SAFETY REGULATION VV 08 **Working in confined space**	nyrstar Bales/Pelt

Nature of the last modification:	*02/02/2022*
Date of last modification:	***Recast and adjustments in blue text***

Contents

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1. Purpose

In a confined space, special circumstances can occur that can become dangerous and even life-threatening. This procedure should ensure that entering confined spaces can be done in a safe manner. It describes the legal obligations, the system of preparation, supervision and rescue when entering confined spaces in Nyrstar Belgium's installations in Balen and Pelt.

2. Scope

This procedure covers all places where work is carried out in confined spaces where potential hazards may occur.

What is entering confined spaces: when one enters the enclosure of a confined space with a body part

3. References

XP-622-PROC-0-00013 : Performing a Risk Inventory and Evaluation (RIE)

XP-452-VV-0-00000 : Work Permit

XP-452-VV-0-00019 : Working at high temperatures (heat stress)

XP-452-VV-0-00025 : Requirements for (electric) hand tools

XP-452-VV-0-00009 : Lock out tag out

XW-531-MI-4-00001: Use of Flanges

4. Definitions

A confined space is a space:

- which is not intended for human continuous residence
- and with a closed character.

Limited or difficult access possibilities and/or limited natural ventilation indicate a confined nature of the space.

We make a distinction between 3 types of confined spaces indicated by colors red, orange and green. These must be evaluated per task, with a red or orange sheet release measurements must always be carried out.

If a confined space no longer has a closed character due to changes in the space, it can exceptionally evolve into a non-enclosed space, this must be justified by a risk analysis approved by the superintendent of the

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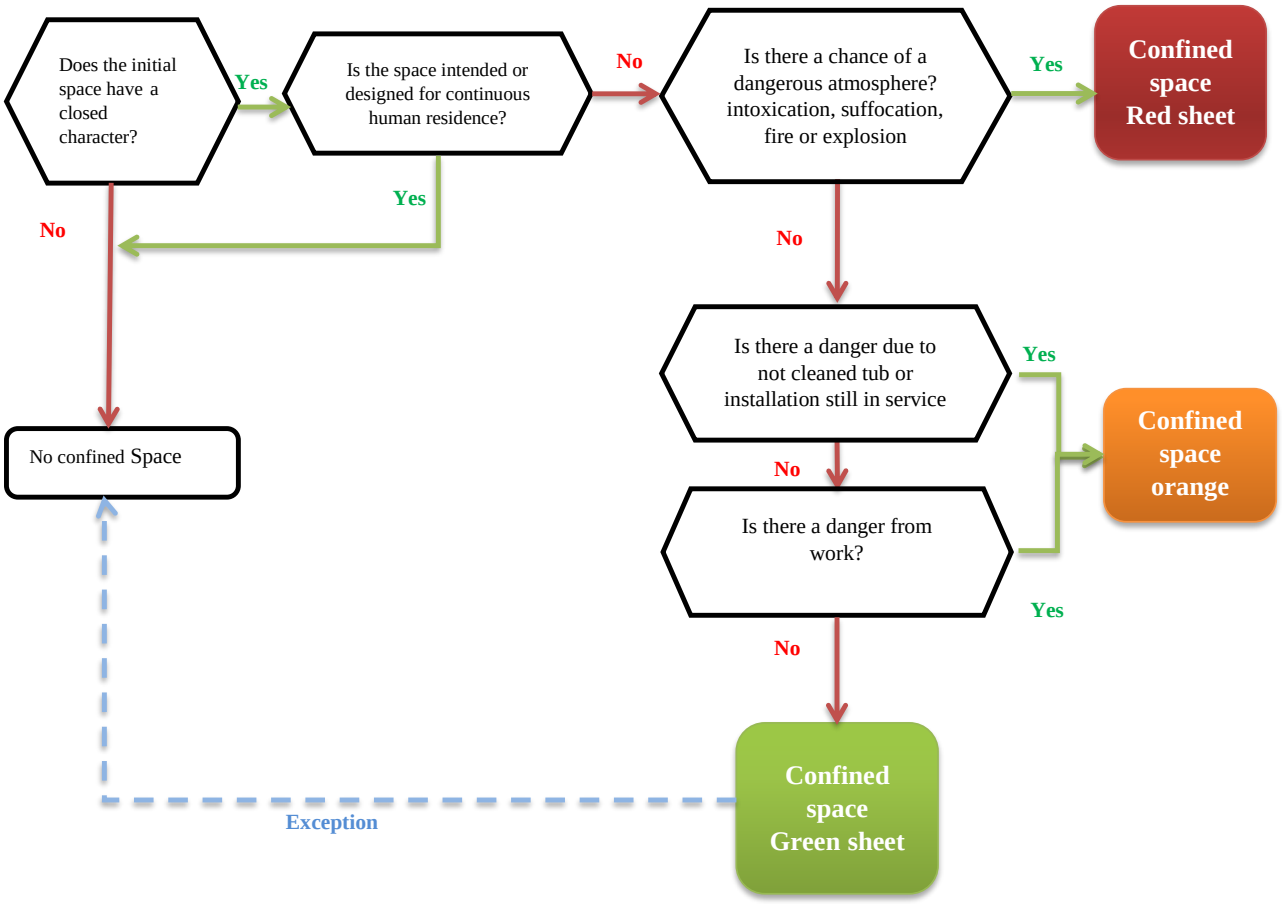
service and targeted by the SI prevention service. Executors must be in possession of this written decision and the work permit if they enter this space.

Flow confined space – determine type and indicate it on the entry sheet



Locations that are considered as confined space: wells, tubs, pipes, sewers, reservoirs, barrels, boilers, ovens, silos, cellars, chimneys, tankers,...

A confined space where a hazardous atmosphere is present or may arise, such as places that can be contaminated suddenly and at any time by environmental factors. Due to activities with dangerous products (dust, gas, vapor) will automatically receive a red card. The potential dangers include: exposure to toxic gases, fire, explosion, exposure to radiation, suffocation due to lack of oxygen, hot works, ...

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Danger from work; hoisting, working at height, increased electrical risk, rope techniques, very limited spaces, falling debris, ...

5. Responsibilities

The *hierarchical line* is responsible for the implementation of this procedure and ensures that the procedure is followed. The superintendent of each department will approve and sign each entry sheet, the prevention advisor can be consulted for advice.
The necessary measures must be taken so that all confined spaces are recognizable and it is clear that they may not be entered.

The *person responsible for the service* is responsible for drawing up a risk analysis.

The *work planner* ensures that the works are carried out in accordance with the results of the risk analysis, prepares the work permit together with the entry sheet and coordinates this with the production. For each entry into confined space, a work permit will be issued for both Asset and production employees. A work permit must be drawn up for each entry and the person concerned signs it for receipt and understanding and applies the safety measures. The *provider of the work permit* ensures that the necessary measurements are carried out.

The *manhole guard* ensures the necessary supervision of the confined space, the occupant, the environment, the necessary back-up and control.

6. Supervision and Intervention

When entering a confined space, the operators must be under constant supervision and must be relieved as often as the circumstances dictate. One or more persons (manhole guard), depending on the circumstances, will be specially designated to carry out this supervision.

There are 2 categories of manhole guards provided,

- Manhole guard category 1 for entry with a red entry card.
- Manhole guard category 2 for entry with an orange entry card.
- For the green entry sheets, there is no manhole guard but a mutual supervision

The 3 categories are described below as indicated in the flow. These 3 categories are shown on the entry sheets, to be determined prior to the works and to indicate on the entry form that applies.

- The **red entry sheet** is used for all entries where there are health hazards before the works start or may arise during the execution of the works. So there is a dangerous atmosphere (toxic gases, LEL, explosion, insufficient tanning, ...) or a dangerous atmosphere can be created by carrying out the

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work (welding, grinding, burning, painting, ...). This card is automatically linked to a manhole guard of the 1st category.

- The **orange entry sheet** is used for all entries where mechanical hazards may arise during the works. Here we take into account falling debris, burial, slip hazard, fall hazard, combustion hazard... This card is linked to a manhole guard of the 2nd category.
- The **green entry form** is used when the previous remarks do not apply. There is no security guard required here but at least 2 people must be working together with mutual supervision.

Competences of the various manhole guards:

Category 2 (orange entry card):

- Observation of the operators in the confined space
- Call for second-line intervention in the event of an emergency
- Observation of working conditions in confined space
- Observation of working conditions outside the confined space
- Calls for evacuation of confined space in case of abnormalities
- Access monitoring: preventing unauthorized access
- Monitoring external factors such as exhaust gases near confined spaces, etc.
- Registration of the entrants
- Checking precautionary measures operators
- Stays until everyone is evacuated (even in case of evacuation alarm)

Conditions:

- Succeed in internal training manhole guard cat. 2 and has the written instructions.
- Specially designated for this task and is permanently present
- Have the necessary tools, visual, auditory communication tools
- Evacuation options have been determined via risk analysis and described in rescue sheet

Category 1 (red entry card):

- Ditto as category 2
- Monitoring the proper functioning of the ventilation
- Entry if necessary

If entry with breathing air is necessary:

- Monitoring of the mandatory wearing of respiratory protection with supply of external air due to the presence of life-threatening atmosphere and a backup system.

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- Equipped with a backup system
- Check that air supply valves are locked in open position
- Control of flexible air supply pipes

Conditions:

- In possession of certificate of external training and has correct profile (physical and mental)
- Specially designated for this task. The safety guard category 1 does not perform any other tasks that could compromise the aforementioned tasks and is permanently present
- Has the necessary tools, visual, auditory communication tools, possibility to carry out measurements
- Knowledge about external risks
- Has the necessary written instructions
- 1st line intervention in order to escape life-threatening circumstances: educated and trained in accordance with PVI educational requirements.

Before and after the works, all open access must be closed (preference is given to orange safety nets but can be replaced by an alternative of at least equal quality). These may only be removed by the manhole guard.

During shutdowns, a different regulation applies:

Depending on the local conditions, the guard may be charged with supervising one or more confined spaces

- If the spaces are completely gas-free and well ventilated, the confined spaces are close together and the accesses can be reached from a work platform

7. Intervention assignments

1st line intervention *(EIP – security guard)*

Quickly removing the victim from life-threatening conditions (stabilization condition, preventing worse).

1. Through intervention in confined space (e.g. administration of air)
    a. Air for victim
        - Bottle + mask ready for use at entrance
        - Connection rescuer
        - Rescuer brings mask + hose
    b. Respiratory protection rescuer
        - With supply of air
        - Independent of air used by operator

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- Flight bottle
- Ready to use at the entrance

c. Clothing of a security guard must comply with the regulations applicable to the operator.

d. Always notify someone and wait for someone to be present.

2. Through evacuation victim without entering
   a. Operator permanently attached via safety harness to rescue rope
   b. If necessary (vertical evacuation): lifting appliances for rescue purposes
   c. Life-saving equipment meets or must offer at least the same level of safety as the requirements set out in EN standards
3. Choice of strategy determined by
   a. Geometry of confined space (ropes)
   b. Risks of non-accompanying evacuation:
      - Risks of displacement (in case of suspected breakage, waiting for TIP)
      - Risks of bumps or clamps during evacuation
      - Fall from loosened belt
   c. Speed of evacuation

2nd line intervention – *(Second intervention team)*

In rescue, the first minutes are of vital importance

If an operator is in distress, the manhole guard shall inform the security:

- Evacuation victim from confined space, If no evacuation by 1st line intervention
- Administering initial care
- Supervision of external organisations (e.g. external fire brigade, ...)
- Evacuation to ground floor (manhole at height)
- Possibly take away victim(s) for further care.

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8. Pre-entry measures:

8.1. Rescue & evacuation possibilities

It is forbidden to enter confined spaces from which the rescue of persons is not possible. Tanks and equipment must therefore be equipped with appropriate access openings. Manholes are therefore provided with a diameter of 600 mm (sometimes 500 mm in older types).

Ducts or pipes with a diameter smaller than 600 mm should never be entered.

In case of doubt about the feasibility of a rescue/evacuation or if the access opening does not meet the dimensions set out above, the person responsible for the works must seek advice from the internal prevention department before the start of the works on the feasibility of a rescue/evacuation. Accessibility of an access opening in operation without scaffolding can differ greatly from accessibility after the placement of scaffolds.
Setting up an emergency shower and changing room in the vicinity can be considered.

8.2. Risk analysis

Before work can start, a risk analysis must be carried out. Particular attention should be paid to possible hazardous substances/atmosphere. Measurements will then only have to be carried out for identified substances. Among other things, attention should be paid to the presence of conductive walls, dust explosion, ...

8.3. Separation from confined space:

The confined space to be entered must be separated from the rest of the installation in such a way that, even through incorrect operations or circuits, no substances or preparations can enter the room in dangerous quantities or concentrations, or at dangerous temperatures.
All connections must:

- Be individually blinded as close as possible to the confined space
- Either to be disconnected by removing an intermediate piece from the pipe

Rotating parts must always be locked. Here one should follow the procedure "isolation & lock-out".

8.4. Opening manholes

The person who first opens a confined space manhole must place an orange net. In the case of a tub where a ladder provides access, a sign will have to be hung on the ladder, these measures serve to prevent this space from being entered without the necessary control measures.

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8.5. Ventilation

The legislation provides that any confined space must be completely refreshed or ventilated (artificial or natural) before entering.
One should try to enter the room afterwards without respiratory protection. Therefore, one will ventilate until: The concentration of health-damaging substances that the confined space has contained is below 50% of the permitted limit values.

8.6. Measuring the air condition

The measurements may be made after the air has been changed from the location, but provided that, at the time of measurement, ventilation has been completely stopped for at least 3 minutes.

Before the confined space can be entered, a release measurement must first take place. The confined space map states which measurements must be carried out. Only persons trained for this purpose and designated by Nyrstar may carry out the release measurements.

The measurement must be done with a measuring probe in the confined space. The person(s) involved in carrying out the measurement must be aware that it is forbidden to enter the room to carry out the measurement(s).

The confined space may be entered without respiratory protection if:

• the percentage of oxygen in the room is higher than 19,5 % by volume and less than 23 % by volume;
• the concentration of toxic substances does not exceed the limit value of that substance.
• the concentration of flammable or explosive gases is less than 10 percent of the lower explosion limit (LEL);

If the air conditions are good, workers must nevertheless wear a personal meter and appropriate respiratory protection if it is feared that the work may result in the sudden formation of dangerous fumes or that these fumes can enter the room.

Remarks

• If the oxygen content is below 19% vol. or there is an acutely toxic concentration, the room should only be entered using independent respiratory protective equipment. In addition, the air supply is independent of the atmosphere in the space.
• If the concentration of a substance exceeds the limit value, the respiratory protective equipment as prescribed on the confined space card should be used.

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• If the concentration of an explosive substance exceeds the 10 % LEL value, one may not work in this room and the ATEX expert must be informed. By carrying out a TRA, the additional control measures will have to be determined.
• Nyrstar's target is 0% LEL. The effectiveness of the control measures taken must be such that, before one wants to enter the confined space, no explosive mixture is present.

8.7. Respiratory protection

In the event of risk of suffocation, stunning or poisoning, the use of independent respiratory protection with emergency provision is necessary. If the air conditions comply with the stated provisions of 8.6. and these can be maintained with sufficient certainty, respiratory protective equipment does not need to be used. If the under 8.6. standards cannot be maintained or cannot be achieved, one should never deviate from the wearing of necessary respiratory protective equipment.

With independent non-autonomous respiratory protection, the person for the breathing air is independent of the ambient air. The breathing air is supplied by a fixed or a loose pipe with breathing air under pressure. The compressed breathing air is supplied by a breathing air group (compressor with the necessary protections) or by a battery of pressurized air bottles. As a result, the movements in space are limited (hence: not autonomous). The operating time is unlimited with a compressor and more limited with a bottle battery. We also note that the arrangement of the air group, where it draws in its air, must be free of pollution.

Persons using independent respiratory protection should have received appropriate training.

8.8. Temperature test

If you have to enter a room whose temperature is higher than the ambient temperature, additional temperature measurements can be made. The permitted values can be found in VV19

8.9. Pre-job meeting before entering

Before starting the work, the manhole guard will check the safety measures of the work permit and entry sheet (red, orange, green) and discuss them with the person(s) in the pre-job meeting. An LMRA card will therefore have to be filled in by the operator(s).
When work resumes after a longer working time interruption (e.g. next day), a new work permit and entry form must be written as prescribed and this will be checked again by the manhole guard. This is certainly important for ventilation and the analysis of the atmosphere.

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9. Measures during entry

9.1. Use of personal protective equipment

The operator(s) must wear a life belt with shoulder straps to facilitate rescue.
Because of residual products, such as acids, caustic soda, acid glasses and acid-resistant clothing and safety boots / gloves (chemically resistant) may be mandatory.

9.2. Ventilation

The legislation provides that any confined space must be completely refreshed or ventilated with air before entering. One should try to enter the room afterwards without respiratory protection. Therefore, one will ventilate till:
The concentration of harmful substances contained in the confined space is below the permitted limit values. In practical terms, the following must be taken into account:

- These places must be adequately ventilated and continued without interruption as long as the workers are in the room.
- workers may enter or remain without being protected by means of a respirator only if detection tests, which are suitable for the given conditions and provide a sufficient guarantee of sensitivity, have determined that there is no release.
- If, on the basis of these tests, it is determined that there are dangerous fumes, even very small vapours, workers may enter or remain only with full protection of a respirator as explained above.
- Workers may enter or remain in such places without the protection of a respirator only if:
    - the room was adequately ventilated
    - the air is completely refreshed
    - a measurement was performed that was negative
    - the given conditions are suitable and that provide sufficient certainty that there is no shortage of oxygen.

  Ventilation must be organised in such a way that the fresh air is introduced and the spoiled air is led outside. For this, attention must be paid to the blind spots in the room.
- If a respirator is not feasible due to the construction of the room or due to other special circumstances, the owner of the installation and the prevention department must be consulted to find a solution (such as, for example, powerful ventilation without interruption so that a quick purification of the atmosphere is ensured).

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9.3. Use of electrical equipment in conductive confined space

See safety regulation VV 25 "Requirements for (electric) hand tools" section 6.4

9.4. Welding, cutting, grinding, (plasma) burning

The following specific conditions apply:

- Electric welding, cutting and grinding see 9.3
- In the case of oxy-fuel, gas arc welding, etc., additional hazards may arise due to leaks. Gas cylinders should not be placed in the room. Gas hoses shall be fitted with hose rupture protections;
- During welding and cutting work, sufficient ventilation and extraction must be ensured;
- When using oxygen and/or other flammable gases, continuous monitoring of oxygen content and explosive gas should take place. In the event of an alarm from the measuring device, the work must be stopped immediately and the room must be left. After that, it is necessary to consult with the licensing authority how the conditions can be improved.
- If work is interrupted, hoses and burners must be removed from the room, the valves of the bottles closed and the keys to the valves taken;
- The key for opening and closing a gas cylinder in use must always be present on the bottle valve.
- There must be no unnecessary flammable substances in the confined space;
- During the above activities, clothing that is difficult to burn must be worn;
- Fire extinguishers should be provided (no CO2 extinguishers) preferably foam extinguisher, or prepare a water hose. Do not take any risks when extinguishing in the confined space, if necessary let it burn out in a controlled manner. In the event of fire-hazardous work in confined spaces that consist entirely or largely of plastic, advice should be sought from IDPBW.

9.5. Paints, adhesives and solvents

If painting or gluing is carried out in a confined space, the following measures must be taken:

- respiratory protection, to be determined on the basis of the SDS and described in the TRA
- good ventilation, to keep the vapour concentration < 10% LEL and below the permitted limit value;
- continuous measurement of the oxygen content and LEL
- never combine these works with welding
- fire extinguishers provided (no CO2 extinguishers)

9.6. Measurements during entry

It is strongly recommended to carry out continuously the measurements that were carried out before entering, also during the entry, or else repeated with sufficient frequency, according to the nature of the

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activities. This is especially true if one can expect that the concentration of dangerous substances may increase during entry.

If the safe limits (exposure limits, oxygen limits or explosion limits) are exceeded, the work must be interrupted and the persons concerned must be asked to leave the room. The situation must then be re-evaluated and measures taken to re-enter the room under safe conditions (such as additional ventilation, use of respiratory protection, etc.).

10. After entering

As soon as no one is present in the confined space, every access must be closed in such a way that it cannot be entered unintentionally. A suitable tool for this is the orange safety net.

11. Deviations

If the above provisions have to be deviated from, this can only be done after motivation via a risk analysis, signed by the superintendent of the department and the prevention department. Executors must be in possession of this written decision and the work permit if they enter this space.

12. Archiving confined space sheet

The used entry sheets must be archived together with the work permit and both documents must be kept for 1 month after the work has been carried out.