JÜLICH Forschungszentrum

ERNST RUSKA-CENTRE
FOR MICROSCOPY AND
SPECTROSCOPY WITH ELECTRONS

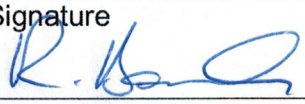
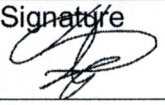
INTERNAL SAFETY INSTRUCTIONS

for the prevention of accidents

Version 1.0 | Date: 11.01.2022

Forschungszentrum Jülich GmbH
Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons
52425 Jülich

Document Status

Compiled:	Name R. Borowski	Date 07.01.2022	Signature 
Audited:	Name Dr. G. Wilbs	Date 11.01.2022	Signature 
Approved:	Name Prof. Dr. R. E. Dunin-Borkowski	Date 11.01.2022	Signature 
Version:	Datum 11.01.2022	Version 1.0	Status Approved
Replaces Version:	Datum -	Version -	Status -
Distribution List:	ER-C Directors, ER-C User Office, ER-C PSD, ER-C Science Office		

Introduction

Welcome to the Ernst Ruska-Centre and the Peter Grünberg Institute!

This document is a summary of elementary safety measures and safety regulations for work within the Ernst Ruska-Centre (ER-C-1 and ER-C-2) and the Institute for Microstructure Research (PGI-5).

To clarify, for legal reasons, it must first be pointed out that the legal and occupational health and safety regulations as well as the internal safety regulations of Forschungszentrum Jülich alone and in their entirety have overriding validity to this document.

1 Accident Reporting

The Emergency Services Centre of Forschungszentrum Jülich, which is manned day and night, forwards all reports of accidents, damage, and requests for assistance in an emergency to the rescue services responsible. The Centre can be reached from any telephone at Forschungszentrum Jülich via the telephone number:

EMERGENCY: 77

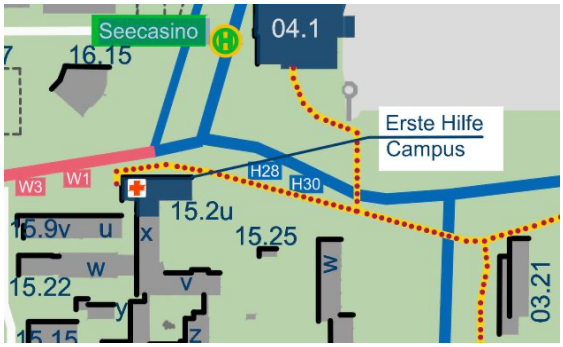
or using a mobile phone

02461 61 77

In the event of an emergency, you must state the name of your building, entrance, and room number. You will find these listed on a sticker on your telephone.

2 Company Doctor

The company medical service is located in Building 15.2 opposite the Seecasino (Refectory overlooking the lake) and can be reached via the emergency number 77 or the telephone number 5262.



3 Organizational

The persons named below are responsible for implementing health and safety measures for ER-C-1, ER-C-2 and PGI-5. Their respective functions and responsibilities can be found in this information sheet.

Function	Institute	Name	Building Room No.	Tel No.	E-mail
Area Representative Bldg. 05.2W, 05.2S, 05.7	ER-C 1,2	R. Borowski	05.2 3003	6700	r.borowski@fz-juelich.de

Area Representative Bldg. 04.6	PGI -5	C. Thomas	04.6 und 04.08 96	3152	c.thomas@fz-juelich.de
Area Representative Bldg. 05.2W 05.2V	ER-C 3	J. Ortiz	05.2 4010	2032	j.ortiz@fz-juelich.de
Safety Officer Bldg. O5.2W, 05.2S, 05.7	ER-C 1,2	M. Kruth	05.2 3079	3605	m.kruth@fz-juelich.de
Ladder Safety Representative Bldg. 05.2W, 05.2S, 05.7	ER-C 1,2	R. Borowski	05.2 3003	6700	r.borowski@fz-juelich.de
Hazardous Materials Officer Bldg. 05.2W, 05.2S,	ER-C 1,2	L. Kibkalo	05.2 3084	3910	l.kibkalo@fz-juelich.de
A-SSB (Radiation Safety Officer)	ER-C 1,2,3 und PGI-5	J. Mayer	05.2 3001	6070	j.mayer@fz-juelich.de
B-SSB (Radiation Safety Officer) Bldg. 05.2S, 05.2W, 04.6	ER-C 1,2,3 and PGI-5	C. Thomas	04.6 96	3152	c.thomas@fz-juelich.de
C-SSB Radiation Safety Officer Bldg. 05.2S, 05.2	ER-C 1,2	M. Kruth	05.2 3079	3605	m.kruth@fz-juelich.de
C-SSB Radiation Safety Officer Bldg. 05.2S, 05.2W	ER-C 1,2	L. Kibkalo	05.2 3084	3910	l.kibkalo@fz-juelich.de
C-SSB, B-SSB Representative Radiation Safety Officer Bldg. 05.2S, 05.2W	ER-C 1,2	R. Borowski	05.2 3003	6700	r.borowski@fz-juelich.de
First aider Bldg. O5.2W, 05.2S	ER-C 1,2,3	M. Göcking	05.2 3004	4274	m.goecking@fz-juelich.de
First aider Bldg. O5.2W, 05.2S	ER-C 1,2,3	L. Kibkalo	05.2 3084	3910	l.kibkalo@fz-juelich.de
First aider Bldg. O5.2W, 05.2S, 05.7	ER-C 1,2,3	R. Borowski	05.2 3003	6700	r.borowski@fz-juelich.de
Laser Safety Officer	ER-C 1,2,3 and PGI-5	M. Schnedler	04.6 98	3155	m.schnedler@fz-juelich.de

A current overview of the contact data of the officers and responsible persons listed are available for ER-C (Building 05.2S and 05.2W) in the documents at

https://er-c.org/index.php/access/safety-instructions/

Those for PGI-5 and its room-specific operating instructions can be found at

https://pgi-jcns.fz-juelich.de/portal/

For all rooms of the ER-C and PGI-5 in which experimental equipment is kept, Room Officers have been appointed who support the two Scientific Area Officers in the performance of their duties (see below) and are the contact persons in the absence of the respective area manager. The names of the Room Officers can be found in the room-specific operating instructions, which are available in the respective rooms.

Accident prevention regulations are available at:

http://www.bgetf.de/praev/praev_bgvorschriften.html

in electronic form. You will also find a large selection of safety documents on the Occupational Health and Safety intranet pages:

https://intranet.fz-juelich.de/de/organisation/gs/ueberuns/organisation/s-a/

4 Responsibilities and Competencies

a) A general safety briefing of all ER-C and PGI-5 employees shall be held at least once a year by the Institute Director. Participation in this meeting must be confirmed by signature. During the meeting, the current version of this safety instruction sheet must be handed out. A copy must also be available in the workplace.

b) At least once a year, a workplace-related or room-specific instruction session is to be held, if possible following the general instruction session, by the respective room or area representative. Again here, participation must be confirmed by signature.

c) Radiation protection instruction by one of the Radiation Protection Officers shall take place at least once a year. Signed participation is mandatory.

d) Each new employee (including doctoral students, students, guests and trainees) shall be instructed by the department's Radiation Protection Officer for safety and radiation protection. Participation in the instruction must be confirmed by signature.

e) External users of equipment of the ER-C - in particular those using experimental facilities - shall be instructed by the respective instrument officer in relation to their workplace. This also applies to short-term stays if safety-relevant work is to be carried out during this time. The latest versions of this safety data sheet and the associated operating instructions must also be issued to them. Participation in the instruction must be confirmed by signature.

f) For employees and guests who do not have sufficient knowledge of the German language, an English-language safety briefing will be carried out. The English-language version of this safety instruction sheet will be handed out.

g) The area representative and the hazardous materials officer in charge must be consulted when setting up and commissioning new equipment and when starting work with new substances. This applies in particular to electrical safety, explosion protection, safety in handling sources of possible stray radiation such as may occur with electron microscopes, handling chemicals or sample materials and X-ray equipment.

h) For the commissioning of experimental setups, even if only for trial operation, approval must be obtained from the respective specialist in charge. For the areas of radiation protection and electrical safety, Mr. Carsten Thomas is the appropriate contact person.

i) The respective Scientific Area Officers and the Room Officers are authorized to give instructions to employees of the ER-C or the PGI-5 and external guests. The Area Officers are authorized to give instructions to the Room Officers.

5 General Accident Prevention

This bulletin is in no way intended to replace the consultation of accident prevention regulations. It is only intended to point out special hazards, rules of conduct and safety measures resulting from the special field of activity of the Institute for Microstructure Research (PGI-5) or the Ernst Ruska-Centre (ER-C). However, please observe the following basic rules:

a) Inform yourself about possible hazards related to the performance of your activities.

b) Procure the necessary personal protective equipment (e.g. safety goggles, gloves, work shoes, etc.).

c) Report to the Safety or Area Officers any possible lack of safety aids (e.g. protective goggles for liquid nitrogen filling systems).

d) Report any safety deficiencies you notice to the Safety or Area Officers.

e) Only carry out work involving special safety risks or with hazardous materials when another person who could assist you if necessary is nearby.

f) Report every accident! This includes, for example, incidents such as the escape or leakage of hazardous substances as well as contact with or ingestion of hazardous substances. It is also necessary to report an accident if, on the face of it, no one has been harmed. You must do this without fail, not least in order to maintain important insurance coverage.

g) Have injuries treated even if you initially have the impression that the incident is relatively harmless. This is particularly true when handling chemicals, where there may be a time lag before the effects are felt in the event of ingestion or contact. Have the injury entered in the first-aid book of Forschungszentrum Jülich (in the outpatient clinic: Building 15.2 Entrance E 8, Tel. 5262). File an accident report with S-A department.

   Template:
   https://intranet.fz-juelich.de/de/organisation/gs/s-a/schnellzugriff

   FIRST AID BOXES are located at the entrances/exits of the staircases and in the secretary's office 05.2W R 3004 with Ms. Göcking.

6 Special Instructions for Pregnant Women

a) Pregnant women or nursing mothers must not be employed in work where the health of the mother or child (fetus) is endangered by, among other things, harmful physical factors. This includes, in particular, ionizing radiation.

b) Pregnant women and nursing mothers must not be employed in work which, among other things the health of the mother or child (fetus) is endangered by chemical or biological hazardous substances. Such a hazard is given in particular in the case of:

   - exposure to toxic, very toxic, and harmful hazardous substances, exposure to carcinogenic, fertility damaging, or mutagenic hazardous substances;
   - work with the risk of release of infectious agents.

c) If you are pregnant, please contact your supervisor and the Area Officer in confidence before commencing any work.

7 Special Instructions Regarding Electrical Safety

a) All movable electrical equipment will be inspected at intervals of no more than two years and provided with an inspection seal if it meets requirements. The corresponding measures are arranged centrally by PGI. The determination of the inspection intervals (heavily used devices are subject to shorter inspection intervals), the inspection of the

electrical devices themselves and the logging of the inspection is carried out in the by an external company and organized by Mr. Michael Moers (Tel.: 4444). Devices whose test seal has expired may not be used and their renewed testing must be arranged by the respective Room or Area Officer.

b) The opening of equipment operated with high voltage current or high voltage current installations in test setups, e.g. for fault diagnosis and repair, is generally not permitted. Corresponding work may only be carried out by personnel with written authorization. For example, computers may only be opened for the installation of cards and accessories if contact or modification in the area of live parts is excluded. Changes to the high-voltage electrical installation of equipment of any kind, even if only for repair, are not permitted.

c) Test setups with high-voltage electrical installations must be approved by a qualified electrician prior to commissioning or upon recommissioning after modifications. Points (a) and (b) also expressly apply here.

d) High-voltage installations are those in which electrical voltages occur above the limits for extra-low voltages defined by the European Low Voltage Directive. These are max. 50 V for AC voltages and max. 120 V for DC voltages.

e) Each experimental setup or device which, for example, no longer meets the device approval conditions due to removal of the housing, must be clearly marked so that other persons who are unaware of it cannot come to any harm.

f) Equipment that has been dropped, coolant leaks near electrical equipment, trip hazards due to electrical wires, or other incidents of a similar nature may create a high potential for danger due to damage and impacts that may not be directly apparent. Inform the responsible Area Officer and disconnect the device in question from the mains in his presence.

8 SPECIAL INSTRUCTIONS CONCERNING THE HANDLING OF VACUUM VESSELS, GLASS CRYOSTATS AND GLASS DEWARS

a) There is a risk of implosion when handling nitrogen and helium glass cryostats. In experimental operation, nitrogen glass cryostats must have a protective shield of plexiglass or metal.

b) Leather aprons, face shields and cryogenic gloves must be worn during filling, transport and assembly of glass cryostats.

c) Protective goggles and cryogenic gloves must be worn when handling transportable small nitrogen glass Dewars.

9 SPECIAL INSTRUCTIONS CONCERNING THE HANDLING OF REFRIGERANTS

a) Safety glasses and suitable cryoprotective gloves and closed-toe footwear shall be worn when transferring liquid helium or nitrogen.

b) Escaping liquid nitrogen will vaporize. The cold nitrogen gas is heavier than air and falls downwards. This can displace the oxygen needed to maintain lung activity. Consequently, there is a risk of suffocation in small enclosed spaces. (One liter of liquid nitrogen produces about 700 liters of gaseous nitrogen at room temperature). For this reason, larger quantities of liquid nitrogen (> 5 liters) should not be decanted in small rooms (< 15 m²) or the doors of the rooms should be opened during decanting.

c) Transport cans filled with liquid nitrogen or liquid helium and filled (pressurized) gas cylinders must not be transported together with persons in elevators.

d) Oxygen monitoring is installed in special laboratories. Leave these laboratories immediately if an alarm sounds. If it is safe to do so, close the liquid nitrogen supply and provide ventilation to the room before leaving the laboratory. Inform the Room Officer.

10 SPECIAL INSTRUCTIONS CONCERNING THE HANDLING OF CHEMICALS AND MATERIALS

a) The performance of all experiments involving chemicals and the set-up of the reaction apparatus must be approved by the project director or the person in charge of the laboratory.

b) Before handling chemicals and materials that you are unfamiliar with, obtain information from the person in charge of the laboratory and the hazardous materials officer about the possible hazards and the protective measures to be taken. Inform yourself as a precaution even if you think you are dealing with harmless substances.

c) Chemicals may not be stored in the laboratories; they may only be stored in small quantities in suitable safety cabinets. The chemical storage department of Forschungszentrum Jülich is responsible for the storage of larger quantities.

d) Containers and bottles for chemicals must be carefully labelled. This is not only to avoid confusion. Keep in mind that these materials must be disposed of after use. For this purpose, labelling is mandatory.

e) Chemicals must never be stored in fume hoods. They must be stored in the chemical cabinets provided for this purpose.

f) Suitable protective gloves, gowns and eye protection must always be worn when handling chemicals.

g) With regard to the disposal of chemicals, it should be noted that, as a matter of principle, no chemicals may be discharged into the wastewater! Mrs. Sybertz (9278) and Mrs. Kibkalo (3910) have disposal canisters ready in the laboratory rooms.

h) If you have come into contact with hydrofluoric acid (HF), go immediately to the company medical service in Building 15.2 opposite the Seecasino (Refectory) or call the number

EMERGENCY CALL 77

or, if you are using a cell phone, call

02461 61 77

for help. With this chemical, there is a serious risk of a caustic after-effect.

i) The mechanical processing of Beryllium (Be) and BeCu alloys is generally prohibited. Beryllium is sometimes used as a window material in X-ray detectors and as an X-ray neutral material in electron microscope specimen holders. Even extremely small amounts of Beryllium dust are highly carcinogenic. When using electron microscopes, avoid the use of mouth-operated tweezers ("butterflies") for positioning specimen holders (hex and snap rings, washers) into specimen holders.

j) Dusts and aerosols, such as those produced during evaporation in the course of melting metals, represent a health risk that should not be underestimated. Cleaning of equipment used for this purpose, e.g. in crystal growing, must be carried out in a wet environment with the use of respiratory masks and gloves and under extraction.

k) In connection with paper, oxidizing agents (e.g. H_2O_2) can start to burn even in large dilutions and with a time delay of hours. When picking up spilled quantities of such substances, care must be taken to avoid fire hazards. (Do not simply throw them in the wastebasket!)

l) The use of Oxyhydrogen mixtures (Hydrogen-Oxygen mixtures) is prohibited.

11 SPECIAL INSTRUCTIONS CONCERNING THE HANDLING OF COMPRESSED GAS CYLINDERS

a) Compressed gas cylinders shall always be secured to walls or to sufficiently solid laboratory benches by the use of chains.

b) During transport of compressed gas cylinders, the valve cap shall be screwed on. The cylinders are to be moved by using the transport trolleys provided specifically for this purpose. Wear work safety shoes when transporting compressed gas cylinders.

c) In principle, compressed gas cylinders may only be stored in special safety cabinets within the building. If no suitable cabinet is available, the gas cylinders must be moved to the gas cylinder storage area in front of Building 05.2W at the end of the experiment.

12 SPECIAL INSTRUCTIONS CONCERNING THE HANDLING OF ELECTRON MICROSCOPES AND RADIATION SOURCES

a) Electron microscopes are comparatively strong X-ray sources. They are equipped with radiation shielding and are type-approved. In view of this, X-ray shielding must not be removed as a matter of principle. The same applies to trial operations during repair or maintenance. Please inform the SSB immediately if you suspect that the shielding has been altered.

   DO NOT REMOVE/CHANGE DETECTORS or CAMERAS BEFORE (!) CONTACTING THE RADIATION SAFETY OFFICER!

b) High electrical voltages are used in electron microscopes. The voltages present in the capacitors of the voltage generation system and in the high-voltage section can be lethal. The electronics cabinets must therefore be kept closed at all times. The opening of the electronics cabinets is reserved for authorized personnel only.

c) Components containing Beryllium are installed in electron microscopes, namely in the X-ray analysis system, in the X-ray detector and in the object holders. Gloves must be worn when handling these parts. Mechanical surface treatment of the corresponding components is prohibited. The Beryllium dust produced is extremely toxic.

d) Experience has shown that in vacuum systems where voltages are used in deflections or measurements, X-rays may be generated by discharges if the vacuum is poor. For this reason, Plexiglas viewing windows should not be installed near such sources, but heavy glass windows should be used instead. Because these can burst under the influence of liquid nitrogen, they must be protected from splashes with a cover when liquid nitrogen is used! When troubleshooting, use radiation measuring devices, since even equipment that does not normally emit X-rays can become a powerful X-ray source if it malfunctions.

13 PROHIBITIONS

In the following, areas with a lower safety risk are distinguished from those with high safety risk (based on the activities carried out there).

Low safety risk: Offices, data processing and operator rooms as well as laboratories used for electron microscopy, provided that the equipment is in a condition that complies with the type-approval or CE certification.

High safety risk: workshops, chemical and furnace rooms, laboratory rooms (i) with experimental equipment unless such equipment is CE certified or meets a safety standard equivalent to CE certification, (ii) in which work is performed at high temperatures and pressures, (iii) in which there is a risk of explosion or suffocation, and (iv) in which work is performed on equipment involving open high-voltage installations.

On Sundays and public vacations, during general company shutdowns and on working days outside the working hours defined by the time recording system (from 6:00 a.m. to 8:00 p.m. on

weekdays), work is only permitted under exceptional circumstances and is generally prohibited in areas with a high safety risk.

Exceptions are possible if work in areas with a low safety risk has been approved in consultation with the head of the institute and the person responsible for the laboratory. The following must then be observed:

Option 1) The work must be carried out with a second person present. This second person must be in the immediate vicinity and be able to provide immediate assistance in case of an emergency. Note that it is not sufficient for the assistant to be present somewhere in the building. He or she must be in your immediate vicinity and be informed of and actively perform his or her supervisory function.

OR

Option 2) The work must be performed using the PNA (personal emergency call system). Prior to this, it must be clarified whether this is possible in the affected area.

The above mentioned notes of safety risks and the regulations with regard to normal working hours apply equally to employees of the PGI-5 or the ER-C as well as to external users of ER-C equipment.

14 CONDUCT IN THE EVENT OF IMMINENT DANGER

In case of immediate danger, e.g. due to leaking hazardous gases, fire or in case of an explosion hazard:

Do not hesitate! Act immediately! Request help immediately by calling the **emergency number 77** (or 02461 61 77 when using cell phones) or by using the emergency call boxes.

Personnel at the emergency call center are there to help you. No one will hold it against you for setting off a false alarm or an alarm in which things seem less serious in retrospect than initially thought.

15 CONDUCT DURING BUILDING EVACUATION

In the event of particularly dangerous occurrence, a public address system may be used to order an evacuation of the building or the entire premises. If you hear a three-step acoustic signal, this signal means a particularly high level of danger is present. Even if the signal sounds harmless to you, do not assume you are not in danger! Act immediately!

In the event of an evacuation, only stop to secure the premises (e.g. by closing gas taps or hydrogen sources)- when this would avoid a further potential high-risk situation. Leave the building immediately afterwards.

Keep in mind that colleagues or guests may not have heard the loudspeaker announcement. Also bear in mind that the announcements are usually only made in German and that your colleagues and guests may not be able to correctly assess the hazardous situation. Inform them immediately about the evacuation order.

After receiving the evacuation order, proceed immediately to the assembly point for the building in which you were working. Under no circumstances should you re-enter the building until specifically instructed to do so.

16 WHAT TO DO IN THE CASE OF RADIATION ACCIDENTS

There are two evacuation areas on the premises of Forschungszentrum Jülich. The CIP (Building 04.6 (old IFF building) and Building 04.8 (new IFF building)) is located in Evacuation Area 1. The ER-C (Building 05.2S and Building 05.2W) is located in Evacuation Area 2.

The escape gates to be used in a radiation-induced evacuation of the site are the

"Main Gate" for Building 04.6 (old IFF building)

and the

"Biology Escape Gate" for Building 04.8 (IFF New Building) and for Buildings 05.2S and 05.2W (ER-C) although the "Hambach Gate" is closer in the latter cases.

In the case of site-wide evacuation alerts, two categories of warning announcements must be distinguished:

"Evacuation readiness"

In this case, you are to remain in the building for the time being and await further announcements.

"Immediate evacuation"

In this case, you are to leave the premises immediately via the above-mentioned escape gate.