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myfab Uppsala

User Introduction

Myfab Uppsala = Myfab-U = MfU

Used to be

Ångström MICROSTRUCTURE LABORATORY

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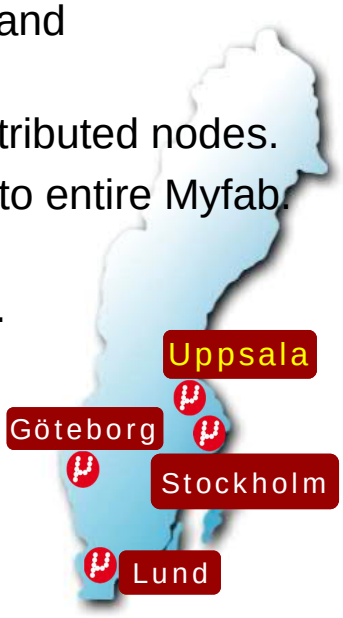
Myfab

- Myfab: National research infrastructure for microtechnology, nanoscience and characterization.
- Myfab Uppsala: One of four distributed nodes.
- Access to Myfab-U ⇨ Access to entire Myfab.
- Open research infrastructure: Efficient use of expensive tools.
- Many users: Needs of others, high quality standards and safety regulations must be respected!!!



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1) Cleanroom Basics
2) Administrative Guidelines
3) Electronic Infrastructure
4) Rules and Work Instructions
5) Work Environment and Safety
6) Chemical Safety
7) Alarms and Emergency

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What is the cleanroom and why do we have it?

- Clean, i.e. controlled particle density and size.
- Constant temperature and air humidity.
- Vibration free.
- Distributed laboratory infrastructure and safety systems:
  - electrical connections
  - de-ionized water
  - compressed gases
  - chuck vacuum
  - drains
  - exhaust ventilation
  - gas alarm
  - eye showers
  - …

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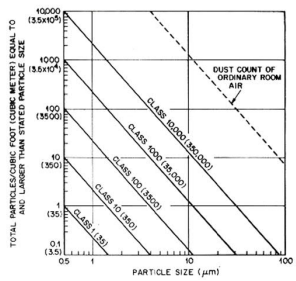
Particle Concentration

CLEANROOM CLASS *COMPARISON CHART*

CLEANLINESS LEVEL	ISO CLASS	FED STD 209E EQUIVALENT	AIR CHANGES PER HOUR	MAXIMUM PARTICLES / CUBIC METER					
				0.1 MICRON	0.2 MICRON	0.3 MICRON	0.5 MICRON	1 MICRON	5 MICRONS
EXTREMELY CLEAN	ISO 1	N/A	N/A	10	2	N/A	N/A	N/A	N/A
	ISO 2	N/A	N/A	100	24	10	4	N/A	N/A
	ISO 3	CLASS 1	360-540	1,000	237	102	35	8	N/A
	ISO 4	CLASS 10	300-540	10,000	2,370	1,020	352	83	N/A
	ISO 5	CLASS 100	240-480	100,000	23,700	10,200	3,520	832	29
	ISO 6	CLASS 1,000	150-240	1,000,000	237,000	102,000	35,200	8,320	293
	ISO 7	CLASS 10,000	60-90	N/A	N/A	N/A	352,000	83,200	2,930
	ISO 8	CLASS 100,000	5-48	N/A	N/A	N/A	3,520,000	832,000	29,300
CLEAN	ISO 9	N/A	N/A	N/A	N/A	N/A	35,320,000	8,320,000	293,000



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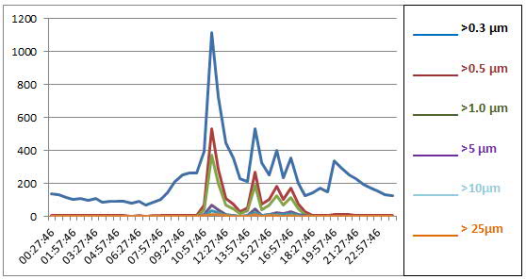
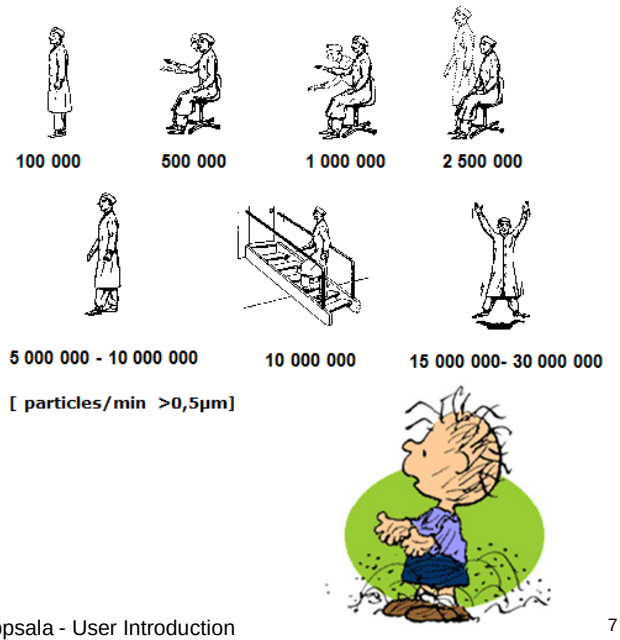
Particle Concentration

Variation over time





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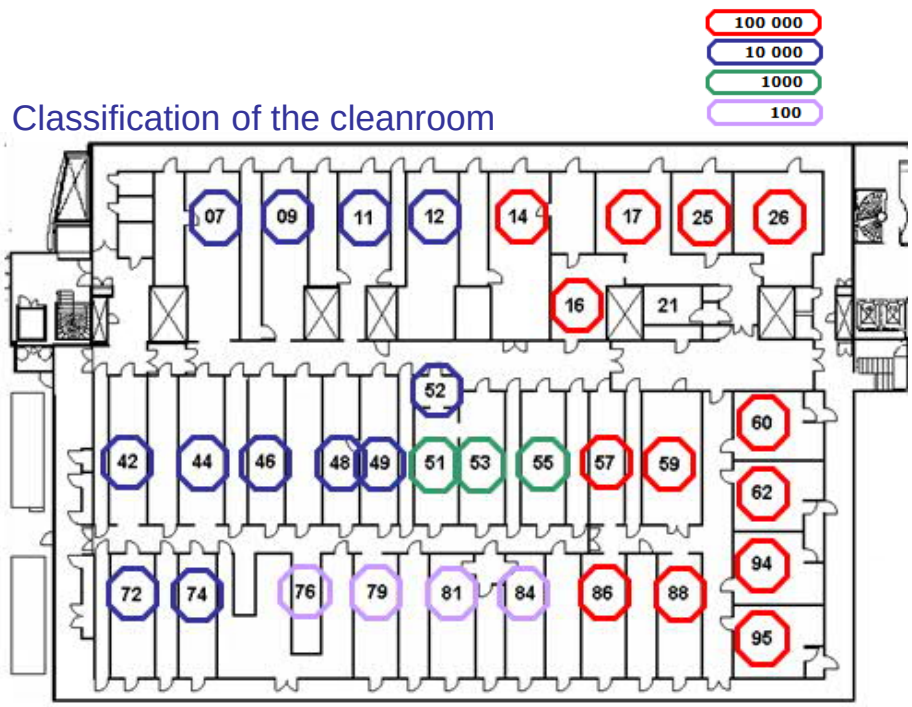
Particle Concentration

Classification of the cleanroom



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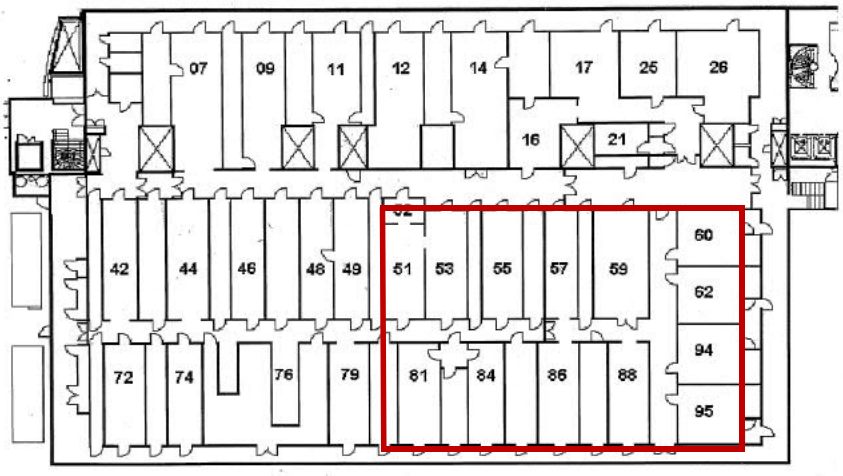
Vibration

700 m^2 vibration-free floor



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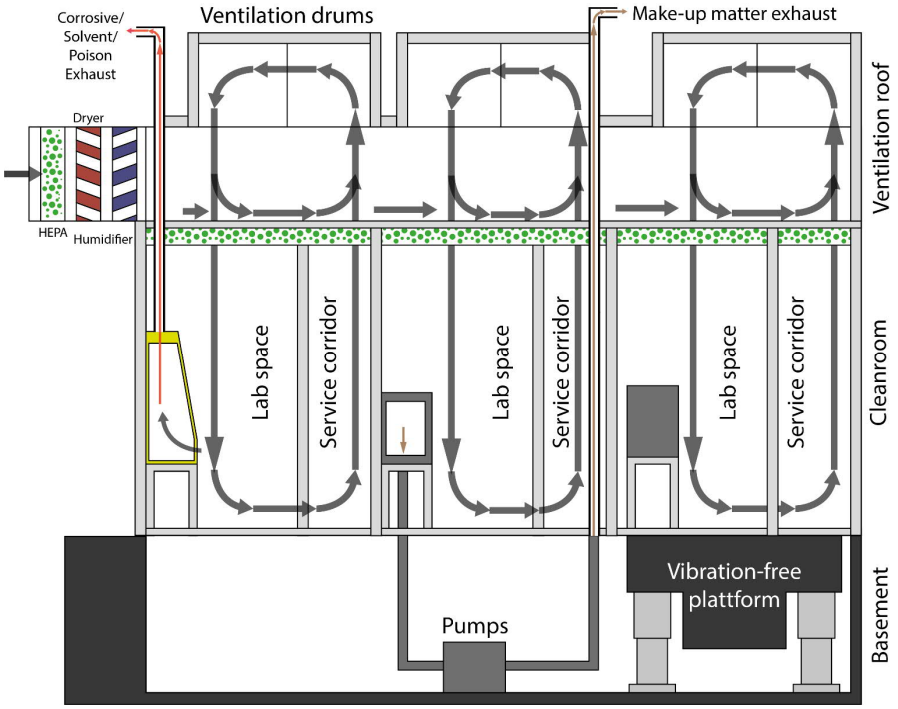
Ventilation



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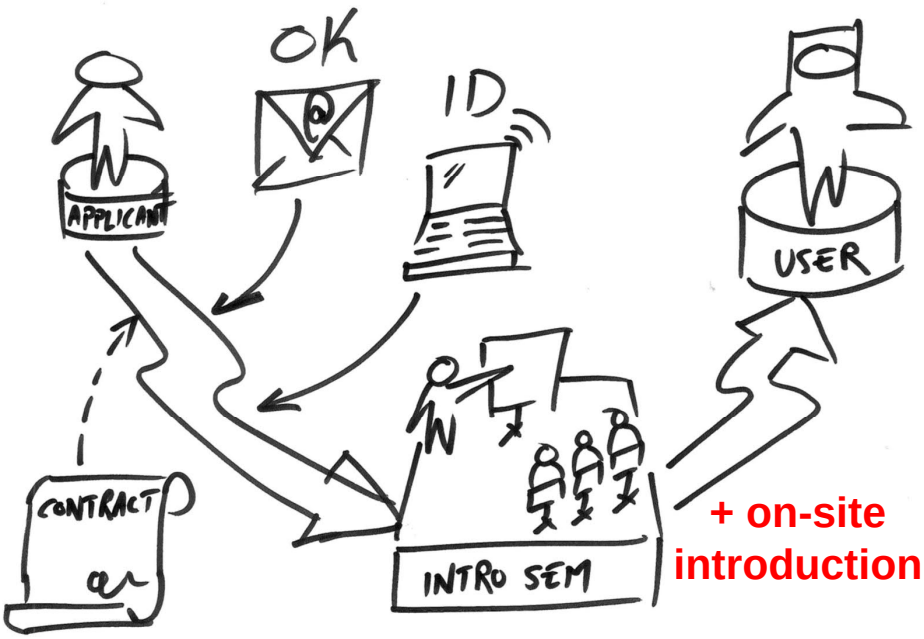
Laboratory Access



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During Covid-19 Pandemic

On-site introduction individually scheduled with
Sven Norén: sven.noren@angstrom.uu.se
072 999 9571

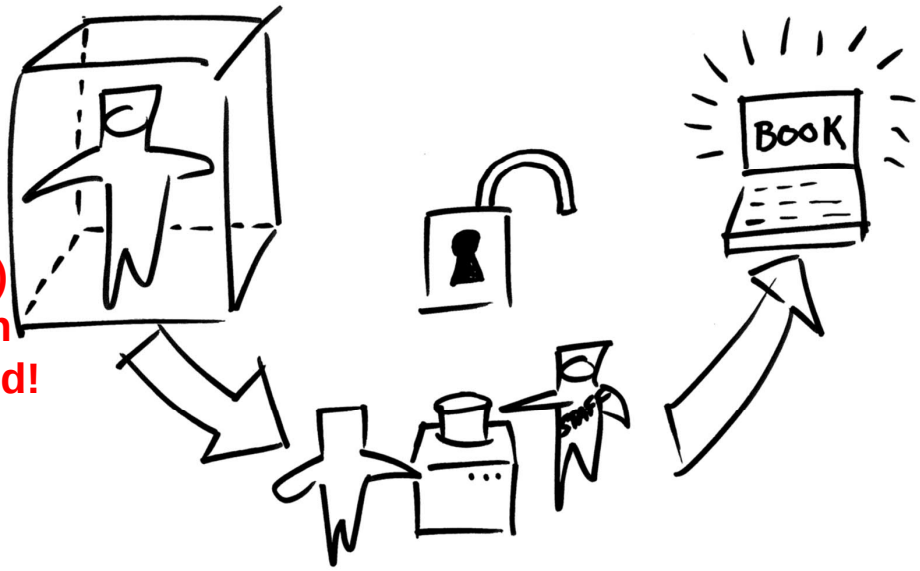
Required for lab access activation!

Tool Access

COVID-19:

Approval (general or tool specific) from division head required!

Additional (tool spec) restrictions may apply.



When ready to use!

Lab / Tool Access

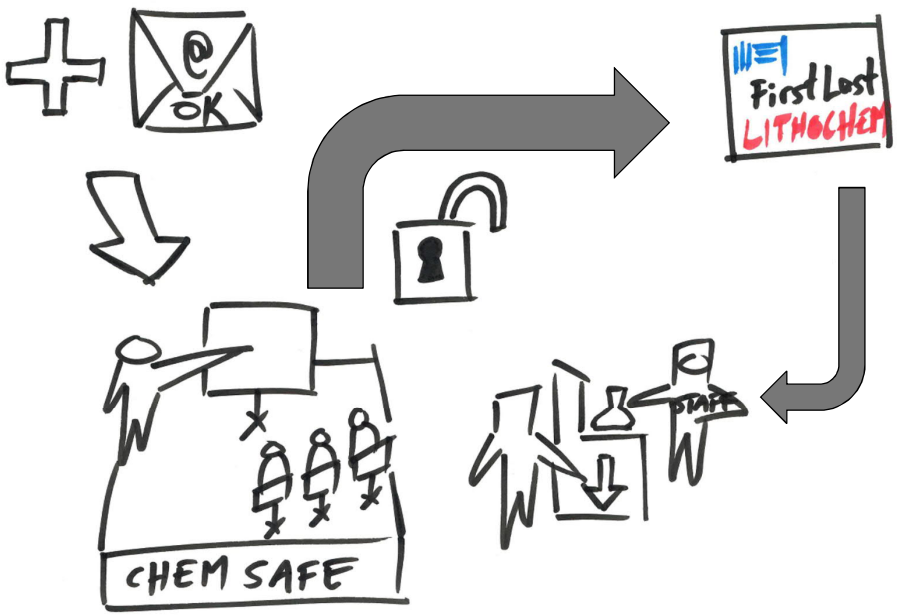
LithoChem access

- Lithography
- Wet chemistry
  (other than basic cleaning solutions)

Regular access

- Electron microscopy
- Surface characterization
- Thermal processing
- Thin film deposition
- Dry etching
- Backend processing
- Metrology

LithoChem Access



Booking & Logging in Myfab LIMS

- Booking compulsory for all major equipment.
- Tool specific booking restrictions may apply to optimise availability and efficiency.
- Important to use correct project for booking.
- Logging compulsory for some tools.
  Encouraged for all tool sessions (brief ”OK” may be sufficient and valuable).
- Always log at malfunction.

Access to Other Myfab Laboratories

- Myfab-Uppsala lab user = Myfab lab user
- When backup or complement is needed.
- Check LIMS ⇨ Contact tool resp. engr.
- On-site: Extensive or repeated use.
  Remote: Urgent or isolated activities.

Language: English

- Great number of nationalities among lab users.
- English is used in all Myfab laboratories.
- Good knowledge and ability to speak & write absolute requirement to maintain lab safety.

Publications & Acknowledgements

Importance of Myfab should be communicated!

- All users benefit from Myfab resources (e.g. subsidized user fees).
- Support from the Swedish Research Council (VR) important to maintain and develop infrastructure and support.

Important to acknowledge Myfab in all publications!

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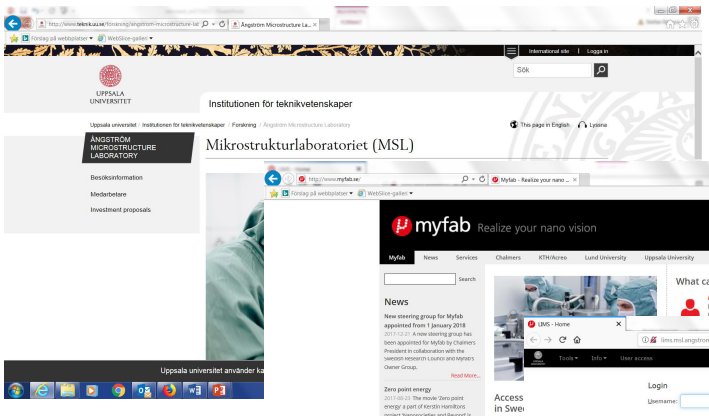
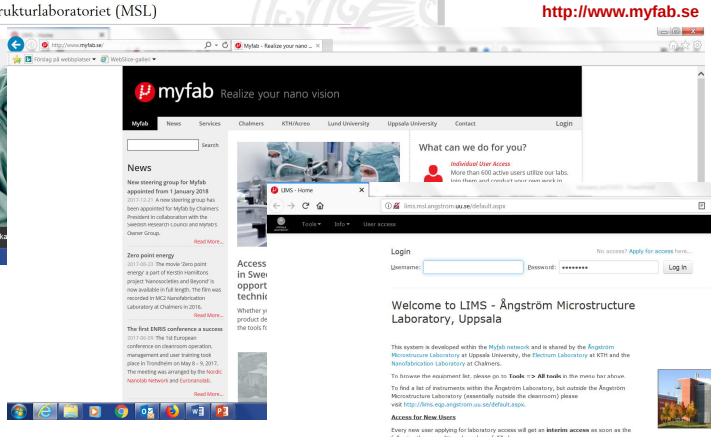
3 Websites

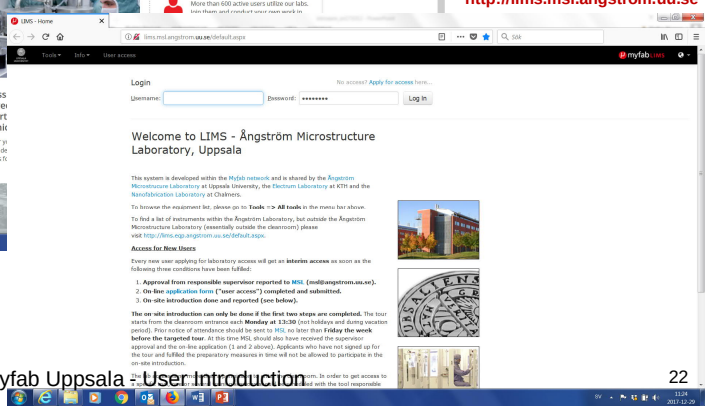
http://www.teknik.uu.se/forskning/angstrom-microstructure-laboratory



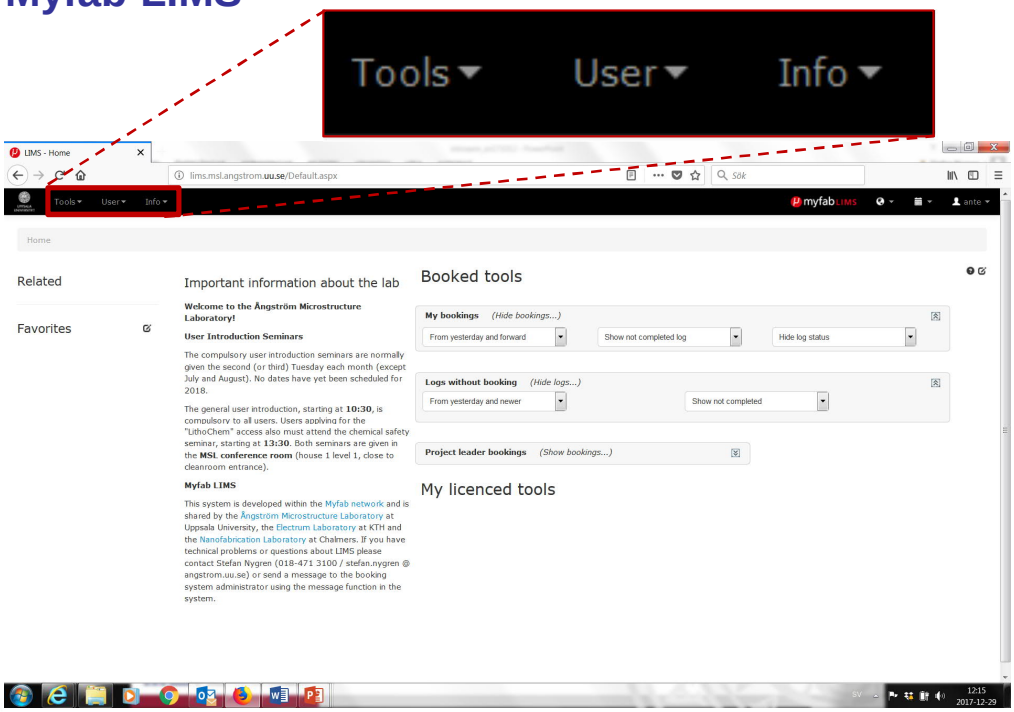
http://www.myfab.se



http://lims.msl.angstrom.uu.se



Myfab LIMS



Some Useful Myfab LIMS Menus

Tools	User	Info
• Apply for licence • All / My licenced tools • Tool status • View bookings • Log • …	• My profile • My bookings • My statistics • Send message • User list • …	• General documents • …

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Entering the Cleanroom

- Plan & prepare (minimize exits / re-entries).
- Check bookings (tools available?).
- Verify required material is available.
- Adjust clothing (comfortable / CR compatible).
- Take off potentially harmful watches, rings, etc.
- Avoid working in the CR if not feeling well.
- Avoid cosmetics and fragrances.
- Do not smoke immediately (< 30 min) prior to CR entry.

Bringing Material into the Cleanroom

- Only relevant items allowed.
- Only CR compatible material (paper / pen / …) in coverall area.
- Cleaning required (prepared stand at entrance).
- Material to be introduced in lab tools must conform to lab and tool regulations (composition / processing history / cleanliness).
- Chemicals and technical equipment other than mobile phones must be approved by lab staff.

If uncertain: Consult lab staff!

Mobile in the Cleanroom (coverall areas)

Keep your mobile inside your cleanroom garment and keep it there throughout the lab session.

Or, in order to use and have available:

- Alt. 1: Remove cover and clean mobile properly.
- Alt. 2: Put and keep mobile in plastic zip bag.

Mobile phones must not be placed on lab equipment or workspace, such as wet benches. Keep the phone (lit up screen) away from mask aligners and other light sensitive tools (lithography).

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Storing Material in the Cleanroom

- Personal items that should not be removed from the cleanroom (sample boxes, tweezers, notebooks, …) may be stored in a box (one per user) on a designated shelf in a cabinet provided by lab staff.
- Hazardous material must not be stored in user boxes / cabinets.
- Lithography masks for recurrent use may be stored in mask boxes (one labelled box per user) on wire rack shelves outside lithography area (LithoChem users only).
- Items left in other places will be disposed of.

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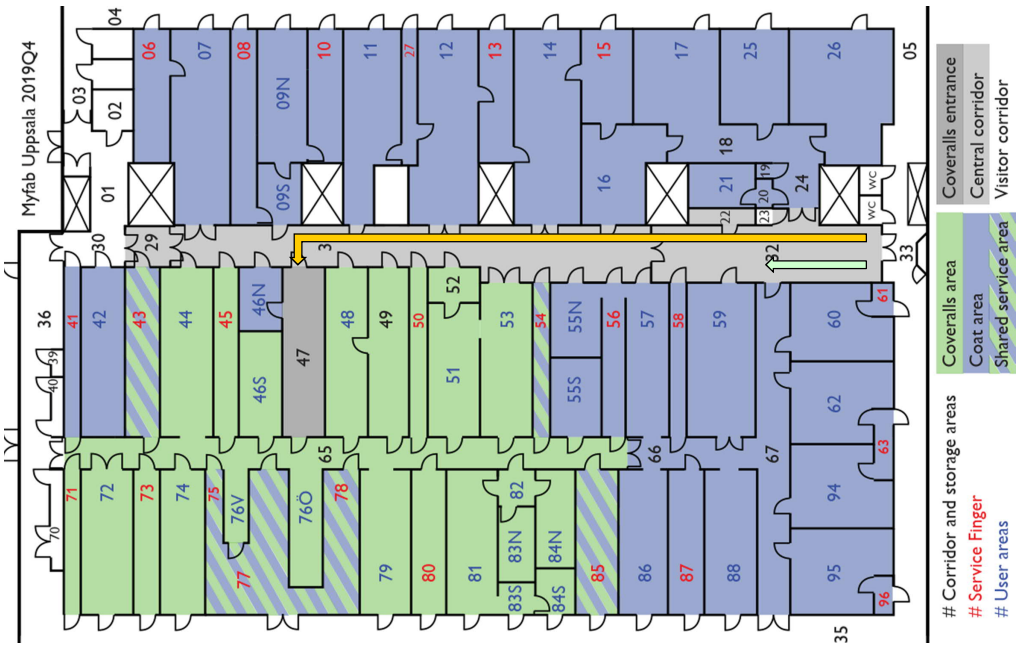
Coat / Coverall Areas



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Dressing Order – Coverall

- Change to cleanroom shoes
- Put on hood (facemask?)
- Put on coverall – badge
- Put on cleanroom gloves

- Put all garment back in the correct place when exiting (right size)!

General Cleanroom Rules

- No beverage or food (incl. snuff & chewing gum) allowed in CR.
- Avoid rapid movements.
- Avoid touching clean surfaces (e.g. load stn).
- Avoid talking close to sensitive objects.
- Avoid crowding.
- Keep doors closed for proper air flow.
- Use designated boxes in cabinets for short-term storage. Keep cabinet doors closed.

Contribute to good environment for all users!

Additional Covid-19 Rules (applied until further notice)

All lab users should wear cleanroom gloves and have their personal lab garment.

The following routines must be observed:

- Carefully wash your hands at the sink immediately to your right inside the main lab entrance.
- If entering the coat area: Put on your personal coat.
- Put on gloves inside the main entrance (coat area) or in the coverall entrance (coverall area).
- Face shields used for chemistry work must be properly cleaned before and after use.

Keep distance and stay at home if you have the slightest indication of illness!

General Work Procedures

- Service areas and areas dedicated to other user groups should not be entered.
- Temporary experimental setups must be approved (allocated space) by lab staff.
- All surfaces (floor / benches / equipment / …) must be kept clear of nonessential material.

Tool Operation (I)

- Virtually all tool operation requires a valid op licence (all tools with computer connection).
- Always ask lab staff for instructions whenever there is any doubt about the correct operation.
- If booking is compulsory, this must cover the entire user session (incl. e.g. setup & cleaning).
- If booking is optional, booking gives priority.
- Booking must be done by operator.
- A booking is invalid if not claimed within 30 min. Will be charged if not cancelled. Use of unclaimed booking must be documented in log.

Tool Operation (II)

- Any tool operation not in strict compliance with regulations must be approved by lab staff.
- Any request to develop new processes, introduce new materials, modify hardware or change tool settings must be approved by MfU.
- Simple trouble shooting (see tool instruction) may be done by tool user. All other issues must be reported to the tool responsible engineer.
- Tool sessions should be logged in Myfab LIMS.
- After use, leave tool in a clean and idle state.
- Users are responsible for catching up with updated information and revised instructions.

Lab Staff

Functions & Responsibilities

- Technical support and lab maintenance.
- Basic process maintenance on important tools.
- Operator training and licensing.
- User support related to tool op. / work proc.
- Supervision of lab order and safety.
- (*If time allows: Commissioning services.*)

NOT to be Expected

- Resetting tools to idle condition after use.
- Providing user specific process development.
- Supervising research or development projects.

Work Outside Regular Lab Hours (weekdays 7:00-18:00)

- Working alone in the lab is not allowed.
- Lab activities outside regular work hours requires coordination with additional user (”lab buddy”).
- Use of chemicals is restricted to ready-made processes in wet benches. Preparation, including pouring and mixing of chemicals is strictly forbidden outside regular work hours.
- Undergraduate students must not work in the lab outside regular work hours.

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Visitors

- Lab users may bring small visitor groups (< 5 people) to the visitor's corridor.
- Prior approval by lab management required to bring visitors into the lab area.
- Fill in visitor's log and prepare badge for the visitor.
- Photography requires specific approval by lab management.

NO VISITORS DURING PANDEMIC!

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Work Environment and Safety

- Challenging interdisciplinary environment.
- Many potential dangers.
- Risks are minimized with technology, awareness and correct behaviour.

General rules

- New processes need approval
- Always supervise potentially hazardous processes.
- Do not work alone. Make sure you have a lab buddy present during nights and weekends
- Think experiments through

Risks (I)

Be aware of the following risks

Chemicals. Will be covered in its own section later in in this presentation.

Process gases. In addition to its chemical risks, gases are pressurised and distributed.

Electrical installations. Research equipment sometimes have exposed electrical wires during *e.g*. maintenance.

Risks (II)

Be aware of the following risks

Fire hazards. The combination of chemicals, gases, high temperature etc. increases risk. The nature of fire is to grow.

Laser radiation. Do not remove shields and wear protection glasses where required.

UV radiation. Do not remove shields and wear protection glasses where required.

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Risks (III)

Be aware of the following risks

X-ray radiation. Normally shielded.

Cryogens. Liquid nitrogen, dry ice, causes freeze, but do also produce gas.

Nano materials. The hazards are still not fully known. Take extra precaution.

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Protective Gear

To protect the cleanroom from the user

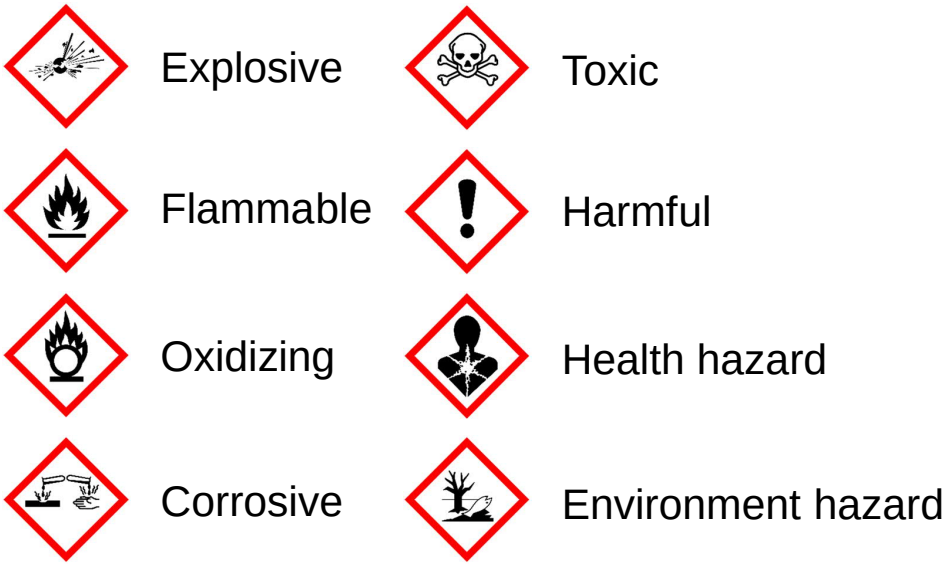
- Vinyl gloves
- Coat or coverall
- Bouffant cap or hood

Protective Gear

To protect the user from chemical hazards

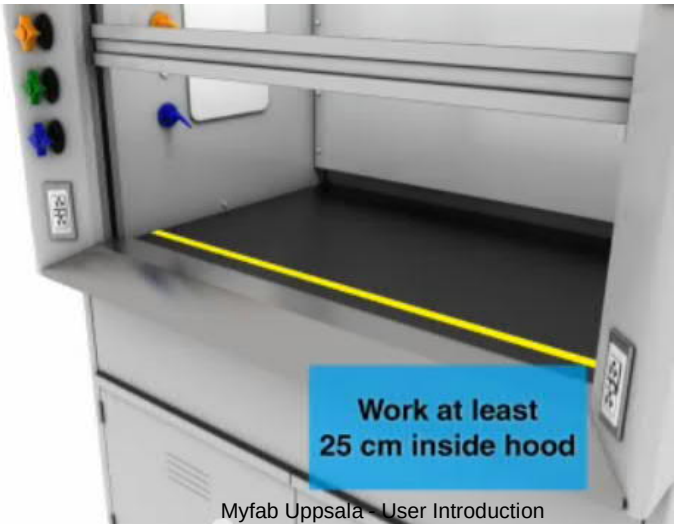
- Shoe cover
- Apron
- Face shield
- Chemical gloves

Chemical Hazard Pictograms



Working in a Fume Hood

- Keep the protective pane at working height (marked with yellow tape).
- Work at least 25 cm inside hood.



Refilling Solvent Squirt bottles

- Small squirt bottles containing solvents with room numbers are available in the fume hoods.
- These are meant for cleaning.
- If the bottles are empty, refill from a large corresponding bottle. Only refill inside a fume hood.

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Alarm: Reason and Action

Fire alarm
Red flashing light and bell.

Evacuation alarm
Red flashing light and siren.

EVACUATE !!!

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Evacuation – Flashing Red Ligh + Audible Signal

- If needed, alert others in your vicinity.
- Assist anyone in your vicinity who may need help.
- Evacuate through nearest emergency exit, without changing or taking off any clothes or shoes. Close exit door.
- Move to appropriate assembly point.
- Report relevant information to lab staff.
- Leave garments in boxes at lab entrance.
- Do not reenter the lab until you are notified (e-mail + entrance door sign) that you are allowed to do so.

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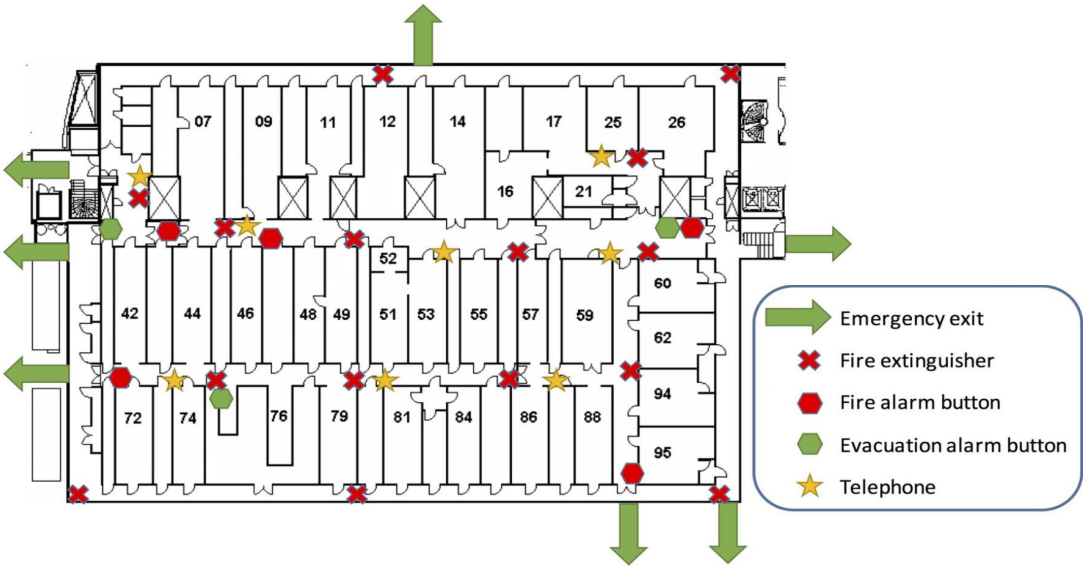
Emergency Exits and Important Locations



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Assembly Points

- **Fire Alarm** (temporary?):

- **Evacuation Alarm** (if no signal outside lab): Outside cleanroom entrance (house 1 / 1:st floor). Not required outside regular working hours.

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Alarm: Reason and Action

Alarm Type	Reason of the Alarm	What to do
Flashing blue light	Technical failure.	No user action required.
Flashing red light and siren	Evacuation alarm: Detection of hazardous gases within the lab or manual activation.	Evacuate the lab immediately! Reassemble outside the cleanroom entrance (house 1 floor 1 – if no signal outside the lab). Outside regular working hours, no reassembly or further action is required from the user.
Flashing red light and bell	Fire alarm: Detection of smoke / fire or manual activation.	Evacuate the building immediately! Reassemble at assembly sign on the northern parking lot. Do not re-enter the building until the flashing light has been turned off (acoustic signal may stop earlier).

Table D1: Possible reasons for an alarm and instructions on what to do.

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Manual Alarm Activation

- In case of fire, press the **Fire Alarm** – **RED** sign. (Summons fire brigade.)
- In case of major chemical spill, or other need for evacuation, press the **Evacuation Alarm** – **GREEN** sign (or red and green).

- Evacuate according to instructions!

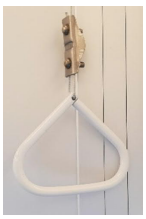
If you are at the site of a starting fire (not yet out of control) you should put it out if you feel confident you can do so.

Eye Showers

- In the case of getting chemicals in your eyes, go to a eye washing station.
- Remove the cap.
- Position your face 20-30 cm from the outlet.
- Press the button ”Tryck” on the right side and stand in shower for at least 25 minutes and wait for medical assistance.

Emergency Showers

- In the case of getting chemicals on yourself, go to a emergency shower station.
- Pull the the red handle to start the shower. Stay in the shower for at least 25 minutes. Remove chemically exposed clothing.
- Wait for medical assistance.



First Aid Station and Portable Eye Wash

- The First Aid Stations are located at the main entrance to CR and at the back loading area.
- The portable eye wash are located next to the First Aid stations.

Emergency Phone and Fire Extinguishers

- Fire extinguishers are evenly spaced in the CR.
- Emergency Phones are located evenly space in the CR. (Can also be used to reach MfU staff.)

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