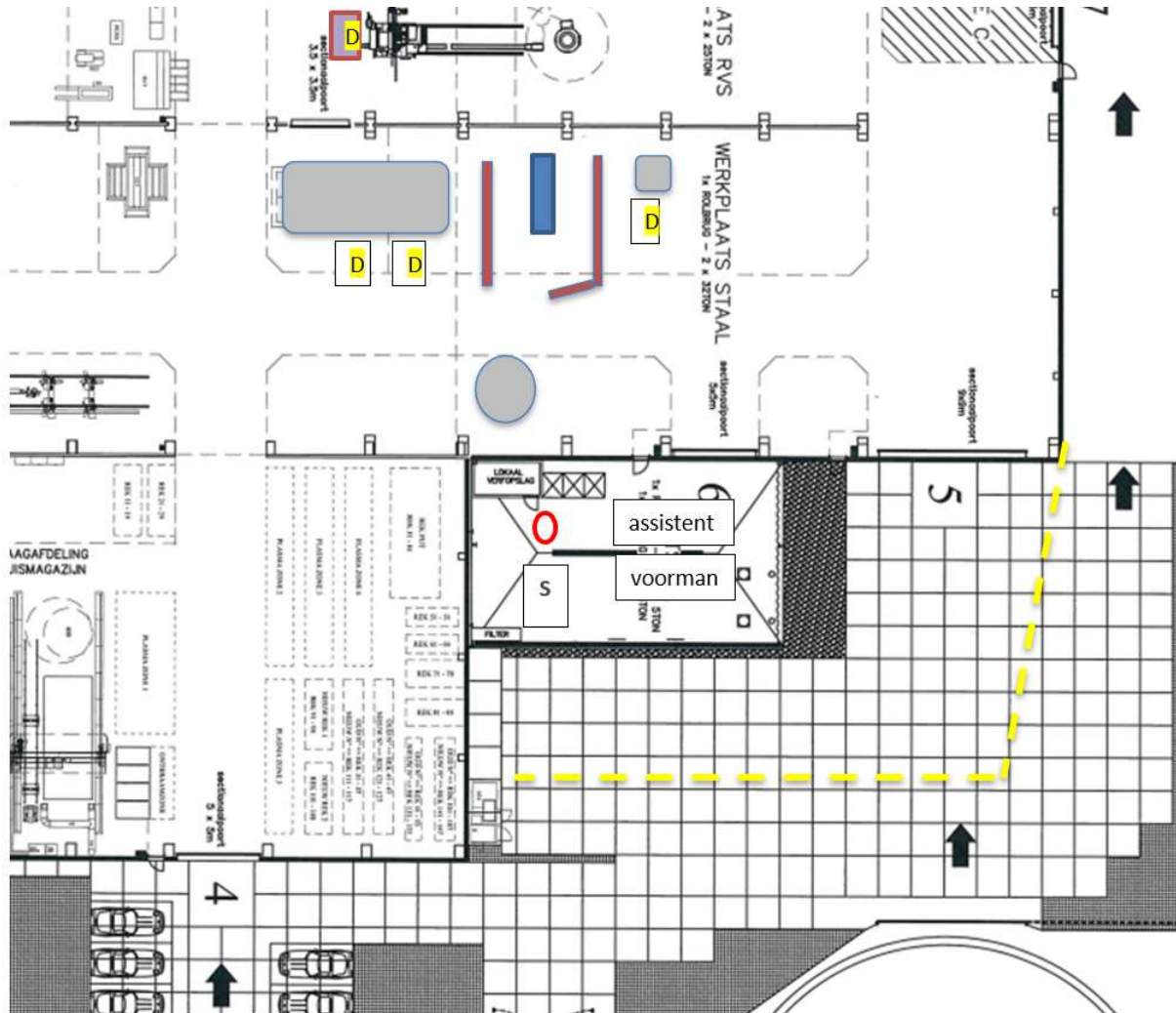


## Sector at risk

- International « return of experience »
- In general, low-skilled operators
- High active sealed sources (HASS)
- Portable/mobile sources
- Working conditions depending on client (time, height, noise, languages, ...)
- Routine work <-> Changing configurations



# Incident 1: irradiation of a welder

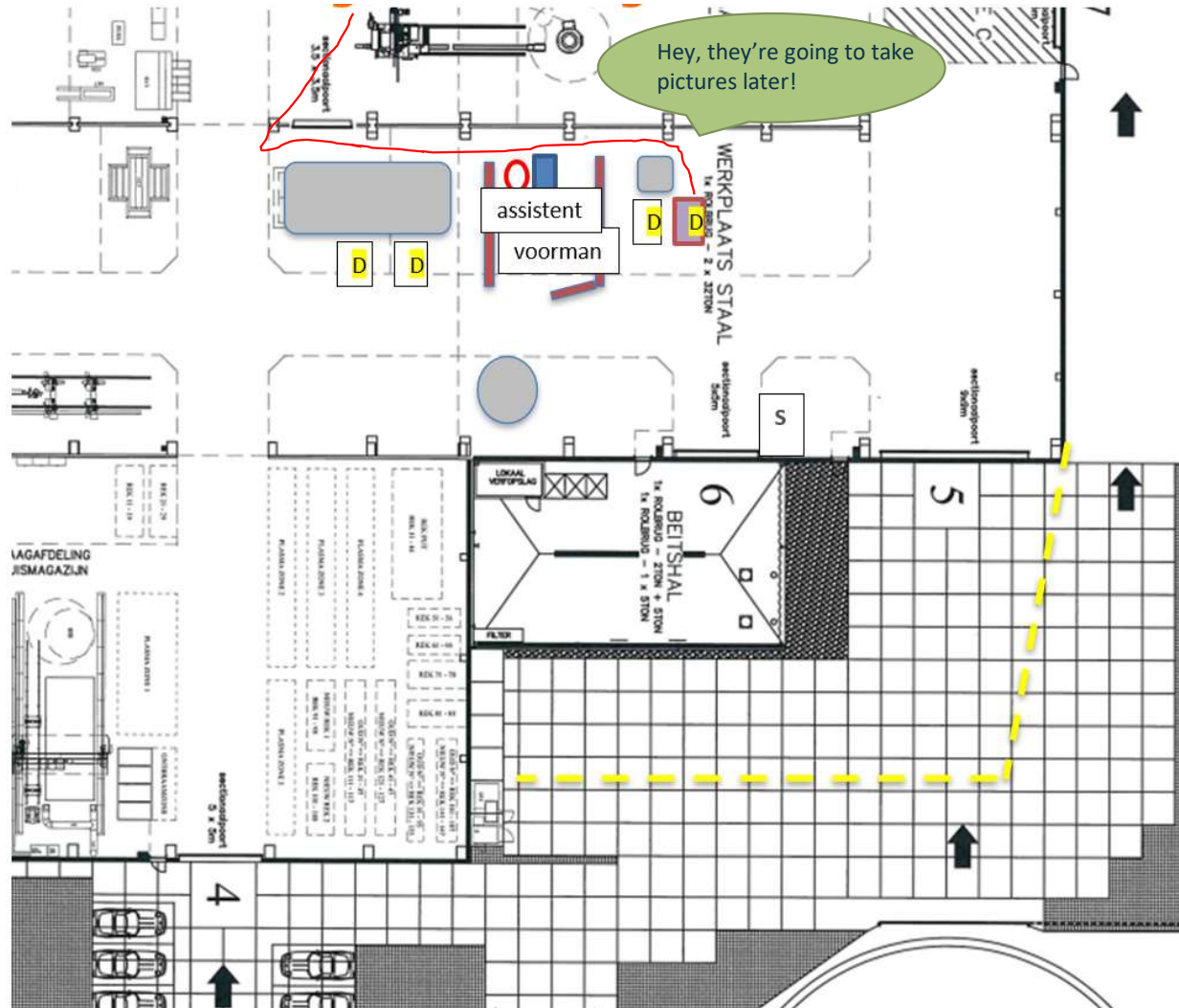


14h: The RT team has finished the previous examination. The equipment will be moved to make a radiographic image of the next weld.

There are 3 welders in the hall. At that moment, the exposed employee is working in the stainless steel hall.

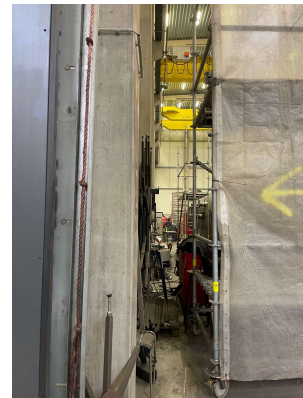


# Incident 1: irradiation of a welder



The RT team sets up the x-ray tube.

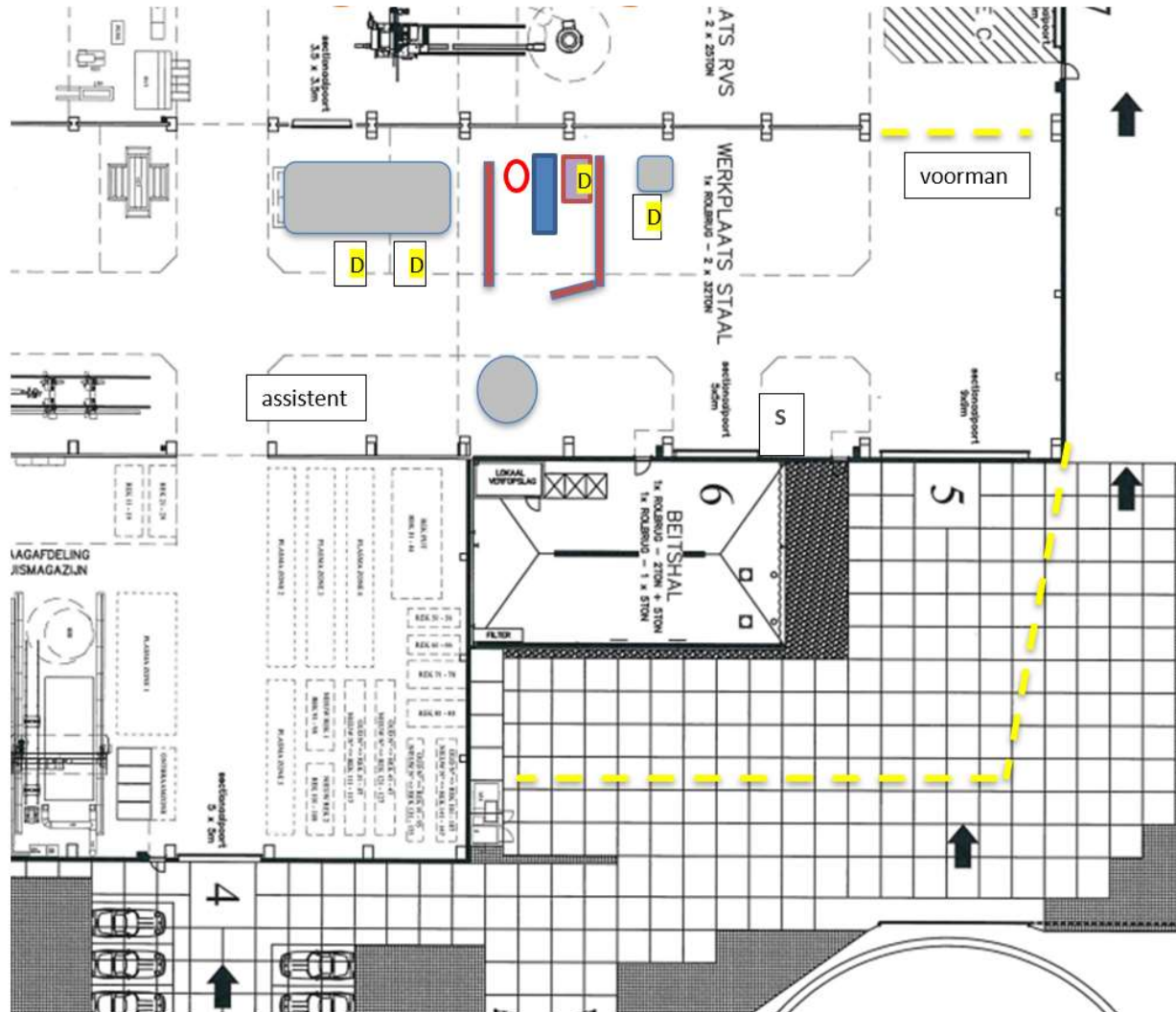
In the meanwhile, the concerned (exposed) employee walks through the garage door and along the wall to his colleague. At that time, he could not yet see any signalisation.



# Incident 1: irradiation of a welder



## Incident 1: irradiation of a welder



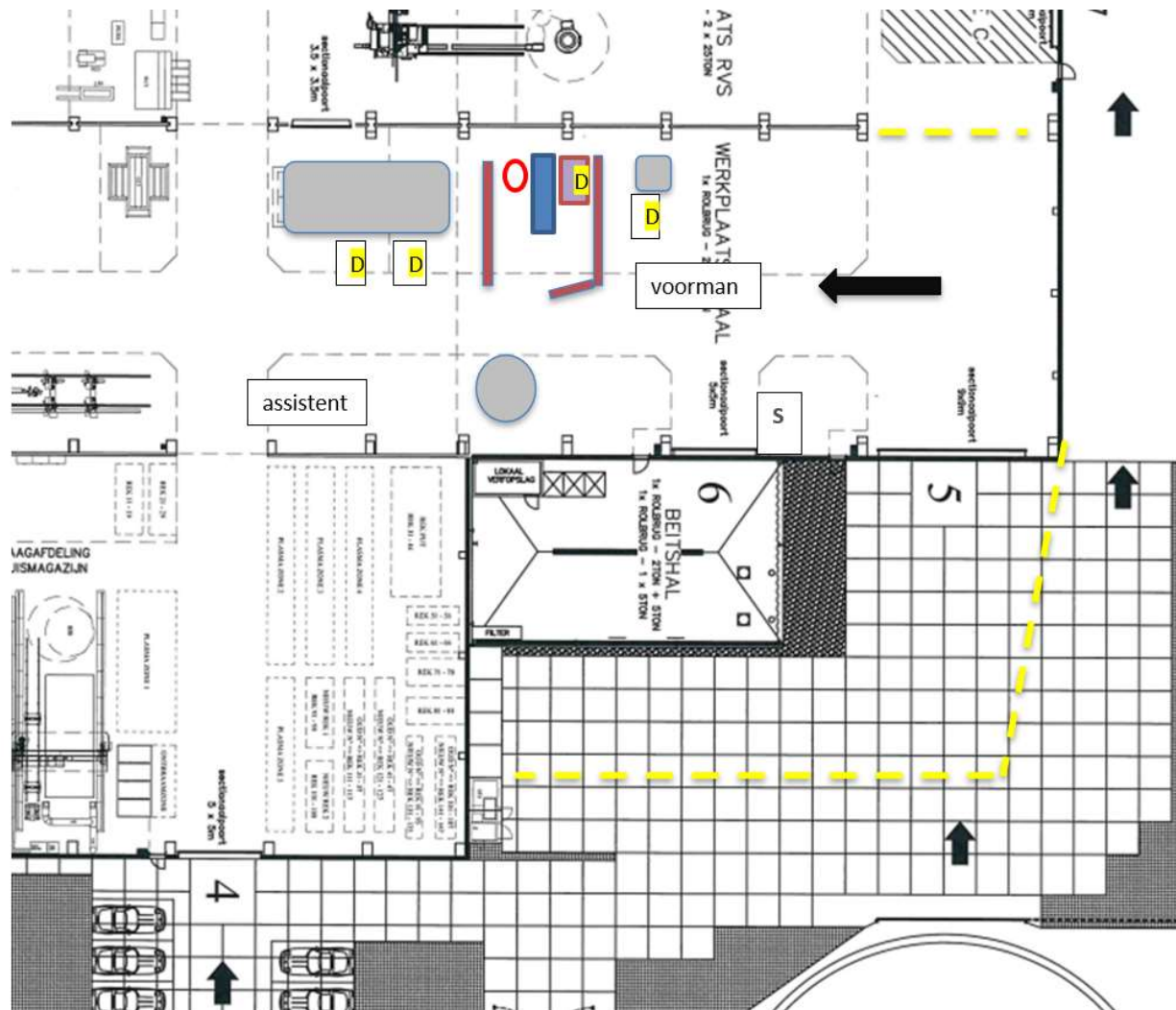
After positioning the film, the RT team leaves the working area to delimit the safety perimeter.

At that moment, the welder involved is near his welding machine, behind the welding curtain.

Consequently, the operator (“voorman”) does not notice the welder involved.



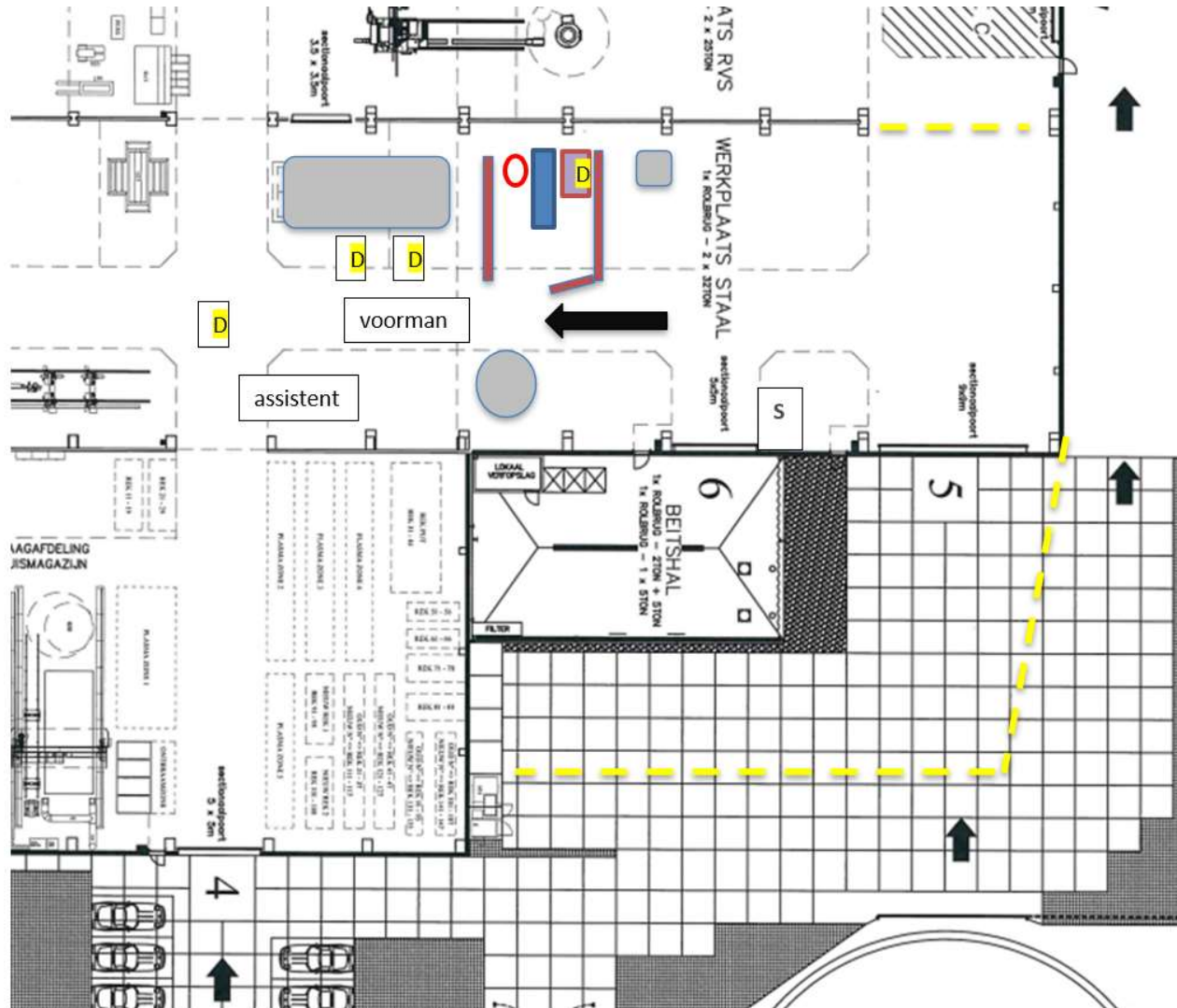
# Incident 1: irradiation of a welder



The operator starts evacuating the steel hall and asks the first welder to leave his workplace.

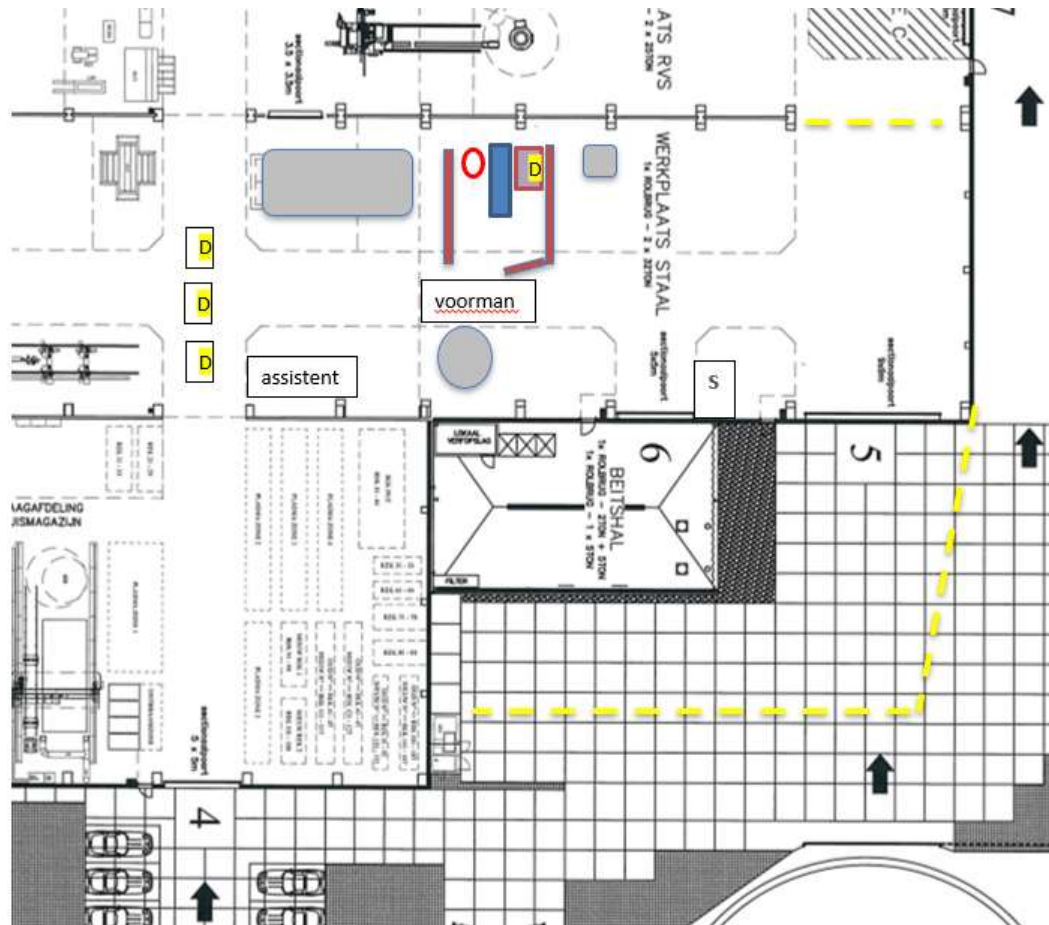
The exposed welder indicated that he noticed his colleague leaving the workplace.

# Incident 1: irradiation of a welder



The operator also asks the 2<sup>nd</sup> and 3<sup>rd</sup> welder to leave the workplace. Both do as asked.

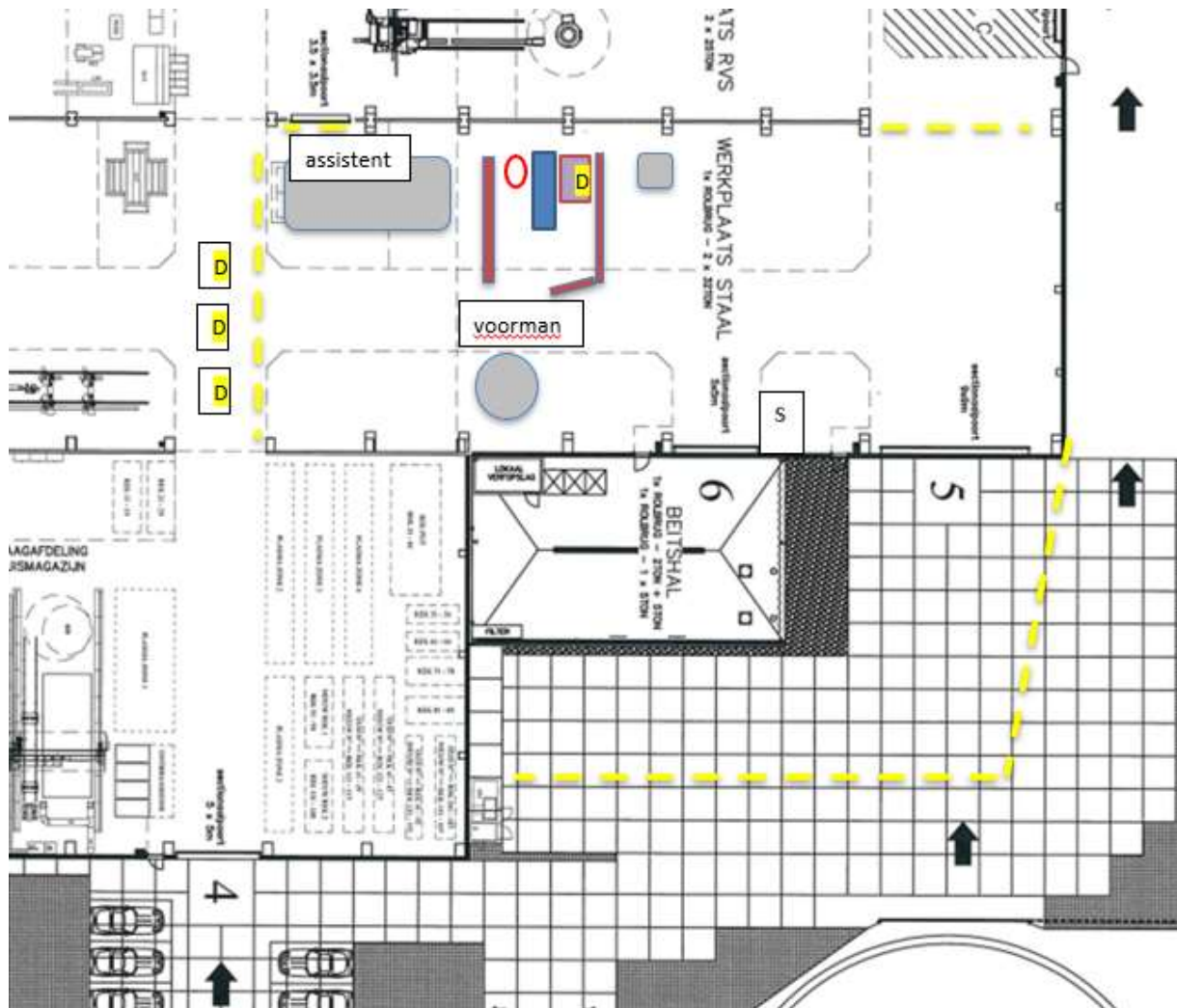
## Incident 1: irradiation of a welder



The 3 welders leave their working area, and thus the RT team assumes the hall is now empty.

The operator (“voorman”) is now nearby the X-ray tube but has no direct view of the welding machine due to the welding curtain and the vessel.

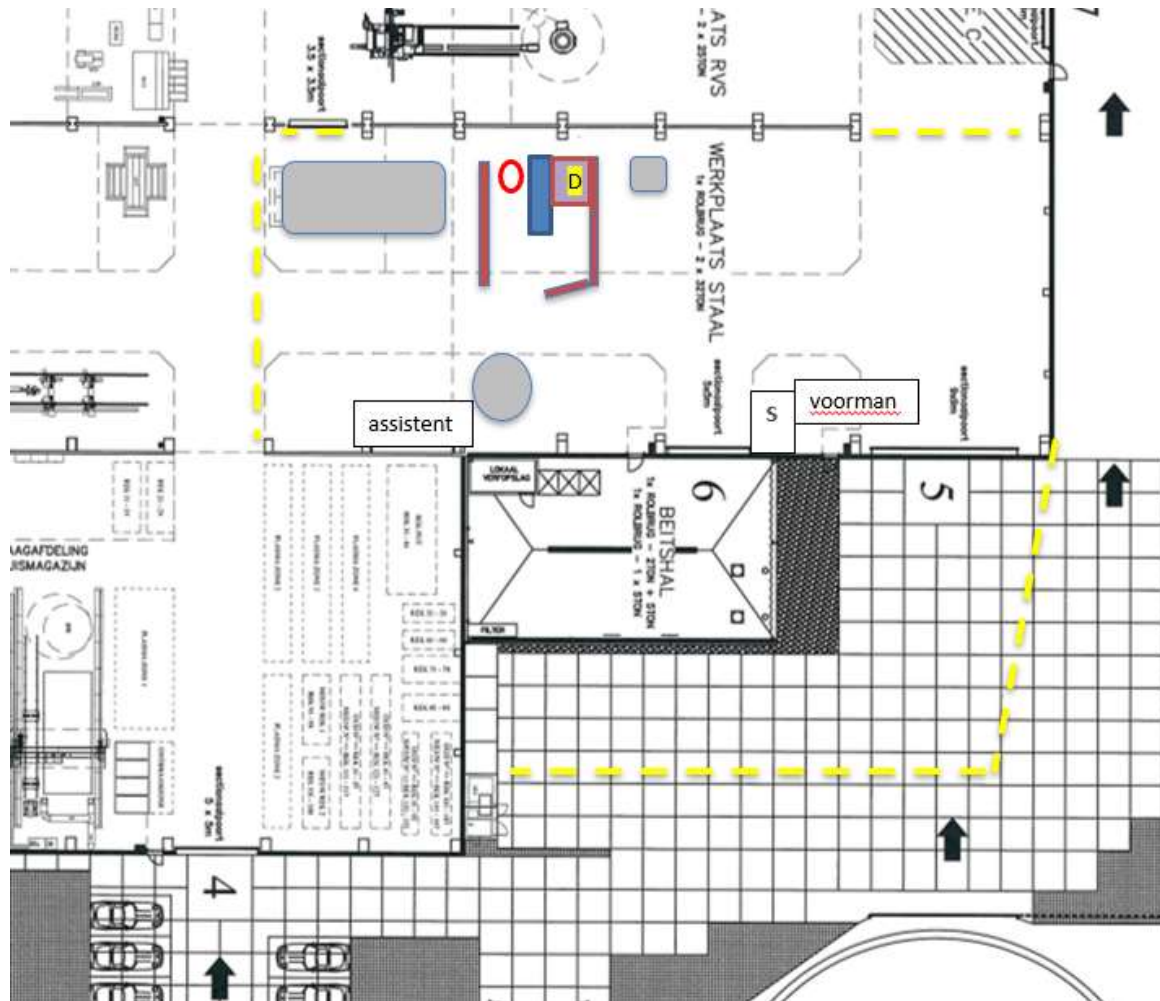
# Incident 1: irradiation of a welder



The 2nd operator (assistant) delimits the area on the left and nearby the garage door.



# Incident 1: irradiation of a welder



Once the perimeter is delimited, the “assistant” reports back to the first operator (voorman).

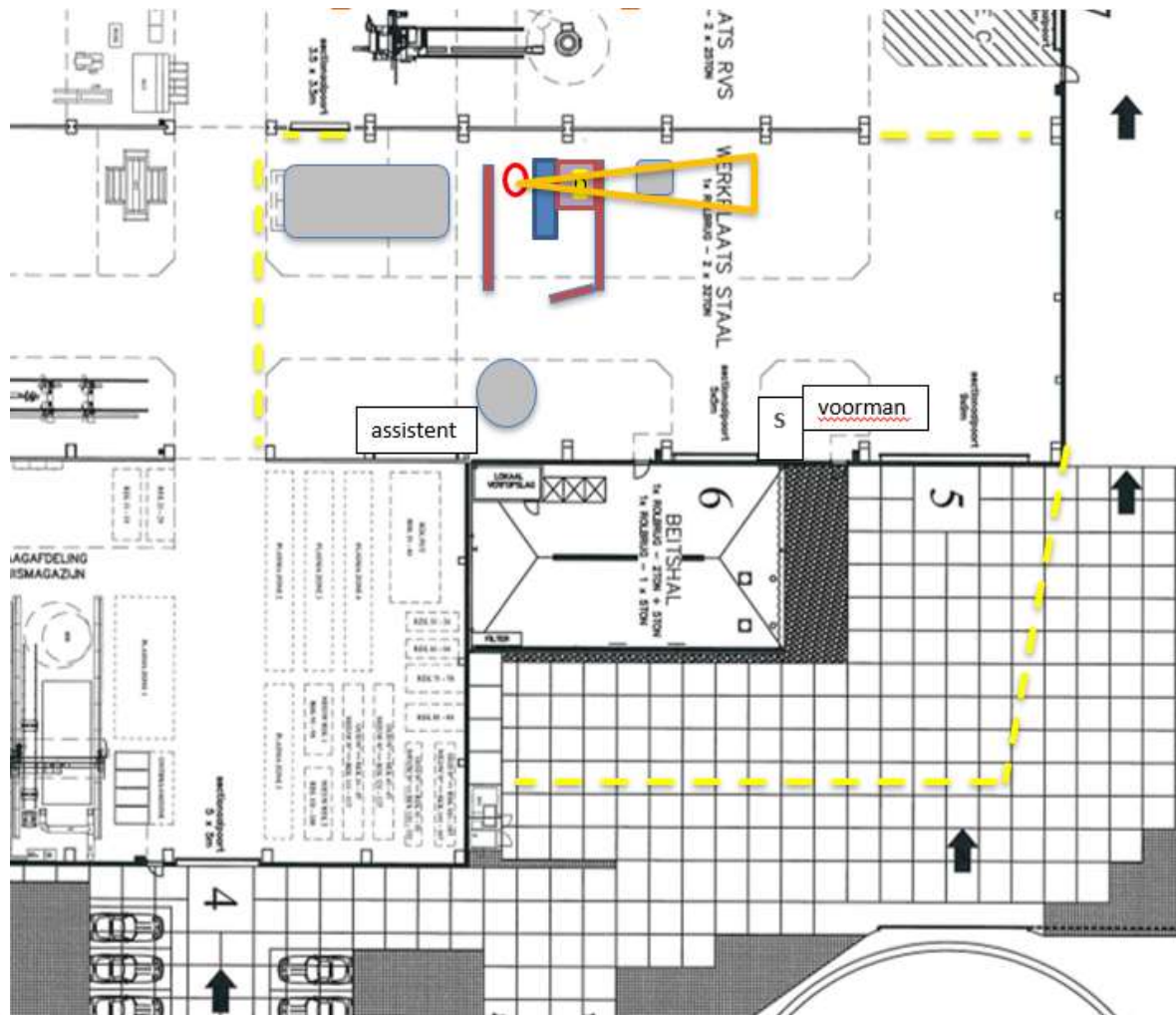
The assistant takes place behind one of the vessels, nearby the X-ray tube.

The first operator goes to the control panel.

The industrial radiography can be launched.

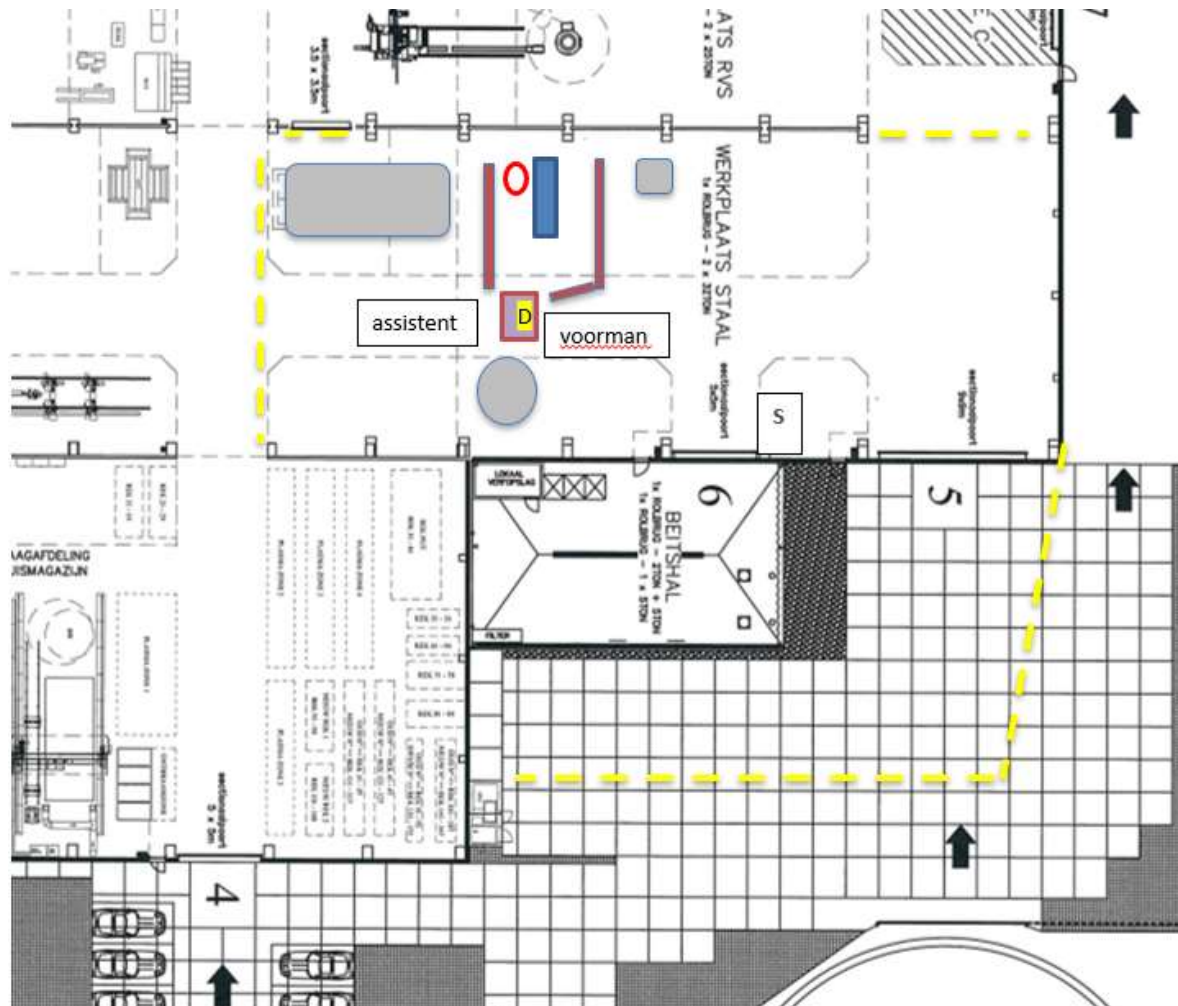


# Incident 1: irradiation of a welder



The X-ray tube is switched on and the welder is most likely exposed to a part of the primary beam.

# Incident 1: irradiation of a welder



After the industrial radiography is finished, the RT team returns to the vessel and only then they encounters the welder.

The operator asks where he comes from, whereupon the welder indicates that he was at his welding machine.



# Incident 1: irradiation of a welder

## Causes

- The welder involved was not informed (by his own company) about the work that was to be carried out.
- Moreover, this employee was only working in the company for a few weeks (little experience).
- “photo” was misinterpreted due to the presence of a photographer in the morning (“misunderstanding”).
- Limited view of the working area due to the presence of large objects (‘limited visibility’).
- Insufficient surveillance of the perimeter
- Timing of industrial radiography (exceptionally during working hours – ahead of schedule)

# Incident 1: irradiation of a welder

## Dose evaluation

- Quick on-site investigation by radiation expert but not all information available
  - Worst-case scenario:
    - Welder at 2 m distance from the radiation source
    - No protection
    - Full radiography time (47sec)
- Dose > 20 mSv
- INES 2 (preliminary)

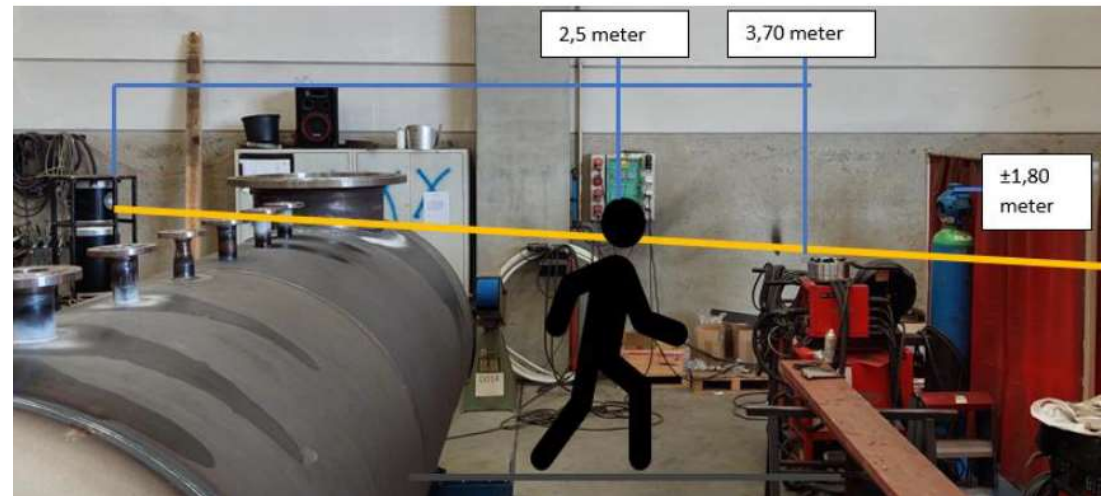
# Incident 1: irradiation of a welder

## Dose RE-evaluation

- After inspection and interview with the welder
- Realistic scenario:
  - Welder at 2,5 m distance from the radiation source
  - Welder partly behind vessel
  - Full radiography time (47sec)

→ Dose < 1 mSv

→ INES 0



# Incident 1: irradiation of a welder

## Dose evaluation

Welder = not occupationally exposed

→ **No info from dosimeter!**

→ **No recognized occupational physician**

Should a recognized occupational physician be contacted?

→ Occupational physician of the company concerned could rely on a recognized colleague.

→ Biological dosimetry (3 days later) to exclude a high dose and to reassure the exposed worker (in collaboration with UZ Gent)



Thank you!