DTU Nanolab - Safety in the Cleanroom

Working with chemicals

High risk work when handling dangerous chemicals.

Risks of accidents and nearby accidents in the cleanroom, when handling chemicals.

Get familiar with the pictograms you will meet in the cleanroom.

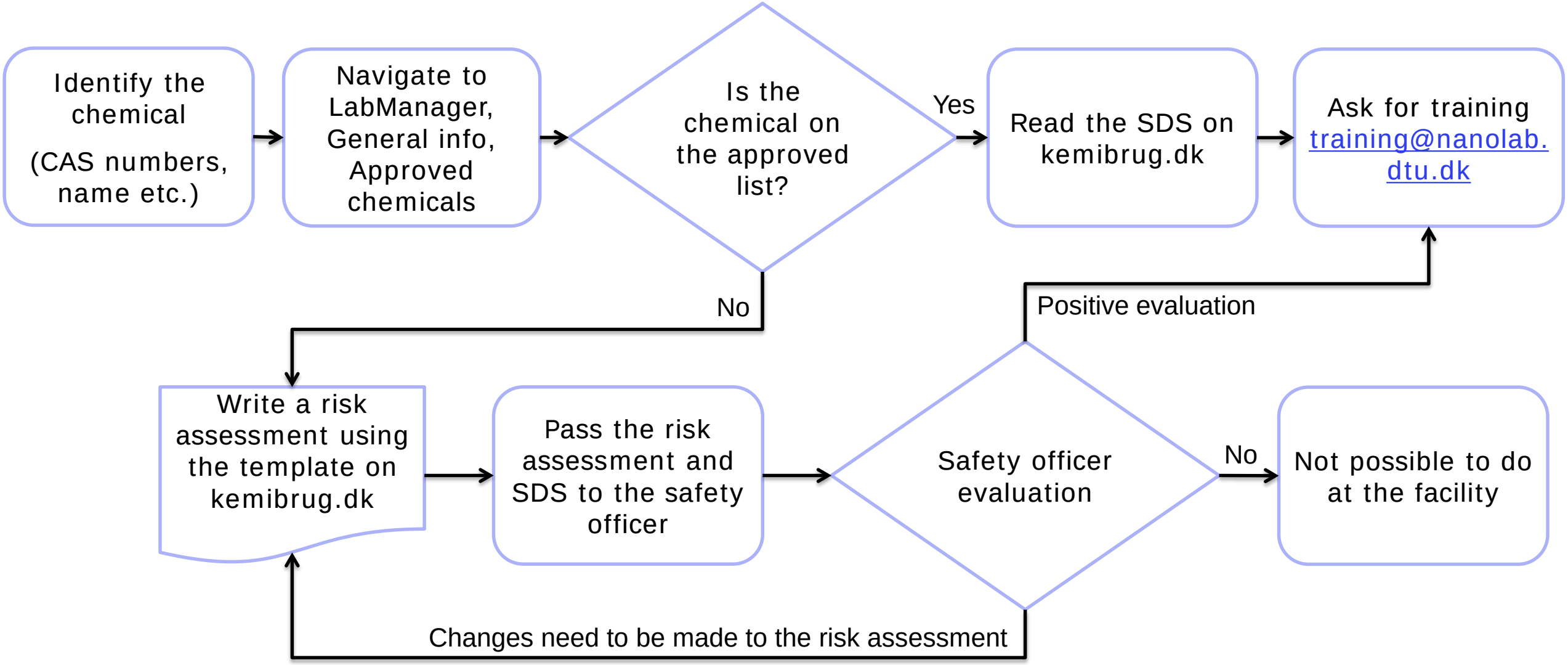
- On the next slide, you will see some of the pictograms you often meet when working with chemicals. Please read the sentencen so you know what to be aware of when working with the chemicals

Oxidizer

- An Oxidizer is a chemical that will react heavily when getting in contact with most solvents like Acetone, Anisol etc. Chemicals like Aluminum powder and Nitric Acid is an oxidizer.

Health Hazard  • Irritant (skin and eye) • Skin sensitizer • Respiratory tract irritant	**Serious Health Hazard**  • Carcinogen • Reproductive toxicity • Aspiration toxicity	**Acute Toxicity**  • Toxic • Fatal
Flammable  • Flammables • Pyrophorics • Self-reactives	**Oxidizing**  • Oxidizers	**Explosive**  • Explosives • Self-reactives
Corrosive  • Skin corrosion/burns • Corrosive to metals	**Hazardous to Environment**  • Aquatic toxicity	**Gas Under Pressure**  • Gases under pressure

Want to work with a new chemical?



Want to work with a new setup?

- If you want to work with already approved chemicals, but in a setup not already approved at Nanolab – e.g. heat up chemicals, mix chemicals or in any way do a process not already described in LabAdviser, then always write a risk assesment and send it to DTU Nanolab´s safety officer for evaluation

Working with a new chemical (kemibrug)

Try to navigate into https://www.kemibrug.dk/ and find the below chemicals (See the video Safety intro to kemibrug and labmanager for help) Read the KBA, the “Danger” and “Long-term Exposure” sentence are important and sections A, D (Incompatibility:) and section F (waste group) are also useful information

- Buffered Hydrogen Flouride – BHF
- Acetone
- Sulfuric Acid – H_2SO_4 (96-97%)
- Hydrogen Peroxide – H_2O_2 (30%)

Working with nanoparticles

- Nanoparticles poses a potential health risk, therefore please enter the below link, and learn more about the guidelines for working with nanoparticles at DTU

- https://www.inside.dtu.dk/en/medarbejder/hr-og-arbejdsmiljoe/arbejdsmiljoe/laboratorier-og-vaerksteder/nano-partikler

Personal protection

Personal Protective Equipment

Rules when working by the wet benches

- **Dipping wafers into the bath:**
  You should always wear at least one barrier glove and *safety* glasses (ordinary optical glasses are not sufficient) or face shield!

Working in the fume hood

- **Follow the sign in the fume hood, and always work with the sash at chest level.**

Example of sign from a fume hood:

When working with toxic or corrosive chemicals in the fume hood:
Always wear **face shield or safety glasses** (ordinary glasses are not sufficient), **apron** and **barrier gloves on both hands**

Only one non-standard chemical setup is allowed in the fumehood unless permission is given by a lab technician from Nanolab.

Alarm and evacuation

Alarm Levels

Sound	Message board	Typical cause	Action
Two-tone alarm (no pauses)		Fire or gas	Immediate evacuation via nearest exit. Meet at building 358
3 sec tone/ 2 sec pause		Ventilation error	Evacuation Exit through gowning
No sound		DTU Nanolab is resolving an issue	Stay out of building 346 Building is closed

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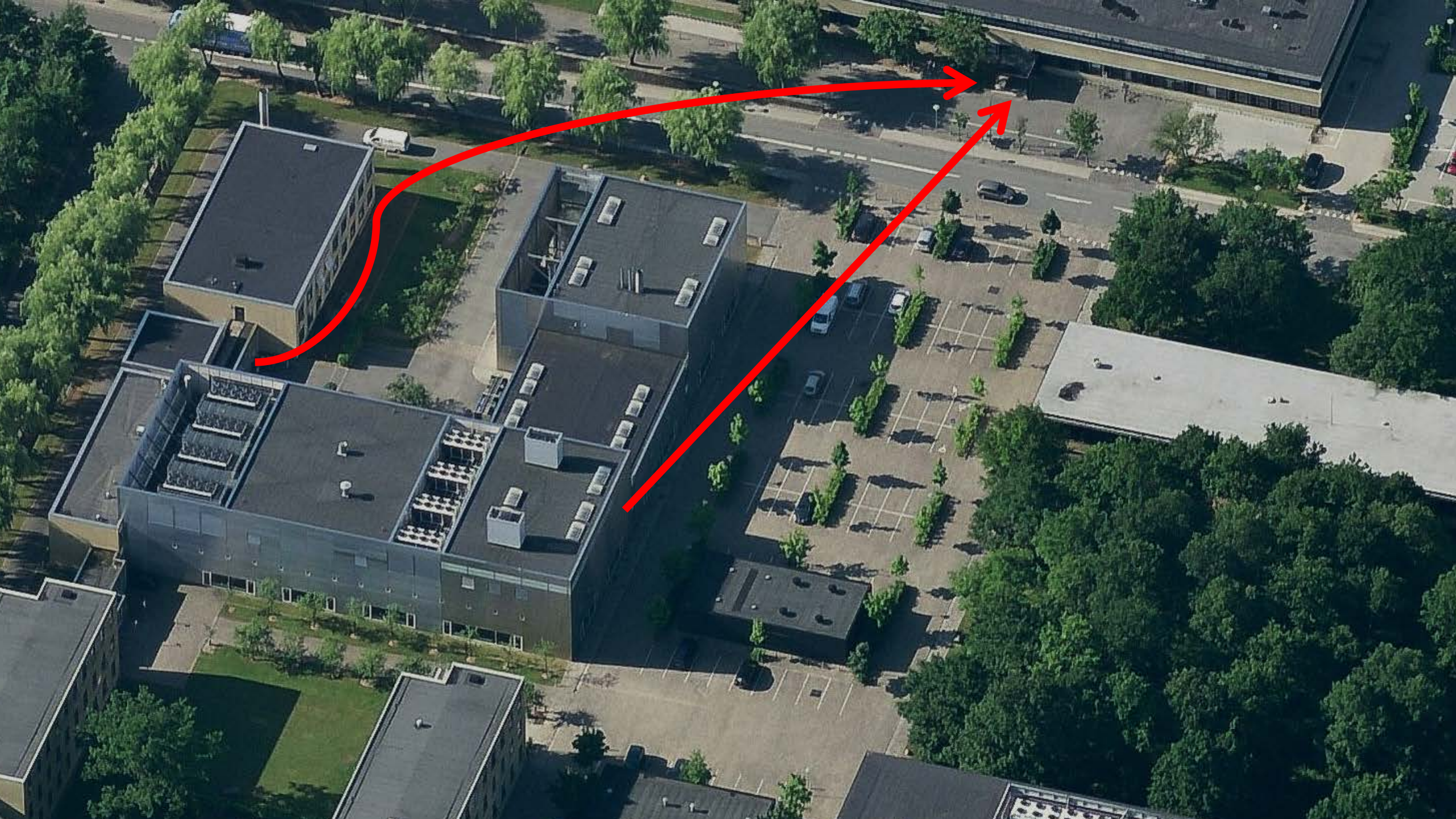


Mild (soft) evacuation button

Mild emergency button in the gowning, can be used in situations where you want everyone to leave the cleanroom but without calling the fire brigade. It can e.g. be used in the following cases:

- Minor spills of non-toxic chemicals
- You notice an unknown leakage or spill outside working hours and cannot easily find a Nanolab employee

Members of the emergency alarm team will ensure that everyone has left the cleanroom and talk to the person who pushed the button. The emergency team will assist in cleaning up the spill and inform everyone via email of the current status.

Hard evacuation buttons

Hard evacuations are used in cases of immediate or severe danger such as:

- Major spill of chemicals
- Fire
- Leak of dangerous gases (automatic)

Fire brigade is called automatically and will arrive within 2-5 minutes. Emergency team will assist.

Handling waste

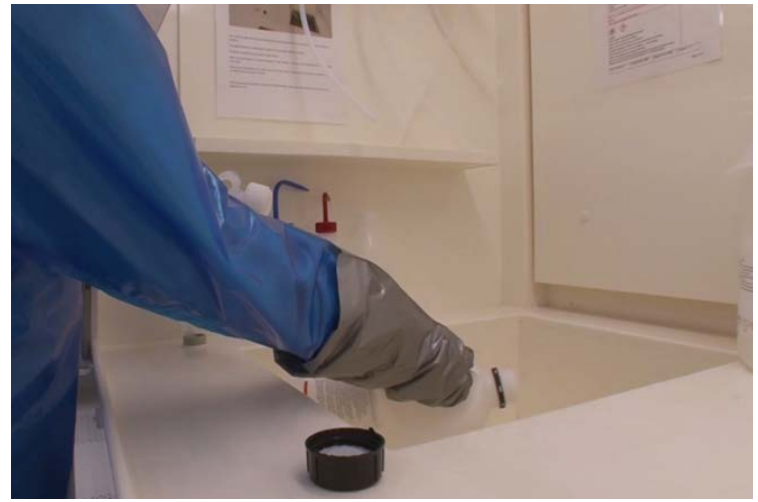
Waste handling of acids, bases

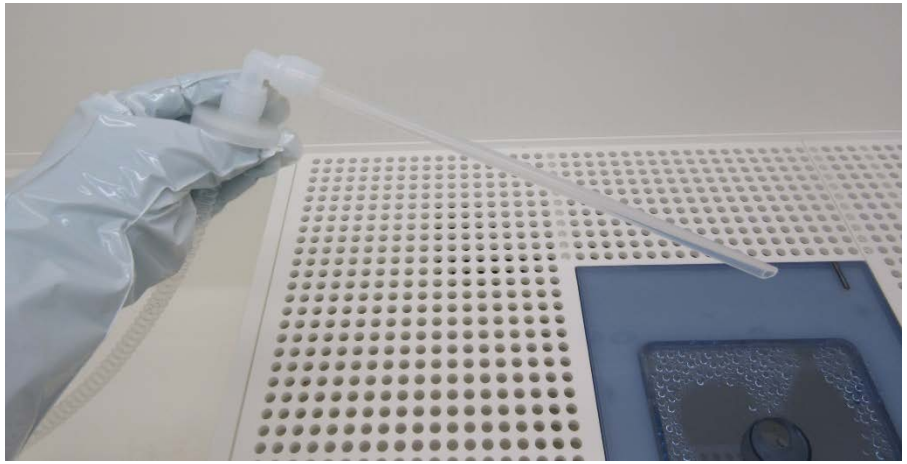
Restricted acids and bases (e.g. TMAH and Nickel solutions)

- Must be collected in dedicated waste bottles

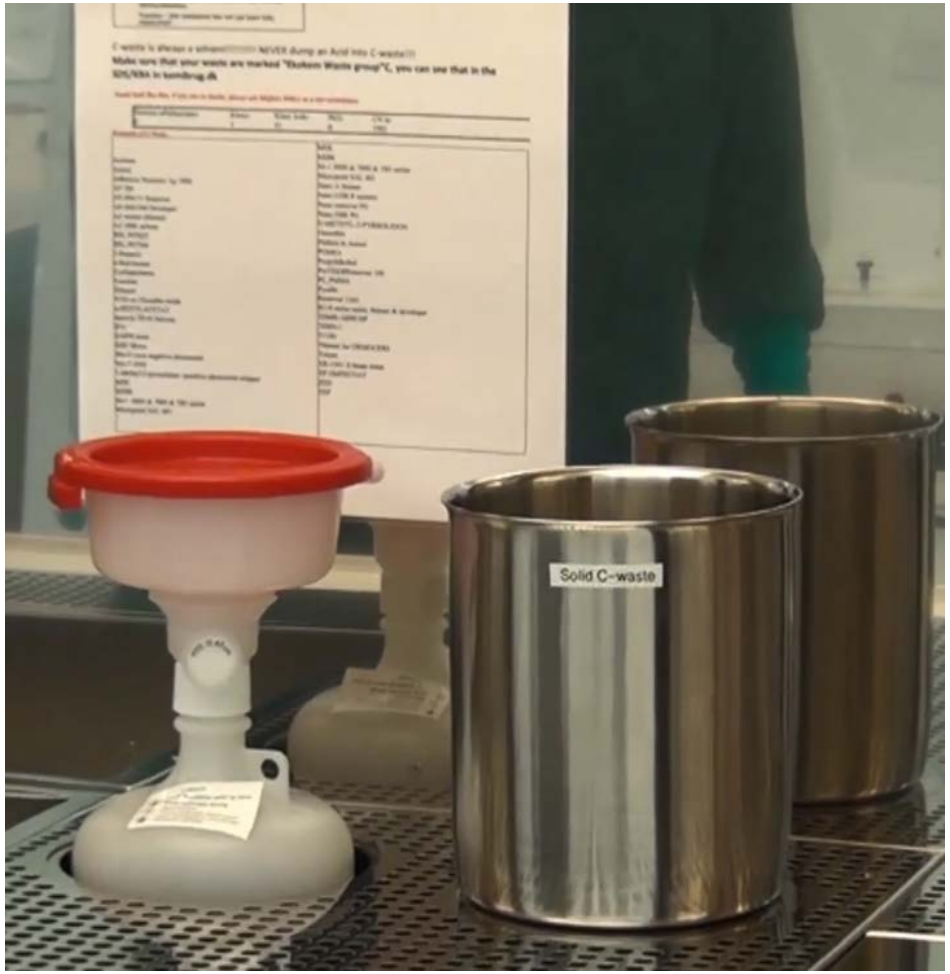
Non-restricted acids and bases (e.g. KOH, HCl, H_2SO_4, HNO_3, HF, BHF, H_3PO_4,)

- Aspirator can be used to suck up the chemical
- Chemicals from small beakers can be poured into a sink inside a fume hood





Waste handling: C-Waste



C-waste

You can dump all your C-waste into the bottle marked

Danger

H225: Highly flammable liquid and vapour.
H319: Causes serious eye irritation.
H336: May cause drowsiness or dizziness.
EUH066: Repeated exposure may cause skin dryness or cracking.
P210: Keep away from sources of ignition. — No smoking.
P280: Wear protective gloves/eye protection.
P305+351+338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

C-waste is always a solvent!!!!!!!! NEVER dump an Acid into C-waste!!!

Make sure that your waste are marked "NORD affaldsgruppe"C, you can see that in the SDS/KBA in kemibrug.dk

Could look like this, if you are in doubt, please ask Majken 55811 or a lab technicians

NORD affaldsgruppe:	Klasse:	Klass. kode:	PKG:	UN nr.
C	3	F1	II	1993

Examples of C-waste:

Acetone
Anisol
Adhesion Promotor Ap 3000
AP 300
AR 600-71 Remover
AR 600-548 Developer
AZ resists (diluted)
AZ EBR solvent
BSL P07025
BSL P07300
1-Butanol
n-Butylacetat
Cyclopentanon
Ecoclear
Ethanol
FOX-xx Flowable oxide
n-HEXYLACETAT
Intervia 3D-N Solvent
IPA
KMPR resist
KRF Mxxx
Ma-N xxxx negative photoresist
Ma-T 1050
1-Methyl-2-pyrrolidone -positive photoresist stripper
MEK
MIBK
Mr-1 6000 & 7000 & T85 serien
Microposit SAL 601
MEK
MIBK
Mr-1 6000 & 7000 & T85 serien
Microposit SAL 601
Nano A thinner
Nano LOR R resister
Nanoremover PG
Nano EBR PG
N-METHYL-2-PYRROLIDON
Ormothin
PMMA in Anisol
PGMEA
Propylalkohol
ProTEK® Remover 100
PS_PMMA
Pyralin
Remover 1165
SU-8 series resist, thinner & developer
TDMR-AR80 HP
TEBN-1
T1100
Thinner for ORMOCERS
Toluen
XR-1541 E-beam resist
XP OMNICOAT
ZED
ZEP

Never add oxidizers or strong acids like HCl, HNO_3 or H_2SO_4 to C-waste!!!!!

Waste handling: *Empty* chemical bottles soluble in water

Content soluble in water: (*All* X and H waste groups, *and* Acetone, IPA and Ethanol)

- Rinse the bottle a few times in a fumehood
- Final rinse on the bottle rinser in the gowning area
- If it is a glass bottle, throw out in glass waste
- If it is a plastic bottle, throw out in normal waste

Waste handling: *Empty* chemical bottles

Not soluble in water

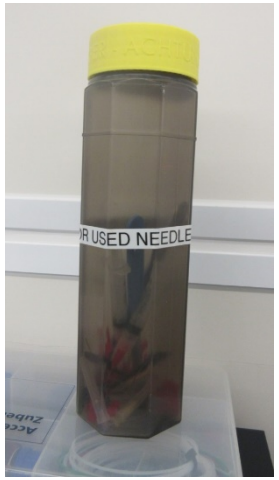
Content not soluble in water (*All* C-waste, except the above

Mentioned, e.g.resists, PGMEA, N50):

- Make sure the bottle is empty
- Place it in the container for solid C-Waste in Cx1

The rules apply equally for plastic and glass containers

Waste handling: Special waste



- Solid waste (wafers, metal, glass, sharp objects like needles etc) must be collected in specific closed containers
- Items (wipes, syringes, etc) contaminated with resists or solvents must be placed in dedicated bins for solid C-waste
- Speak to the lab staff if you have any doubt or questions

We take care of each other and the cleanroom. Therefore receive corrections positively, and do not be afraid to correct other if they do something wrong, and always tidy up after yourself after your work is done!!!!