



Why do we care about safety ?

We have ~ 40 experimental setups where:

- We use gasses (flammable, toxic)
- We use chemicals
- Setups produce smoke (ventilation)
- Liquids (water spill)
- Electricity (high power)
- (High) temperature/pressure
- Steam
- Lasers (in labs with interlock)
- Construction work with crane/forklift

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• Incidents @ P&E:

- Isopropanol in the eye
- Cleaning lady injured on needle in trash can
- Deep cut in finger from glass in the sink
- Near fall from height because a chair was used as a raised working platform
- Leaking exhaust in the frame
- Smoke in lab due to ventilation failure
- Loose connection of cooling water in chemistry lab
- Starting fire in plastic tube connected to fuel cell

Remember:

At different places we have First Aid people who can help you



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How to protect ourselves?

- Personal Protective Equipment
- Alarms and evacuation
- General safety measures for chemical lab and frame
- Safe behaviours and Housekeeping



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Personal Protective Equipment (PPE)





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Personal Protective Equipment





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Personal Protective Equipment



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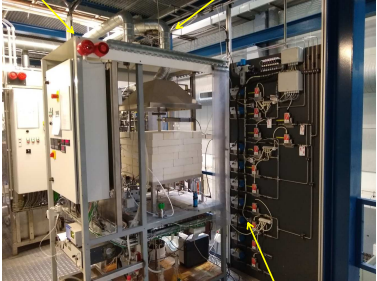
Personal Protective Equipment




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Alarms and evacuation


Alarm system Ventilation



Gas supply




Alarms and evacuation




Gas alarm inside setup
At 0,5-1x MAC-value


At 1x MAC-value:
Closing of gas supply
to the setup




Evacuation alarm
At > 2x Mac-value

Follow emergency
escape routes

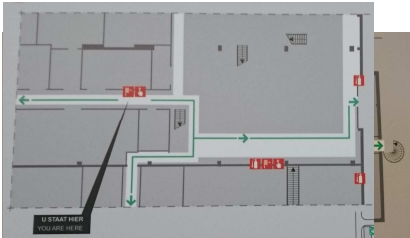






Alarms and evacuation



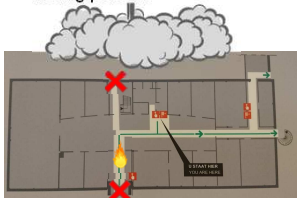
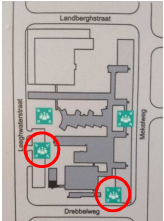
- Be **aware** of how your actions can affect your surroundings
- Be **aware** of how your surroundings can affect you
- **Always** know at least 2 exits from the area you are in
(in various places you find information notices)





Alarms and evacuation



- What to do in case of **evacuation alarm**:
 - When evacuating, don't pack your stuff! But immediately move towards an exit
 - Only use exits that lead away from the calamity
 - Meet at the Meeting Point (and not near the door!): safety officers need to check for missing persons



Safety measures in the frame

- Leave your normal coat and bag on the corridor, or use a locker
- ALWAYS helmet, safety glasses and safety shoes if you cross the yellow line !
- All PPE 's (Personal Protective Equipment) are available near the frame
- ALWAYS cover your legs: No shorts
- Lab coat when working with chemicals
- NEVER leave the frame with your gloves on
- Wash your hands after leaving the frame

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Safety measures in chemistry lab

Video by Michel van den Brink

<http://bit.ly/2GV3PDx>

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Safety measures in the chemistry lab

- Wear safety glasses also if you wear normal glasses
- Contact lenses ?
- Cover your arms, legs and feet (so no shorts, and no flipflops)
- Wear a lab coat: it can be removed quickly when splashed with chemicals
- Wear gloves and change them regularly. When you leave the lab, remove gloves and wash your hands
- Avoid contaminating surfaces and objects
- Know the Material Safety Data Sheet (MSDS) of all chemicals you are working with
- Label samples properly

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Safe behaviours and Housekeeping



- Any surface and object can potentially be contaminated with unknown and harmful chemicals. By touching food and/or eating/drinking you may ingest them!
- Even food in a bag can become inadvertently contaminated.
- Never take food with you into the chemical lab.



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Safe behaviours and Housekeeping

- At all times, people must work in a safe and clean manner
- Know where the safety equipment is
- Dispose of waste in the appropriate manner



Chemical waste



Used needles



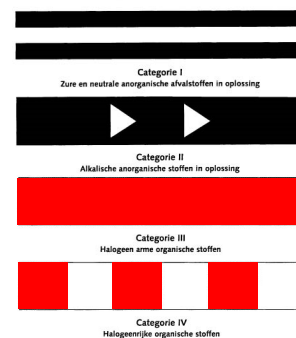
Regular waste



Glass

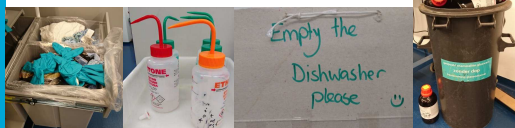
Safe behaviours and Housekeeping

- Inorganic acids in solution
- Inorganic alkali in solution
- Halogen poor organics
- Halogen rich organics



Safe behaviours and Housekeeping

- Clean your used glassware and put them back in the cupboards
- Keep the lab operational:
 - Empty full waste containers
 - Refill empty spray bottles
 - Refill empty towel racks
 - Don't fill the dishwasher with dirty glassware before the clean glassware is taken out and put back in storage



Safe behaviours and Housekeeping

- Do not let unauthorized people into laboratories; do not enter laboratories without permission
- You need to pass a safety course in order to get permission to enter laboratory areas. See P&E website for this
Hand in your certificate to Michel and Jaap
- Office hours Mon-Fri 08:00-18:00
- Off-working hours rule: permission in order to work in lab areas from Rob in advance!(Max. 2 weeks)
- During off-working hours: NEVER work alone, always bring a person who knows how to act in case of emergency !

Safe behaviours and Housekeeping

- Mechanical work inside the enclosure of setups can be done by researchers (these parts are controlled by gas detectors): But **ALLWAYS** ask our technicians to check it when finished!
- Outside the enclosure, only technicians are allowed to make changes.
- Students are not allowed to do **electrical** work on setups. Ask our technicians for this
- Don't couple multiple power strips, or connect too many equipment on it.
- Sometimes we use the crane or forklift for transport: In this case respect the flexible barriers.

Safe behaviours and Housekeeping

- All setups must have a Safety Assessment Sheet (SAS) displayed on the setup
- All setups must have an approved safety report. You can make this in the 'labservant'

TU Delft		Delft University of Technology		ChemE	
Faculty of Applied Sciences		Faculty of Applied Sciences		Chemical Engineering department	
"Safety Assessment Sheet"					
Author:	Danny den Bieman	phone TU	-	private	065 1282755
(Wa/Wa/L)	room # 34-K-1-100	phone TU	-	private	015-2787097
Area Supervisor:	Michel van den Brink	phone TU	-	private	-
	room # 34-1-0-800	phone TU	-	private	-
Description of experiment:					
Synthesis of an isobutylene from benzoylbenzoic acid and isopropyl amine.					
In the first step 2-benzoylbenzoic acid will be dissolved in THF and will be treated with SOCl ₂ and DMF. The mixture will subsequently be stirred for 16 hours in an inert atmosphere (nitrogen flow).					
In the next step the excess of THF and SOCl ₂ will be evaporated in a rotary evaporator. The resulting oil will be dissolved in THF again and cooled in an ice bath. Next isopropyl amine and triethylamine will be added, which will react exothermically. The mixture will be stirred at room temperature for 2 hours.					
In the third part of the synthesis the organic layer will be separated from an aqueous layer by adding 1M HCl and Et ₃ N. The resulting organic layer will be washed with saturated aqueous NaHCO ₃ and water. In the last step the organic layer will be dried with Na ₂ SO ₄ and the solvent will be removed by rotary evaporation to give the product.					

Safe behaviours and Housekeeping



Don't leave your working area like this...

Safe behaviours and Housekeeping



...or the shelves like this!

Safe behaviours and Housekeeping

General remarks:

- Look around you
- Try to identify unsafe situations and hazards
- If you see something unsafe, notify the person
- If you have a question: Ask
- Talk to each other
- Let's work together to [create a safe work environment](#)
- Sanctions may be imposed after (to) many warnings !

