



General Safety Regulations

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List of Abbreviations

BBS	“Beauftragter für die Biologische Sicherheit” (Biological Safety Officer) (GenTG/ § 16 - GenTSV)
BTI	“Bereich Technische Infrastruktur” (Technical Infrastructure Department)
BTI-V	“BTI - Abteilung Ver- und Entsorgung” (BTI - Supply and Disposal Unit)
FIZ	“Fachinformationszentrum Karlsruhe” (Karlsruhe Technical Information Center)
Forschungszentrum	“Forschungszentrum Karlsruhe GmbH” (Karlsruhe Research Center)
GenTG	“Gentechnik-Gesetz” (Genetic Engineering Act)
GenTSV	„Gentechnik-Sicherheitsverordnung“ (Genetic Engineering Safety Ordinance)
GVO	“gentechnisch veränderter Organismus” (Genetically Modified Organism)
HDB	“Hauptabteilung Dekontaminationsbetriebe” (Central Decontamination Department)
HS	“Hauptabteilung Sicherheit” (Central Safety Department)
HS-TBG	“HS - Abteilung Technisch-administrative Beratung und Genehmigungen” (HS - Technical and Administrative Consulting and Licensing Division)
HS-ÜM	“HS - Abteilung Überwachung und Messtechnik” (HS - Monitoring and Measurement Technology Division)
HS-WS	“HS - Abteilung Werkschutz” (HS - Security Division)
IfSG	“Infektionsschutzgesetz” (Infection Protection Act)
ITO	“Transportordnung des Forschungszentrums Karlsruhe für den internen Transport radioaktiver Stoffe” (Transport Rules of the Forschungszentrum for Internal Transports of Radioactive Substances)
ITU	“Europäisches Institut für Transurane” (European Institute for Transuranium Elements)
KISS	“ K arlsruher I nformations S ystem S icherheit” (K arlsruhe I nformation S ystem on S afety) Intranet application of Forschungszentrum Karlsruhe Address: http://www.kiss.fzk.de
ÖA	“Stabsabteilung Öffentlichkeitsarbeit” (Public Relations Staff Unit)
PL	“Projektleiter” (Head of Project) (Genetic Engineering Act; GenTG/ § 14 GenTSV)
SGB	“Sozialgesetzbuch” (Code of Social Law)
SSB	“Strahlenschutzbeauftragter nach Strahlenschutz- oder Röntgenverordnung” (Radiation Protection Officer)
SSO	„Strahlenschutzordner“ (Radiation Protection File)
SSV	“Strahlenschutzverantwortlicher” (Person with the legal responsibility for radiation protection)
StFA	“Stabstelle Fachkräfte für Arbeitssicherheit” (Work Safety Experts Unit)
StrlSchV	“Strahlenschutzverordnung” (Radiation Protection Ordinance)
WAK	“Wiederaufarbeitungsanlage Karlsruhe BGmbH” (Karlsruhe Reprocessing Plant)
ZAG	“Zyklotron AG” (Cyclotron)

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1. Introduction

In these “General Safety Regulations”, the Forschungszentrum Karlsruhe has specified a set of instructions to ensure the safety of persons and property on its operating premises. These instructions are based on laws, ordinances, regulations, official licenses, licensing requirements and orders, as well as on generally recognized engineering guidelines.

Protection against danger is the responsibility of the safety organisation described in Annex I.

In addition to these “General Safety Regulations”, there are a number of “Special Safety Regulations”, which apply to specific groups of persons or particular procedures. The most important “Special Safety Regulations” are listed in Annex II.

Should you have further questions concerning safety regulations, please consult the *Abteilung Technisch-Administrative Beratung und Genehmigungen* (HS-TBG) (Technical and Administrative Consulting and Licensing Division) of the Central Safety Department or the *Stabsstelle Fachkräfte für Arbeitssicherheit* (StFA) (Work Safety Experts Unit).

The latest version of the “General Safety Regulations” can be found on the intranet of Forschungszentrum Karlsruhe under “**K**arlsruher **I**nformations**S**ystem **S**icherheit (KISS)”; <http://www.kiss.fzk.de>.

2. General Rules of Conduct

2.1 Admittance into the Center

Admittance into Forschungszentrum Karlsruhe is only permitted to persons who possess a valid company identity card or visitor's card. By their signature when granted admittance into the Center, card holders are obliged to observe and adhere to the safety regulations in Forschungszentrum Karlsruhe.

The **company identity card** for employees is issued by the Security Division of the Central Safety Department (HS-WS) upon request of the Central Department for Personnel and Social Matters (HPS). For employees of external firms and guests staying at an organisational unit for a longer period of time, application for a company identity card has to be made by the head of the respective unit. Company identity cards are made and issued by HS-WS after presentation of valid identity documents. The company identity card is to be shown unrequested to the HS-WS staff and is to be surrendered on demand. When the period of employment ends, the company identity card must be returned to the Reception Desk staff unrequested.

Visitor cards are issued at the Reception Desk / Main Gate of HS-WS after presentation of a valid identification card or passport and proof that admittance to the Forschungszentrum is necessary. The visitor card is to be shown unrequested to the HS-WS staff and is to be surrendered on demand.

Security inspections of vehicles or carried-along boxes can be performed under specific instructions.

2.2 Admittance Regulations for Visitors

Visitors can enter the Center with a visitor card. In the case that the visitor is unable to show any valid identification documents for the visitor card to be issued, admission is only possible, when his identity can be confirmed by the host. Visiting groups may be given a group pass, provided that the group has been registered by HS-WS in the form of a list (with name, given name, date of birth, and place of birth) and constantly is under the direction of a visitor's guide.

Persons younger than 16 years are only allowed to enter the Center, if a written agreement from the head of the organisational unit to be visited has been submitted to the Reception Desk staff. Then, admittance is granted for this individual case and the rooms of the organisational unit to be visited only.

For admittance into radiation protection and security areas, as well as biological laboratories of safety category S2 according to the Genetic Engineering and Infection Protection Act of the Forschungszentrum, specific regulations have to be applied (see Sections 4 and 5).

2.3 Bringing along and Taking out Goods and Equipment

Whoever wishes to bring along or take out goods or equipment, as far as these are not private, has to indicate this unrequested to the staff of HS-WS. In general this must be handled through the **Central Delivery Gate** (building 234). Employees of the Forschungszentrum and of guest institutions on-site (e.g. FIZ, ITU, WAK, and ZAG)

can use the Southern and Northern Gates for this purpose, provided they carry the corresponding forms (e.g. Ein-, Ausfuhrpapiere, Leihschein, Lieferschein).

Persons bringing items into or acquiring items within the Center itself must be able to give evidence of ownership when taking out these items from the Center. It is not allowed to bring in items for disposal.

For further details concerning the removal of materials (in particular waste, etc.) refer to Sections 4.6 and 6.

It is forbidden to bring animals, weapons, or waste into the Forschungszentrum.

In justified individual cases the "Sicherheitsbeauftragter" of the Forschungszentrum (Safety Commissioner of the Forschungszentrum) may allow exceptions on request.

2.4 Locking of Buildings and Rooms

When offices or laboratories are left unattended by persons working there for a longer period of time during the day, they must be locked. These regulations have to be applied also at the end of the working day. After the normal working time, buildings must be locked.

2.5 Road Traffic on Site

Throughout the site, provisions of the German **Road and Traffic Ordinance** and the Road and Traffic Registration Ordinance have to be applied. The maximum speed allowed is 50 km/h.

Traffic supervision is attended by HS-WS. Directions and traffic regulation signals given by uniformed HS-WS staff must be obeyed. These take priority over general traffic regulations and specific local traffic signs.

Doors and gateways must be kept clear. In particular, marked **emergency and escape routes** (e.g., access routes for the fire brigade), as well as roads and entrances to the buildings must not be blocked by vehicles or objects.

To ensure an efficient exit of vehicles from the parking lots in cases of **evacuation**, vehicles have to be parked in a way that it is possible for all vehicles to leave unhindered.

Industrial trucks (fork-lifts, electric trucks) may only be operated by persons in possession of a "Fahrerausweis für motorisch angetriebene Flurförderzeuge" (driving license for motorised industrial trucks), with written authorisation from the respective organisational unit to operate these vehicles for internal purposes.

Other motorised company vehicles are only allowed to be operated by persons in possession of a valid driving license and a "*Berechtigungsausweis zum Fahren von Kraftfahrzeugen des Forschungszentrums*" (authorisation to operate motorised vehicles belonging to the Forschungszentrum).

Company vehicles, which are not registered for use on public roads, are not allowed to leave the fenced part of the site.

Washing and repairing of company vehicles is only allowed in the garage facilities of the Forschungszentrum. Washing and repairing of private vehicles is forbidden on the site.

2.6 Admittance Regulations for Specific Areas

Specific areas of the Center are divided off from the rest of the site by fences and other security measures and are under special surveillance. Movement of persons, vehicles, and materials across the boundaries of these areas is subjected to special regulations.

2.6.1 Radiation Protection Areas

Areas in which unsealed radioactive substances are allowed to be handled and “Kontrollbereiche” (controlled areas) are specially divided off and marked (see Annex IV). Admittance into these areas is subject to special requirements, referred in Section 4.

2.6.2 Biological Laboratories

Laboratories that are classified into safety categories according to the Genetic Engineering Act (Gentechnikgesetz) or the Infection Protection Act (Infektionsschutzgesetz) are specially marked (see Annex IV). Starting from safety category S2, admittance into these areas is subjected to special requirements, referred in Section 5.

2.6.3 Construction Sites

The Construction Site Regulations of the Forschungszentrum are applied to construction sites. Construction sites are supervised by the responsible construction manager. Admittance onto the construction site is only permitted with the consent of the construction manager, following his instructions.

Construction site accommodation facilities (permanent or mobile) are only allowed to be set up with permission (Baustelleneinrichtungsschein) from BTI. These facilities may be inspected for safety by HS-TBG or the “Fachkräfte für Arbeitssicherheit” (Work Safety Experts).

Fire and heating facilities may only be installed and operated with the authorisation of the Forschungszentrum Fire Department.

2.7 No Smoking, Fire, and Open Lights

Fire, open lights, and smoking are forbidden in specially posted areas. In addition, smoking is forbidden in all forest areas and in areas where unsealed radioactive substances are handled.

2.8 Unauthorised Operating of Facilities and Equipment

Interventions on machines, devices, and other working equipment may only be carried out by authorised persons who are familiar with their operation, use, and maintenance.

Devices and equipment of information technology may be put into operation by authorised persons only. It is the responsibility of each organisational unit to specify regulations for admittance and for their use, and to control the observance of the regulations.

2.9 Photography

Recording photos, films, and videos on non official occasions requires authorisation. Outside of buildings, this authorisation may be obtained from the Public Relations Staff Unit (ÖA). For taking photos inside the buildings, authorisation may be obtained from the head of the respective organisational unit.

3. Work Safety Regulations

Special work safety regulations for work with radioactive substances, for work with organisms modified by genetic engineering so as for infectious pathogens, respectively are given in Sections 4 and 5.

3.1 General Work Safety Regulations

In all activities, the appropriate laws, ordinances, administrative regulations, and accident prevention rules, as well as the recognised guidelines of engineering, must be observed and applied.

The most important work safety instructions are available in the organisational units. They can also be found on the Intranet under "KISS". Further references are given in the specifications and documents distributed by HS-TBG to the heads of the organisational units and the "Sicherheitsbeauftragte Arbeitsschutz nach Sozialgesetzbuch VII" (Safety Commissioners according to the Code of Social Law VII). For questions, consult these persons and/or the responsible "Fachkraft für Arbeitssicherheit" (Work Safety Expert). If required, work safety regulations can be requested from HS-TBG.

The most important warning signs are shown in Annex IV.

3.2 Handling Hazardous Substances at Work

Persons handling hazardous substances at work must be informed by oral instruction. Herein potential hazards and ways of averting them specific to their respective jobs are instructed before co-workers are taking up their duties. Instructions have to be repeated at appropriate intervals at least once a year. The contents and date of the instruction must be recorded in writing and confirmed by the signature of the person instructed. Attention must be given to the operating instructions given by the organisational units.

Pregnant or nursing mothers and persons younger than 18 years are subject to special restrictions when handling dangerous substances. For these persons, a job evaluation by the responsible "Fachkraft für Arbeitssicherheit" (Work Safety Expert) and/or the Center's Physician is necessary before starting such work.

Hazardous substances such as laboratory chemicals may be transported within the site of the Forschungszentrum only in their original transport packaging or in a special box. The boxes can be obtained from the "Hauptlager" (main depot). These special boxes should also be used for transportation of chemicals within buildings. Large amounts of hazardous substances that are still in the original transport packaging must be transported in this packaging from the main depot for chemicals / central delivery gate to the recipient.

3.3 Preventative Medical Examinations, Information Obligations

Persons performing activities which require **preventative medical examinations** in accordance with the work safety regulations such as work involving the use of hazardous substances or working in hazardous or polluted areas (subject to noise, heat, etc.), must be examined before starting these activities. This has to be repeated in regular intervals by an Occupational Physician. The preventative medical examina-

tion must be carried out within 12 weeks before activity begins and, if necessary, in time before any dates of follow-up examinations expire. If the preventative medical certificate is not submitted in time, the person is excluded from performing this work.

To ensure a central control of examination dates, the organisational units must notify HS-TBG that their employees are due for preventative medical examination (e.g., using the form “Meldung zur arbeitsmedizinischen Vorsorgeuntersuchung” - notification for preventative medical examination). HS-TBG will inform the Medical Department about the examinations due. Appointments for the examinations are made by the Medical Department.

If pregnant, employees are no longer allowed to perform heavy physical work or work in which they can be exposed to hazardous substances, dust, gases, fumes, heat, cold temperatures, dampness, vibrations, or noise. In this case, refer to the head of your organisational unit or the Center’s Physician.

3.4 Fire Prevention Measures

All work involving fire and explosive vapor/air mixtures may be carried out only with a “Erlaubnisschein für Schweiß-, Schneid-, Löt-, Auftau- und Trennarbeiten” (permission form for welding, cutting, soldering, melting, and separation work).

Permission forms are issued through the Technical Infrastructure Department (BTI) or the “Betriebsbeauftragter”. No permission is required for work involving fire in specially equipped laboratories or workshops.

In addition to the permission form, allowance for execution of the work must be obtained from the “Betriebsbeauftragter” (responsible person of the organisational unit). This may take place only, if:

- any necessary instructions have been defined,
- the fire department has signed and, if necessary, completed the permission,
- all required safety measures have been taken, and
- the contractor (e.g., external company, BTI) has been informed of the safety instructions and other particulars.

The organisational unit must ensure that the **fire extinguishing equipment** is operational at all times. If fire alarm systems or parts of them are switched off for the execution of work for more than 15 minutes, surveillance of the respective area (guard or use of auxiliary fire alarm systems) is required. Access to fire extinguishing equipment must not be blocked. Staff members will be instructed in the use of fire extinguishing equipment by the fire department upon request by the organisational units.

Electrical cooking devices, such as boilers, coffee makers, and hot plates, must be put on refractory stands or mats. These items should only be used in the kitchens and common rooms.

3.5 Obligation to Report Accidents

In the event of an accident, the “Alarmzentrale” (Emergency Control Center) – emergency call 3333 – must be contacted.

In case of a work accident involving an employee of the Forschungszentrum, the head of the corresponding organisational unit must be informed. He has to fill out the specific accident report and to forward it to HS-TBG within three days. HS-TBG transmits copies of the accident report to the “Fachkräfte für Arbeitssicherheit” (Work Safety Experts), the “Betriebsrat” (Works Council), the accident insurance company of the Forschungszentrum, and to the competent authority.

In case of accidents involving employees of external companies and persons delegated to the Forschungszentrum, the head of the corresponding organisational unit and the superiors of the delegating company have to be informed. These are then obliged to report the accident to their accident insurance company. A copy of the accident report must be sent to HS-TBG.

An accident report must also be filed for accidents occurring when carrying out official activities on the way to and from the workplace, business trips, in sports within the company’s sports groups, or internal community events. In case of doubt, information can be obtained from HS-TBG or from the “Fachkräfte für Arbeitssicherheit” (Work Safety Experts).

To ensure that all work **accidents and accidents occurring on the way to and from the workplace** are reported in due time, you are required to report them to your superiors as soon as either you involved in or are witness to such an accident.

4. Radiation Protection Regulations

Generation of ionising radiation or any handling of radioactive substances is subject to approval or licensing by the appropriate authority. This means that all such activities are forbidden, unless a license has been granted or laws and regulations authorize an exception.

Persons generating ionising radiation or handling radioactive substances, for which a permit is required or which must be reported, must observe the Atomic Energy Act, the Radiation Protection Ordinance, the X-ray Ordinance, clauses in the respective permit under the Atomic Energy Act, instructions given by the authorities, and special operating instructions. **The SSB (“Strahlenschutzbeauftragte”, Radiation Protection Officers) appointed are responsible and are authorised to give directions in matters of radiation protection.** In most organisational units, the names of the competent SSBs can be found on a signboard in the entrance lobby. In case of doubt, ask the head of your organisational unit.

The radiation protection regulations are collected in the “Strahlenschutzordner” (Radiation Protection File) distributed to each SSB. Supplementary notifications of regulations concerning accounting and transportation of radioactive substances are also contained in the “Strahlenschutzordner” (Radiation Protection File). General radiation protection regulations can also be found in “KISS”.

If applicable, further radiation protection instructions of the individual organisational units necessary for any special circumstances must be observed.

Persons working with ionising radiation or radioactive substances must be instructed on relevant regulations as needed for their work. They also must be informed of possible hazards and protective measures before initially entering radiation protection areas and in subsequent annual radiation protection instruction. Annual radiation protection instruction is performed and documented by the responsible SSB or a qualified person appointed by him.

4.1 Radiation Protection Areas

In radiation protection areas, failure to observe the applicable rules and regulations when handling radioactive substances and/or radioactive emitters may create hazards due to:

- external exposure to ionising radiation,
- contamination through unsealed radioactive substances,
- incorporation of radioactive substances.

“Radiation Protection Areas” for the purpose of these “General Safety Regulations” are:

- **“Kontrollbereiche”** (controlled areas, areas where effective doses exceeding 6 mSv/year are possible),
- **“Sperrbereiche”** (exclusion areas, areas within a “Kontrollbereich”, with a local dose rate exceeding 3 mSv/hour possible),
- **“Überwachungsbereiche”** (supervised areas, operating areas not belonging to a “Kontrollbereich” where effective doses exceeding 1 mSv/year are possible or

areas, in which unsealed radioactive substances are handled above the exemption level defined by the Radiation Protection Ordinance, with an existing risk of contamination).

“Kontrollbereiche” and “Sperrbereiche” are marked at the entrance by a warning sign indicating their associated potential hazards (Annex IV, 6.).

“Kontrollbereiche” are to be kept closed at all times.

4.1.1 Admittance Requirements

Before entering a marked radiation protection area to carry out or maintain operation processes everybody has to ask the competent SSB about the admittance regulations and the applicable rules of conduct in the area(s) in question.

Before working in a radiation protection area for the first time everybody has to ask for specific instructions by the competent SSB or his/her appointed qualified person. He has to attend a radiation protection instruction. If necessary a medical examination has to be done before starting to work. In any case, anyone working in a radiation protection area must seek the approval of the competent SSB.

Pregnant and nursing women and persons younger than 18 years are subject to special protection according to the Radiation Protection Ordinance. Women, as soon as they have informed their employer that they are pregnant or nursing, may only work in radiation protection areas when the working conditions are such that an internal occupational radiation exposure is excluded and when the responsible SSB has agreed.

Persons under the age of 18 are not allowed to handle unsealed radioactive substances without explicit permission of the authorities if a license is necessary to handle the radioactivity.

Special regulations for admittance into “Kontrollbereiche” (controlled areas) also apply to visitors. These regulations can be found in “KISS” and in the “Strahlenschutzordner”.

4.1.2 Specific Measures when Entering and Leaving Radiation Protection Areas where Unsealed Radioactive Substances are Handled

Only materials needed for the work at hand may be taken into radiation protection areas where unsealed radioactive substances are handled. It is forbidden to bring in food, cigarettes, beverages, and cosmetics into these areas.

Books and journals from the Central Library may not be brought into these areas. Books on permanent loan, which are needed in these areas in exceptional cases, must remain there and marked permanently.

Protective clothing prescribed by the SSB must be worn in radiation protection areas where there is a risk of contamination, (Annex V). Upon leaving the area, the protective clothing has to be removed. Hands, shoes, and, if applicable, clothes are to be subjected to a **contamination control**. The contamination monitors are installed at the exits of the radiation protection areas with the risk of contamination. On suspicion of a **personnel contamination** or when a contamination is detected by the monitor, the responsible radiation protection staff must be informed immediately. The per-

son(s) involved must await radiation inspections and measures. When the personnel contamination cannot be removed by simple means (e.g., washing) or under additional suspicion of **incorporated radioactive substances**, the SSB or the “Alarmzentrale” (Emergency Control Center) must be informed immediately. These, in turn, inform the Medical Department. The phone numbers of the competent SSB or the radiation protection staff are posted next to the contamination monitor. Further measures will be taken by the Medical Department. **The affected people are always transported by special vehicles of the Medical Department.**

Items (materials and objects) to be removed from areas in which unsealed radioactive substances are handled are subject to special regulations (see Section 4.6).

4.2 Radiation Protection Monitoring of Persons

The competent SSB applies to HS-TBG to include occupationally exposed personnel of the Forschungszentrum Karlsruhe in radiation protection monitoring (“Personendosisregister”) using the form “Erhebungsbogen Strahlenschutz” (radiation protection application form). Persons from external companies that are occupationally exposed to radiation in the radiation protection areas at Forschungszentrum are dealt with by the central “Strahlenpassstelle” (Radiation Passport Office). Non-occupationally exposed persons (personnel of the Forschungszentrum or persons from external companies), who wish to enter “Kontrollbereiche” (controlled areas) of the Forschungszentrum must also register in the central “Strahlenpassstelle”.

4.2.1 Individual Dose Monitoring

Depending on the risk of exposure, persons registered for dose monitoring according to Section 4.2 are classified into different monitoring categories. The personal dosimeters distributed to these employees (the authority’s and/or operator’s dosimeter) must be worn during time of present employment in the Center’s radiation protection areas. Under special exposure conditions, the instructions given by the local SSB concerning the number, mode of wear, and use of additional dosimeters or other monitoring methods must be observed.

In case the competent SSB orders to have regular incorporation measurements or additional monitoring measures carried out due to a suspected incorporation, these must be tolerated by the persons concerned for their own protection.

Employees of the Forschungszentrum who work outside the Center in “Kontrollbereichen” (controlled areas) as occupationally exposed personnel must be in possession of an officially registered, valid radiation passport and an official personal dosimeter. HS-TBG (phone 3021) arranges registration and controls of radiation passports (“Strahlenpass”). Details can be found in a radiation protection instruction for the implementation of Article 15 of the Radiation Protection Ordinance, which can be requested from HS-TBG.

4.2.2 Radiation Protection Instruction

Persons handling radioactive substances or using ionising radiation under a license have to be instructed about potential hazards and their prevention before taking up

their work. These instructions must be repeated annually. An instruction obligation also applies to the access of visitors to "Kontrollbereiche" (controlled areas).

The competent SSB is responsible for the instruction contents and dates. He/she is also responsible for the documentation of the names of the persons so instructed in written form and that these documents being signed by the persons instructed.

Whoever does not participate in a scheduled instruction in time is prohibited from performing activities in radiation protection areas at the Forschungszentrum by the "Strahlenschutzverantwortlichen" (SSV) until the person receives instruction.

4.2.3 Medical Surveillance and Information Obligations

Persons are only allowed to work in a "Kontrollbereich" (controlled area) or handle unsealed radioactive substances, if a valid medical certificate of health from an authorised Physician exists. The medical examination has to be repeated at fixed intervals. The necessary medical examinations must be tolerated by the persons concerned.

In case the necessary medical certificate is not be submitted in time to start work, the person is prohibited from performing these activities by the SSV.

Persons handling unsealed radioactive substances must inform the SSB or the authorised physician without delay about any **diseases** or **lesions of the skin** and immediately stop working with unsealed radioactive substances (cf. Section 4.4.2).

Female employees who are occupationally exposed to radiation are obliged to report **pregnancies** immediately to the SSB to ensure that the child is protected during pregnancy and nursing. The SSB has to ensure that the women's working conditions exclude any incorporation and the dose limit for the unborn child specified for this case in the Radiation Protection Ordinance, is not exceeded. The dose monitoring measures to be taken in addition in this case are outlined in a separate radiation protection instruction that can be found in "KISS" or can be obtained from HS-TBG.

4.3 Work with Risk of Increased Radiation Exposure

Work with risk of increased radiation exposure is such work in which:

- an effective dose of 2 mSv or more is to be expected, or
- existing or foreseeable contamination requires protective measures exceeding the protective clothing defined in the Clothes and Zone Rules (Annex V), e.g., the use of respiratory protection gear or additional foil-type protective clothes, etc., or
- persons from external institutes/departments, who are not under continuous supervision are working
 - a) in "Kontrollbereiche" (controlled areas), or
 - b) in "Überwachungsbereiche" (supervised areas) in which unsealed radioactive substances above 10 times the exemption level are handled, without these radioactive substances being enclosed by a solid enclosure or barrier, or
 - c) on systems enclosing radioactive substances with activities above 10 times the exemption level (e.g., closed loops and their protection systems, etc.), or

- d) on systems that may affect safety in the areas mentioned under a) through c) (e.g., control rooms, ventilation systems, etc.).

This work is only allowed to be conducted with an “Arbeitserlaubnis-Strahlenschutz” (work permit – radiation protection). Notwithstanding the above regulation, regular work or work comprising frequently repeated activities with a constant or foreseeable risk of exposure may be controlled with a “Sammel-Arbeitserlaubnis-Strahlenschutz” (collective work permit – radiation protection).

The work permit is to be issued by the persons responsible in agreement with the SSB (Radiation Protection Officer), possibly involved external companies, and the local radiation protection staff in compliance with the regulations outlined in “KISS” or the “Strahlenschutzordner” (Radiation Protection File). For research reactors that are currently dismantled, different regulations are possible if they are part of operation regulations.

4.4 Safe Handling of Radiation Sources

4.4.1 General

Radiation sources are all devices or systems emitting, or able to emit ionising radiation. This includes, for example, X-ray facilities, particle accelerators, large-scale gamma sources, and neutron generators. Radiation sources also include sealed or unsealed radioactive substances.

Radiation sources are only allowed to be issued – or loaned out – when it is ensured that the recipient is entitled to have possession to handle those sources.

Sealed radioactive substances or facilities that generate ionising radiation but do not contain radioactive substances (X-ray facilities) are hazardous only due to external radiation exposure. Unsealed radioactive substances and damaged sealed radioactive substances pose hazards due to contamination and incorporation.

Nuclear fuels are classified as a special type of radioactive substances. In addition to measures against internal and external radiation exposure, appropriate control and monitoring steps have to be taken.

4.4.2 Measures against External Radiation Exposure

Persons operating or handling radiation sources must familiarise themselves with its properties and their correct, safe handling and observe valid handling instructions. For example, the following safety precautions have to be taken:

- Sufficient barriers and signs must be posted within hazardous areas, as shown in Annex IV, 6. In case of doubt, the competent SSB or the local radiation protection staff is to be consulted.
- Active materials and their containers must be correctly marked and labelled.
- Time spent in the radiation field is to be kept as short as possible.
- All work is to be carried out in such way that the radiation exposure of persons potentially affected is as minimal as possible.

- For an activity where the body dose is expected to be 2 mSv or more, an “Arbeitserlaubnis-Strahlenschutz” (work permit – radiation protection) must be obtained (see Section 4.3).
- On suspicion of inadmissibly high radiation exposure, the competent SSB and the local radiation protection staff have to be informed immediately.
- The loss of a radiation source is to be reported immediately to the competent SSB and the “Alarmzentrale” (Emergency Control Center, phone: 3333).

4.4.3 Additional Measures when Handling Unsealed Radioactive Substances

Persons dealing with unsealed radioactive substances must familiarise themselves with the chemical and physical properties of the respective substances and must observe the local work and radiation protection rules and instructions. The following safety precautions must be taken in addition to the measures required in Section 4.4.2:

- Work is only allowed after verifying that any necessary equipment is intact and that the workplace is sufficiently equipped for handling the substance envisaged taking into account the type, condition, quantity, and activity of the substance.
- It is forbidden to remove larger quantities from storage vessels and, consequently, higher activities than necessary for the work at hand.
- Records of the activity and history of the radioactive substance during the work process must be kept.
- It is absolutely forbidden to **pipette** liquids **by mouth**: Only suitable systems available for this purpose are to be employed.
- Residual radioactive substances are only to be collected in the specially prepared and distinctly marked containers. If major quantities of residues arise, these must be collected separately in the following categories: State (liquid, solid); type (organic, inorganic); property (fire hazard, burnable, unburnable); activity (high level, radioactive, potentially radioactive).
- Precautions must be taken to prevent any discharge of radioactive substances in rainwater drainage or the household sewage systems.
- Type and volume of contaminations are to be marked.
- Work in contaminated areas, in which respiration protection gear must be worn, may only be carried out if an “Arbeitserlaubnis-Strahlenschutz” (work permit – radiation protection, see Section 4.3) is obtained. In addition a training in the use of the respiration protection gear has to be performed. Finally the physical fitness of personnel involved has to be confirmed by an Occupational Physician in a preventative medical examination (see Section 3.3).

In cases of:

- **contamination,**
- **suspicion of personal contamination or incorporation, and**
- **accidents,**

further spreading of the radioactive substances must be prevented, the local radiation protection unit must be called, and the competent SSB as well as the "Alarmzentrale" (Emergency Control Center, phone 3333) must be informed.

Further measures to be taken at the workplace in order to confine damage are agreed upon by the competent SSB and the local radiation protection unit.

On **suspicion of a personal contamination or incorporation**, the Medical Department establishes further measures to be taken (examinations, measurements, treatment, if necessary). The transport of persons from the workplace to the Medical Department takes place exclusively by the special vehicles provided.

4.4.4 Additional Measures when Handling Nuclear Fuels

For persons handling nuclear fuels, Sections 4.4.2 and 4.4.3 apply. In addition, those persons must observe the following rules:

- They must keep records about the origin, current location, and whereabouts of the nuclear fuels in accordance with existing instructions.
- Wasting of nuclear fuels is to be kept at a minimum. Upper limits for measured waste, as specified by EURATOM in the "Besondere Kontrollbestimmungen" (Special Control Provisions), may not be exceeded under no circumstances.
- Changes in nuclear fuel inventories and current location are to be documented.

In case of doubt, the competent SSB or HS-TBG is to be consulted.

4.5 Storage and Transport of Radioactive Substances

Radioactive substances are to be packed, stored, and transported, according to the relevant regulations, in specific containers with adequate shielding and clear labeling.

Radioactive substances are only allowed to be stored in suitable containers and must be in safe-keeping, in such way that unauthorised seizure and improper use are excluded. In rooms where radioactive substances are handled, flammable materials (e.g., flammable liquids, cardboard boxes) and ignition sources are restricted to the absolute minimum. No other objects which may affect the safety (e.g., explosive materials, unnecessary pressurized gas bottles) may be kept there.

Contaminated objects are to be packaged leak-tight to prevent radioactivity from penetrating to the outside. They are to be marked with the correct label displayed in Annex IV, 7.

Radioactive liquids are to be stored in a way to prevent any leak of the container. Precautions are to be made to ensure any accidental spill of radioactive liquid material. It's absorbed by an absorber material or spreading is reliably prevented by a collecting system.

Transports of radioactive substances within an institute, i.e. transport within buildings and under the same license, are part of authorised handling activities. The safety precautions are laid down by the competent SSB.

Internal transports of radioactive substances are all transports of radioactive substances within the fenced site of the Forschungszentrum, with the exception of transports within buildings described in the previous paragraph.. These transports are cov-

ered by a special license, in connection with the “Transportordnung des Forschungszentrums Karlsruhe für den internen Transport radioaktiver Stoffe” (ITO, transport rules of the Forschungszentrum for internal transports of radioactive substances). The competent SSB are responsible for the application of these regulations.

External transports of radioactive substances, i.e. transportation to and from the Forschungszentrum, are subject to regulations for the transport of radioactive substances under the German traffic laws and the Atomic Energy Act. In the Forschungszentrum, the “Beförderungsleitstelle” (Transport Control Office) of HDB (phone 4453) is responsible.

4.6 Removal of Materials from Radiation Protection Areas of the Forschungszentrum Karlsruhe

In principle, all materials and objects that are to be removed from radiation protection areas, in which radioactive substances are handled, must be subjected to radiation protection control. This is also applied to materials from buildings, in which only parts have been declared as radiation protection areas, where unsealed radioactive substances are handled under a license.

As a rule, the radiation protection controls are performed by the radiation protection staff of HS-ÜM in accordance with the corresponding work instructions. The competent SSB of HS-ÜM is responsible for the result of the measurements; the SSB of the radiation protection area involved is responsible for the substances being registered for radiation protection control.

The following removal activities have to be distinguished:

- transfer of radioactive substances to another area under a separate handling license within the Forschungszentrum,
- delivery of radioactive substances as radioactive residues to HDB,
- removal of objects for repair or reuse,
- clearance of former radioactive substances as non-radioactive substances for unrestricted use or disposal, and
- removal by waste collections from buildings, in which only parts have been declared as radiation protection areas.

For each of these removal activities, specific regulations have to be applied.

4.6.1 Transfer of Radioactive Substances to another Area under a Separate Handling License within the Forschungszentrum

In principle, transfer of radioactive substances from one area to another area with a separate handling license has to take place via the competent SSB, as he/she is responsible for observing the removal conditions, for accounting of material, and for executing internal transports or for arranging correct transportation through the “Beförderungsleitstelle” (Transport Control Office) of HDB (see Section 4.5). Radioactive substances removed from areas, in which unsealed radioactive sources are handled, must be marked by HS-ÜM with the corresponding label according to Annex IV, 7.3 or 7.4.

4.6.2 Delivery of Radioactive Residues to HDB

Radioactive residues may only be delivered to HDB, if they fulfill the HDB criteria for the delivery of radioactive substances and if a properly completed “Begleitschein für radioactive Reststoffe” (consignment note for radioactive residues), signed by the competent SSB, has been submitted. This note may be obtained from HDB. For transportation, see Section 4.5.

4.6.3 Removal of Objects for Repair or Reuse

The removal of objects, e.g., tools, instruments, measurement devices, clothes, books, etc. from radiation protection areas is subjected to instructions given by the “Sicherheitsbeauftragten of the Forschungszentrum” (Safety Commissioner of the Forschungszentrum). These radiation protection instructions may be found in „KISS“. They are also part of the competent SSB’s “Strahlenschutzordner” (Radiation Protection File).

Accordingly, objects may only be removed from radiation protection areas after a contamination control measurement by staff of HS-ÜM has been performed. Objects controlled have to be marked by HS-ÜM with the label according to Annex IV, 7.1, and may then be handled freely. These labels have to be removed when taking these objects out of the Forschungszentrum.

If contamination is found on any object during measurement, the object must remain in the respective radiation protection area or may only be removed according to Section 4.6.1 or 4.6.2.

4.6.4 Clearance of Former Radioactive Substances as Non-radioactive Substances for Unrestricted Use or Disposal

In case objects or materials are to be removed as non-radioactive substances for unrestricted use or disposal, an official clearance procedure must be initiated with the competent authority by the local SSB via HS-TBG. Execution of this procedure is subject to a radiation protection instruction according to Article 29 of the Radiation Protection Ordinance, which is also part of the “Strahlenschutzordner” (Radiation Protection File) and contained in „KISS“.

Observance of clearance conditions specified in the authorities’ decision must be confirmed by the competent SSB of HS-ÜM. After this, the materials may be handled freely.

4.6.5 Removal by Waste Collections from Buildings, in which only Parts have been declared as Radiation Protection Areas

Materials collected regularly on the site of the Forschungszentrum include, e.g., wastes similar to domestic waste, styrofoam parts, styrofoam chips, paper, cardboard, glass, and office waste (toner cartridges, ink cartridges, data carriers, etc.). Removal of such materials also is subject to a radiation protection instructions, which is contained in the amended version in “KISS“. Note the following excerpts:

Materials removed by regular collections from buildings, in which unsealed radioactive substances are handled under a permit according to the list of

“Strahlenschutzstatus FZK” (radiation protection status FZK) (see „KISS“), have to be collected separately, depending on their origin from rooms with or without handling of radioactive substances. These materials must be kept ready for disposal in marked collection containers.

Materials to be removed from rooms, in which radioactive substances are handled, must be delivered to HDB as radioactive residues (see Section 4.6.2).

Materials collected regularly from rooms, in which no unsealed radioactive substances are handled, must be subjected to a radiation protection control by HS-ÜM. If radioactivity from permitted handling is detected, these materials also have to be delivered to HDB as radioactive residues. If no radioactivity from permitted handling is detected, the collection containers have to be sealed by HS-ÜM. During collection, only such sealed containers may be discharged or collected.

In addition, the collection containers must be marked with a label according to Annex IV, 7.2. In cases of doubt, consult the competent SSB.

5. Regulations for Biological Laboratories with a Safety Classification

5.1 Areas, in which Genetically Modified Organisms and Infectious Pathogens are Handled (Biological Protection Areas)

Genetic engineering activities and work with infectious pathogens are classified into various safety categories depending on their hazard potential (S1 to S4; GenTG, S2 to S4; IfSG). Classification is based on the risks for human health and the environment posed by the (micro)organisms and their properties (pathogenesis, infectiousness, transmission paths, etc.). According to the state of science, no risks for the human organism and the environment can result from related working processes and from the organisms used (risk group I) in facilities of safety category S1. Safety category S2 laboratories pose an inherent small risk for man and the environment. Accordingly, categories S3 and S4 are associated with a moderate and high risk, respectively. The safety requirements to be met in terms of equipment, personnel (qualification), and protection systems in the laboratories increase from level S1 to S4. For example, admittance is restricted to S2 laboratories, installation of a personnel lock is required for S3, and a lock combined with a vacuum system must be installed from S4. The “Beauftragte für die Biologische Sicherheit” (Biological Safety Officers) are responsible for the safety of genetic engineering activities in “Gentechnische Anlagen” (Genotechnical Plants).

5.2 Admittance

Admittance to genetic engineering laboratories is restricted from safety category S2 (GenTG). In addition, admittance to facilities, where work with infectious pathogens (IfSG) is performed, is subject to access restrictions. Admittance restrictions must also be applied to persons in charge of maintenance work and laboratory cleaning.

5.3 Work in Biological Protection Areas

Work with genetically modified organisms (e.g., bacteria, cell cultures) may only be performed in specially marked laboratories according to the valid operation instructions and hygiene plans. These are explained in a personnel safety instruction given prior to the start of any work (wearing of protective clothing, disinfection measures, etc.; Section 5.4).

When handling genetically modified organisms, working with biological examination materials and potentially infectious pathogens, as well as when safely disposing of contaminated waste, pertinent regulations (operations instructions, hygiene plans, disposal plans) of the organisational units have to be observed.

In laboratories classified into safety category S2 or higher, maintenance and installation work is subjected to additional requirements. For example, laboratories and test objects (e.g., microbiological workbenches) must be decontaminated, if necessary, prior to the start of maintenance work.

Disposal of contaminated waste is described in the hygiene plans of the organisational unit.

5.4 Instructions

Before taking up work in laboratories with a safety classification, new employees must receive a general safety instruction of the regulations of the facility and the work requirements. For employees of genetic engineering and infection laboratories, safety instructions have to be repeated at intervals of twelve months and whenever the type of genetic engineering activity or room conditions are changed. Safety instructions must be documented (instruction content, signature of the staff, name of the instructor). The documentation of the instructions must be sent to HS-TBG. Responsible staff of external companies (e.g., cleaning companies) has to be familiarised with the relevant safety requirements prior to the start of work. The contracted company is obliged to instruct its working personnel.

5.5 Medical Surveillance and Information Obligation

Persons working in genetic engineering laboratories or in laboratories for work with pathogens according to “§§ 44 ff. Infektionsschutzgesetz (IfSG)” (Articles 44ff. of the Infection Protection Act), which have been assigned to safety category S2 or higher, have to be examined by the Center’s Physician before taking up their activity. These medical examinations are then to be repeated at regular yearly intervals. In case the necessary medical certificate is not be submitted in time, the person is prohibited from this activity (for registration for medical examination and the control of examination dates, see Section 3.3).

Medical examinations of persons working in S2 to S4 laboratories (genetic engineering, infection protection) must be carried out annually and within six weeks prior to the expiry of the examination deadline, as well as prior to the termination of employment.

Female employees who work in S2 laboratories (genetic engineering, infection protection) are obliged to report pregnancies. In addition, persons working in areas classified S2 or higher are obliged to inform their superiors about changes in their state of health (e.g., impairment of the immune system). In these cases, contact the competent head of project, head of your organisational unit, or the “Betriebsärztin / Betriebsarzt” (Center’s Physician).

6. Treatment of Non Radioactive Waste for Utilisation or Disposal

6.1 Delivery of Wastes

Wastes from “Kontroll-/Überwachungsbereichen” (controlled/supervised areas) are subjected to specific regulations (cf. Section 4.6).

The Waste Management Center of the Forschungszentrum (phone 2222) is responsible for the entire internal and external disposal measures. This includes, for example,

- advice and information for the grading and collection of waste and for the internal waste management,
- packaging for internal registration of waste products,
- collection of waste products from the organisational units
- receiving refuse for the intermediate waste storage facility (building 604),
- planning and execution of all internal and external waste management procedures, and
- overall administration of waste management.

All accumulated waste must be handed over with an **“interner Abgabeschein”** (internal delivery form) to the Waste Management Center or registered for collection. This does not apply to recyclable or valuable materials (paper, cardboard boxes, spent glass, styrofoam, packaging material), as well as to industrial waste (residues) that have to be kept ready for collection at collection points for regular wastes (waste depots). Waste produced by external companies, e.g., construction materials, components, or operation media, remain the **property of the external companies** and must be disposed of by that external company or its own appointed contractor (see also Construction Site Regulations).

In every organisational unit, a **contact person to the Waste Management Advisor** must be appointed. This person manages the internal delivery forms and is responsible for the coordination of waste management of the related organisational unit. The **“Betriebsbeauftragte für Abfall” (Waste Management Advisor)** may be contacted by all employees of the Forschungszentrum and external companies if necessary (phone 4848).

Specific wastes for utilisation or disposal will be collected regularly. These are industrial waste (residues) and recyclable materials such as paper/cardboard, glass, styrofoam, and valuable materials (metals, plastics, composite materials, packaging). Collection takes place at the central waste depot of the organisational unit according to a defined schedule (semi-annual disposal calendar) organised by the “Abfallwirtschaftszentrale” (Waste Management Center). The organisational units are obliged to sort waste as necessary and to transfer the sorted cardboards, old glasses, styrofoam, and valuable materials (“Grüner Punkt” materials) to the waste depot. Waste paper and refuse bins in the rooms are emptied by the cleaning staff. Waste paper with data protection-relevant contents can be collected upon request (phone 2222). All other wastes have to either be delivered to the waste store (building 604) for disposal complete with the **“Interner Abgabeschein** (internal delivery form) or the units must notify the “Abfallwirtschaftszentrale” (Waste Management Center) for its collection (phone 2222).

Wastes with hazardous properties, i.e., toxic, caustic, infectious, highly flammable, explosive materials, materials hazardous to health, and materials hazardous to the environment are excluded from the refuse and recyclable waste collection. They must be delivered to the Waste Management Center with an internal delivery form.

6.2 Collection of Non-radioactive Waste

Non-radioactive waste may only be collected in suitable and clearly labelled containers provided for internal refuse collection. These containers must be put up in such a way that unauthorised access, misuse, and hazards to man and the environment are excluded.

Information about the registration and collection of waste can be obtained from the Waste Management Advisor (phone 4848), the Water Protection Advisor (phone 4511), or the Waste Management Center (phone 2222). It also supplies the necessary collection containers.

6.3 Documents Accompanying Waste Transports

For the removal of waste that does not need to be controlled for utilisation, a special delivery receipt issued by the Waste Management Center is required. For this, an internal delivery form must be submitted to the Waste Management Center by the respective organisational unit. All other wastes must be removed with the legally required documents "Begleitschein" (data sheet) or "Übernahmeschein" (acceptance note). All waste-relevant documents having an external effect have to be issued and signed by the Waste Management Center exclusively.

7. Water Protection Regulations

The existing laws and internal regulations concerning water protection must be strictly adhered during utilisation of the Forschungszentrum's sewage systems and the handling of substances hazardous to water.

In case of doubt, please contact:

- the "Kontaktperson zum Gewässerschutzbeauftragten" (Water Management Commissioner/s) of your organisational unit,
- your "Betriebsbeauftragter", or
- the Water Protection Advisor (HS-TBG, phone 4511).

7.1 Sewage

Sewage collection, treatment, and safe discharge into a surface water body are managed by BTI-V in separate systems:

- rainwater drainage system,
- domestic sewage (offices and amenities),
- chemical effluents (workshops, laboratories, technical facilities).

Note that:

- domestic sewage or chemical effluents may never be introduced into the **rain-water drainage system**, as the rainwater is discharged into a surface water body (Hirschkanal) without further treatment.
- Cooling water which is not altered chemically may be discharged into the rain-water drainage system, if BTI-V (phone 4362) has been previously informed.
- The following types of chemical effluents are distinguished:
 - **chemical effluents I** (non-radioactively contaminated effluents),
 - **chemical effluents II** (potentially radioactively contaminated effluents),
 - **chemical effluents III** (radioactively contaminated effluents).

These differences are to be observed on all accounts when discharging effluents and sewage. It is strictly prohibited to dispose chemicals (chemical residues) or waste via the sewage systems (for proper disposal, see Section 6).

7.2 Handling Substances Hazardous to Water

In case substances **hazardous to water** enter the ground, groundwater or any of the sewage systems, call the "Alarmzentrale" (Emergency Control Center), phone 3333).

8. Regulations in the Event of an Alarm

The alarm plan of the Forschungszentrum encompasses all measures to be taken to render assistance and maintain/restore safety in cases of imminent danger to persons, environment or objects, or in cases of safety-relevant events (hereinafter referred to as alarms).

8.1 Precautional Obligation to Inform

Beside the regulations summarised in this section, all employees must familiarise themselves with the emergency measures pertinent to their specific areas of work. By this way, prompt repairs of breakdowns and defects are guaranteed without impairing safety.

The heads of the organisational units must therefore ensure that necessary instructions are given and all employees are sufficiently informed. The information is contained in instructions, operating manuals, plans derived from the alarm plan, and fire-fighting plans (for each building).

8.2 Notification in Case of an Alarm

Every employee is obliged to inform the “Alarmzentrale” (Emergency Control Center) by phone 3333 as soon as it is recognised that the safety of persons, the environment or objects is endangered.

The “Alarmzentrale” (Emergency Control Center) can be reached by the emergency call 3333.

In the case of notifying an emergency to the Emergency Control Center, the following information must be given:

Location	institute/department (or name of external company), building number, building section, room number in which the event has occurred,
Type	of event (short, clear details about the emergency, e.g., fire, explosion, etc.),
Name	of the person calling, and
Phone number	under which the caller can be reached after the report.

The caller has to wait for the Emergency Control Center to **repeat his report**. Then, the caller's superior is to be informed. If the caller is not in his organisational unit, then the management of the organisational unit affected by the alarm is to be informed. **Injured and ill persons will be transported by the Medical Department.** Arriving emergency forces are to be informed about the details. If necessary, an information chain has to be maintained until all emergency forces have arrived.

Some areas are equipped with automatic alarm systems. Whoever sees or hears an alarm signal must inform the Emergency Control Center (phone 3333) and the persons responsible for the affected area.

8.3 Information about the Alarm

Forschungszentrum buildings and facilities are equipped with loudspeaker systems. The Emergency Control Center can use these for messages to all areas.

General messages are introduced by a gong sound.

Alarm reports are preceded by an intermittent sound of a horn.

The loudspeaker system is checked regularly by test transmissions. Any defects detected should be reported to the Emergency Control Center.

8.4 Emergency Measures

In the event of an alarm, the personnel of the facility affected has to take all necessary measures specified in the operations instructions, in order to repair the damage or to reduce the consequences until the emergency forces arrive.

8.5 Task Force Management

The instructions of the “Einsatzleiter” (Task Force Leader) are to be carried out by all persons. This also applies when duties are assigned, which normally are not part of a person’s activities.

In the event of an alarm, the Task Force Leader, in close cooperation with the head of the affected organisational unit, defines the measures to be taken and arranges for their execution. Measures which cannot be delayed can be initiated without previous discussion.

If an alarm is restricted to the premises of an external institution (e.g. ITU, FIZ, WAK), the **responsible operations manager** of this institution acts as the Task Force Leader.

8.6 Evacuation of the Forschungszentrum

8.6.1 Evacuation Causes

External:

Evacuation of the Forschungszentrum may be necessary on the basis of information from:

- the “Regierungspräsidium Karlsruhe“,
- the “Landespolizeidirektion“ (police headquarter) Karlsruhe,
- the “Landratsamt Karlsruhe“,
- the “Bürgermeisteramt“ (mayor’s office) Eggenstein-Leopoldshafen.

Internal:

Evacuation of the premises, parts of the premises, buildings or facilities of the Forschungszentrum may be necessary in the event of an alarm, if required by an emergency situation. In this case, the “Einsatzleiter” (Task Force Leader) gives the necessary instructions.

8.6.2 Evacuation

An evacuation is ordered by the Task Force Leader via the loudspeaker system. All persons staying in the affected areas must obey the evacuation order.

The order for evacuation can be issued in two steps:

- "Räumungsbereitschaft" (evacuation alert),
- "Soforträumung" (immediate evacuation).

In case of an **"Räumungsbereitschaft" (evacuation alert)**, all activities must be stopped immediately and a safe state of facilities must be ensured. All those affected must wait for further instruction and be prepared for an evacuation.

If **"Soforträumung" (immediate evacuation)** is ordered, all activities must be stopped at once and a safe state of facilities must be ensured. All persons must immediately leave the building and behave as described in the following sections 8.6.3, 8.6.4, and 8.6.5.

In accordance with internal regulations of the organisational units, the necessary shutdown and emergency measures must be taken by those employees commissioned to perform these duties.

During evacuation excessive haste and hurry must be avoided. Being careful for accidents or injuries can be avoided.

8.6.3 "Gesamträumung" (Complete Evacuation)

If immediate evacuation of the complete Forschungszentrum is ordered, all persons, with the exception of the safety services, are to leave for home. For safety and efficiency reasons, the Forschungszentrum site is subdivided into two evacuation areas, north and south, in the case of a complete evacuation (Annex VI). Persons in the northern evacuation area when the evacuation is ordered use the Northern Gate to exit the site and persons in the southern evacuation area use the Southern Gate.

Primarily private cars are to be used for the evacuation. Car owners are obliged to give lifts to persons without cars. Persons who are unable to find a lift are to gather near the Southern Gate, in front of the canteen (building No. 211) or next to the Northern Gate (building No. 1600).

The duration of an evacuation – unless otherwise provided – is in principle limited to the one working day. The duration of an evacuation of the Forschungszentrum in the event of a disaster is variable, you can keep informed through the general communication channels (newspapers, radio).

8.6.4 Evacuation of Parts of the Forschungszentrum

If immediate evacuation of a part of the Forschungszentrum is ordered, all persons, with the exception of the safety services, are to proceed to the **assembly point "Canteen"**. There, further instructions are to be waited for.

Depending on the danger situation, the "Einsatzleiter" (Task Force Leader) may give other instructions. Listen to the loudspeaker message.

8.6.5 Evacuation of Buildings and Facilities

If immediate evacuation of buildings and facilities is ordered, all persons, with the exception of the safety services, are to proceed to the designated assembly point of this building/facility.

Depending on the danger of the situation, the “Einsatzleiter” (Task Force Leader) may give other instructions. Listen to the loudspeaker message.

8.6.6 Specific Regulations

For the safety services and the technical emergency services of the single organisational units, specific regulations have to be applied. They are described in detail in the alarm plan or in the “Gebäudeanschlussplan” (follow up plans) derived from the alarm plan for those specified buildings.

9. Annexes

Annex I: Safety Organisation of the Forschungszentrum Karlsruhe



“Hauptabteilung Sicherheit” (Central Safety Department)
Work Safety
Environmental Protection
Radiation Protection
Security Staff, Fire Department

Medical Department
Ambulance
Personnel Decontamination
Toxicological Laboratory

“Bereich Technische Infrastruktur” (Technical Infrastructure Department)
Maintenance Services (Electrics, Heating, Ventilation, Plumbing)
Supply and Disposal (Electricity, Water, Sewage, Heat)

“Hauptabteilung Dekontaminationsbetriebe” (Central Decontamination Department)

Annex II: Special Safety Regulations¹

Event	Persons Responsible	Rules
Alarms	"Einsatzleiter" (Task Force Leader), head of the respective organisational unit, employees holding functions in the safety organisation	"Alarmplan" (Alarm plan) and "Anschlusspläne" (follow-up plans)
Work safety	Head of the respective organisational unit, "Betriebsbeauftragte", "Fachkräfte für Arbeitssicherheit" (Work Safety Experts), "Sicherheitsbeauftragte für den Arbeitsschutz nach Sozialgesetzbuch VII" (Safety Commissioners for Work Safety according to the Code of Social Law VII)	"Arbeitsschutz-Merkblätter, Band 1 und 2" (work safety leaflets, volumes 1 and 2), "Unfallverhütungsvorschriften" (accident prevention regulations), "Merkblätter 'Gefährliche Arbeitsstoffe'" (data sheets on "dangerous substances")
Waste management	"Abfallwirtschaftszentrale" Waste Management Center, "Kontaktpersonen zum Abfallbeauftragten" contact persons of the Waste Management Advisor	Regulations for the recycling and disposal of waste at Forschungszentrum Karlsruhe ("Abfallordnung")
Delivery of radioactive residues	HDB, the respective SSB (Radiation Protection Officer)	"Bedingungen für die Annahme radioaktiver Stoffe" (Criteria for the delivery of radioactive substances) of the Central Decontamination Department (HDB)
Special events (radio-logical)	SSB, "Einsatzleiter" (Task Force Leader)	"Melde- und Informationsregelung" (Reporting and information regulations)
Special events in the fields of - work safety - environmental protection	"Einsatzleiter" (Task Force Leader), "Leiter der Anlage" (Plant Manager)	"Melderegelung" (Reporting regulations)
External transport of hazardous radioactive substances	"Beförderungsleitstelle der HDB" (Transport Control Office of HDB), "Gefahrgutbeauftragter" (Hazardous Goods Advisor)	GGVSE/ADR/RID, ICAO-TI/IATA-DGR, "Strahlenschutzordner" (Radiation Protection File), "Betriebsanweisung HDB" (HDB operations instructions)
External transport of non-radioactive hazardous goods	"EKM-MW/Versand" (EKM-MW/dispatch), "Abfallwirtschaftszentrale" (Waste Management Center), "Gefahrgutbeauftragter" (Hazardous Goods Advisor)	GGVSE/ADR/RID, GGVSee/IMDG Code, ICAO-TI/IATA-DGR

¹ Many of these regulations can also be found on the intranet under <http://www.kiss.fzk.de>

Event	Persons Responsible	Rules
Water protection	“Verantwortliche Betriebsleiter für Abwasser” (Head of Wastewater Treatment Plant), “Gewässerschutzbeauftragter” (Water Protection Advisor), head of the respective organisational unit, ”Betriebsbeauftragte”	“Abwasserordner” (Sewage File)
Internal transport of radioactive substances	Dispatchers and recipients of radioactive substances, “SSB” (Radiation Protection Officer), “Transportverantwortliche” (personnel responsible for transporting radioactive substances), “Transporteure” (carriers)	“Genehmigung nach § 9 Atomgesetz” (License under Art. 9 of the Atomic Energy Act) and “Transportordnung des Forschungszentrums Karlsruhe für den internen Transport radioaktiver Stoffe” (transport regulations of the Forschungszentrum Karlsruhe for the internal transporting of radioactive substances)
Nuclear materials safeguards	Head of the respective organisational unit, “SSB” (Radiation Protection Officer), “Kontaktpersonen zur Erfüllung der Meldepflichten für Kernmaterial und sonstige radioaktive Stoffe” (contact persons for compliance with the reporting obligations for nuclear material and other radioactive substances), persons handling nuclear material	“Strahlenschutzordner”, (Radiation Protection File)
Radiation protection	“SSB” (Radiation Protection Officer) under the Radiation Protection Ordinance and the X-ray Ordinance	“Strahlenschutzordner”, (Radiation Protection File)
Activities of staff of Forschungszentrum Karlsruhe in external facilities or installation according to Art. 15 Rad. Prot. Ord.	Central “SSB” (Radiation Protection Officer) for Art. 15 Rad. Prot. Ord. with HS-TBG	“Strahlenschutzordner”, (Radiation Protection File)

Annex III: Tasks of the HS Divisions (Divisions of the Central Safety Department) and of the “Stabsstelle Fachkräfte für Arbeitssicherheit” (Work Safety Experts Unit)

Radiation protection	Observance of the Radiation Protection and X-ray Ordinances, advice, operations and time monitoring, documentation of all person-related radiation protection data and reporting, appointment of Radiation Protection Officer (SSB), issuing of “Strahlenpässe” (radiation passports). Compliance with the obligations concerning activities of staff of the Forschungszentrum Karlsruhe in external institutions and installations, for which permits are required
Work safety	Plant and workplace monitoring, safety information, consultancy and training, accident analyses
Monitoring of radioactive substances	Accounting and reporting of nuclear materials, accompanying inspectors from IAEA and Euratom, accounting and reporting of other radioactive substances Accounting and reporting for the clearance of radioactive substances Internal transportation: Documentation, list of containers
Security	Safety organisation and safety regulations, task force documents and reports, training, alarm drills of the safety services, task force management during incidents and accidents, fire fighting, access controls and monitoring of the operating premises
Waste management	Regulations for internal waste management, monitoring of recycling/disposal of wastes, working towards avoiding and recycling of waste, information and documentation
Hazardous goods	Monitoring and control of authorised personnel and transportation procedures, notification of defaults and working towards their avoidance, information, instruction, and guidance for employees concerning the transporting of hazardous goods, documentation
Water protection	Regulations concerning the removal of sewage and the handling of substances hazardous to water, control and monitoring, information and documentation
Emission protection	Regulations concerning the reduction of emissions of combustion and district-heating plants, control and monitoring of emissions, radiological exhaust air and environmental monitoring, information and documentation
Licensing	Coordination and execution of all licensing procedures with the exception of decommissioning licenses according to Art. 7 AtG and licenses according to LBO
“Stabsstelle Fachkräfte für Arbeitssicherheit” (Work Safety Experts Unit)	
Work safety	Duties of the Work Safety Experts according to “§ 6 Arbeitssicherheitsgesetz” (Art. 6 Work Safety Act)

Annex IV: Signs in the Workplace

1. Prohibition Signs



P00 Prohibition



P01 No smoking



P02 No fire, naked flames or smoking



P03 No pedestrian access



P04 No fire-fighting with water



P05 Not suitable for drinking water



P06 Unauthorised access forbidden



P07 No floor conveyors



P08 Forbidden to touch



P09 Do not touch, housing under voltage



P10 Do not switch



P11 Forbidden for people with heart pace-makers

Annex IV: Signs in the Workplace

1. Prohibition Signs



P12 Do not leave or store objects



P13 No man-riding
(passengers on cableway prohibited)



P14 No animals allowed



P15 Do not step on this area



P16 Forbidden for people with metal implants



P17 Do not spray with water



P18 No mobile radio communication



P19 No eating or drinking

Annex IV: Signs in the Workplace

2. Warning Signs



W00 Warning of a danger area



W01 Warning of flammable substances



W02 Warning of explosive substances



W03 Warning of toxic substances



W04 Warning of caustic substances



W05 Warning of radioactive substances or ionising radiation



W06 Warning of suspended loads



W07 Warning of floor conveyors



W08 Warning of dangerous electric voltage



W09 Warning of optical radiation



W10 Warning of laser radiation



W11 Warning of fire-promoting substances

Annex IV: Signs in the Workplace

2. Warning Signs



W12 Warning of electromagnetic radiation



W13 Warning of magnetic fields



W14 Warning: Risk of tripping



W15 Warning: Risk of falling



W16 Warning: Biological hazard



W17 Warning of cold temperatures



W18 Warning of harmful substances



W19 Warning of gas containers



W20 Warning of danger caused by batteries



W21 Warning of explosive atmosphere



W23 Warning of being squashed in



W24 Warning of tilting danger during rolling

Annex IV: Signs in the Workplace

2. Warning Signs



W25 Warning of automatic start of operations



W26 Warning of hot surfaces



W27 Warning: Risk of hand injuries



W28 Warning of slip hazard



W29 Warning of a conveyor system in the rails



W30 Warning: Risk of objects being drawn-in

Annex IV: Signs in the Workplace

3. Mandatory Signs



M00 General mandatory sign*



M01 Wear protective eye goggles



M02 Wear protective headgear



M03 Wear ear protection



M04 Wear breathing apparatus



M05 Wear protective footwear



M06 Wear protective gloves



M07 Wear protective clothing



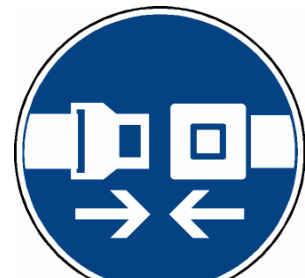
M08 Use protective face screen



M09 Use belt against falling



M10 Pedestrian access



M11 Wear safety belt

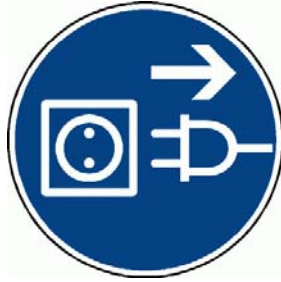
* Only together with additional sign!

Annex IV: Signs in the Workplace

3. Mandatory Signs



M12 Use crossing provided



M13 Pull mains plug before opening



M14 Clear before work



M15 Wear life jacket

Annex IV: Signs in the Workplace

4. Escape Signs



E01 Direction of first-aid facilities, escape routes, emergency exits*



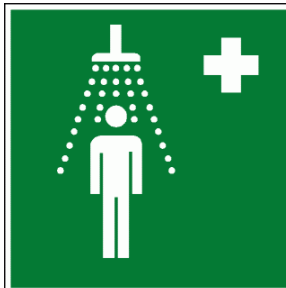
E02 Direction of first-aid facilities, escape routes, emergency exits*



E03 First-aid station



E04 Stretcher bearer



E05 Emergency shower



E06 Eye washing facilities



E07 Emergency telephone



E08 Physician

* Direction arrows may only be used in connection with other escape signs

Annex IV: Signs in the Workplace

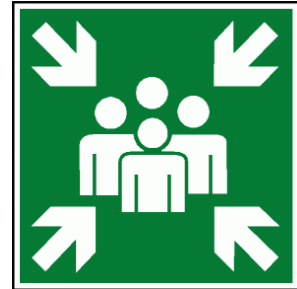
4. Escape Signs



E09 Escape route /
emergency exit**



E10 Escape route / emergency exit**



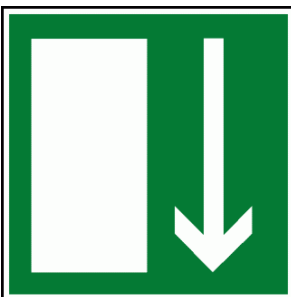
E11 Assembly point



E12 Escape route***



E13 Escape route***



E14 Emergency exit



E15 Emergency exit



E16 Emergency exit

** Only displayed along with a direction arrow

*** On the escape route sign, the arrow may also point to the upper or lower corner of the door opening so as to mark the further course of the escape route, e.g., stairs

Annex IV: Signs in the Workplace

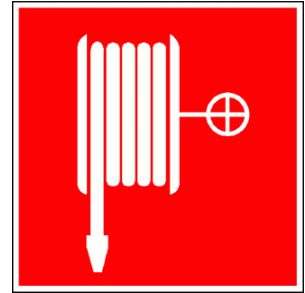
5. Fire Protection Signs



F01 Direction*



F02 Direction*



F03 Extinguishing hose



F04 Ladder



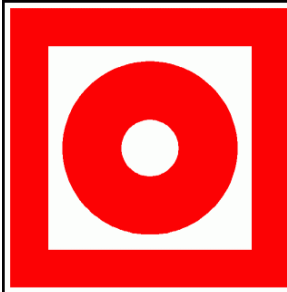
F05 Fire extinguisher



F06 Telephone for reporting fires



F07 Equipment for fighting against fires



F08 Fire alarm (manual)

5a. Classification of Radiation Protection Areas for the Fire Department



Classification of radiation protection areas in danger groups I to III (I being the lowest risk, III being the highest)

* Only displayed along with an additional fire protection sign

Annex IV: Signs in the Workplace

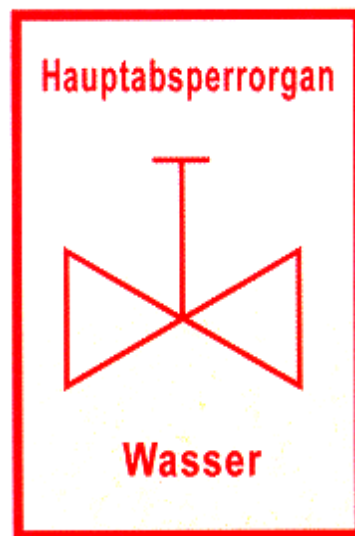
5b. Master Switches, Switch-off and Emergency Stop Systems



Switching station of electricity supply for building sections



Master switch of electric equipment (e.g. ventilation system*)



Emergency stop system (e.g. water*)

* The designation of the system is to be indicated on the sign when using it.

Annex IV: Signs in the Workplace

6. Radiation Protection Signs



6.1

Warning notice* indicating
"Sperrbereich" (exclusion area)



6.2

Warning notice* indicating
"Kontrollbereich" (controlled
area)



6.3

Warning notice* indicating
general ionising radiation



6.4

Warning notice indicating an
area of increased radiation



6.5

Warning notice indicating a
contaminated area



6.6

Warning notice indicating a
"Kontrollbereich für
Röntgenstrahlung" (controlled X-
ray area)

* The information of the type of danger below these radiation warning signs is defined by the competent Radiation Protection Officer in the light of existing conditions

Annex IV: Signs in the Workplace

7. Radiation Protection Labels

7.1 Clear for Reuse

Frei zur Wiederverwendung nach § 44 StrlSchV			
Forschungszentrum Karlsruhe GmbH Hauptabteilung Sicherheit/ Überwachung und Messtechnik	Bereich:	Datum:	
	Unterschrift:	Uhrzeit:	

This label is used to mark objects which are to be removed for repair or reuse from radiation protection areas, in which unsealed radioactive substances are handled (Section 4.6.3). Only devices marked in this way may leave these radiation protection areas.

7.2 Label for Wastes

Abfall kann abgeholt werden			
Forschungszentrum Karlsruhe GmbH Hauptabteilung Sicherheit/ Überwachung und Messtechnik	Bereich:	Datum:	
	Unterschrift:	Uhrzeit:	


This label is used to mark wastes to be collected regularly from buildings, of which only parts are radiation protection areas where unsealed radioactive substances are handled (Section 4.6.5). Only waste marked in this way may be collected.

7.3 Radioactive

	Radioaktiv		
	Oberfl. kont.: $A_{\alpha} \cdot 10 + A_{\beta} \leq 0,9 \text{ Bq/cm}^2$ abwischbare*, gesamte* Aktivität * nicht Zutreffendes streichen! Oberflächendosisleistung: $\mu\text{Sv/h}$		
Forschungszentrum Karlsruhe GmbH Hauptabteilung Sicherheit/ Überwachung und Messtechnik	Bereich:	Datum:	
	Unterschrift:	Uhrzeit:	

This label is used to characterise radioactive objects or packaging without external contamination. The packaging may only be removed in a radiation protection area.

7.4 Radioactive Contamination

	Radioaktiv Kontamination		
	Oberfl. kont.: A_{α} : Bq/cm^2 , A_{β} : Bq/cm^2 Dosisleistung in 10 cm Abstand: $\mu\text{Sv/h}$		
Forschungszentrum Karlsruhe GmbH Hauptabteilung Sicherheit/ Überwachung und Messtechnik	Bereich:	Datum:	
	Unterschrift:	Uhrzeit:	

This label is used to characterise radioactively contaminated objects. The object may only be handled unpackaged in a "Kontrollbereich Kontamination" (controlled area contamination).

Annex V: Clothes and Zone Rules when Handling Unsealed Radioactive Substances

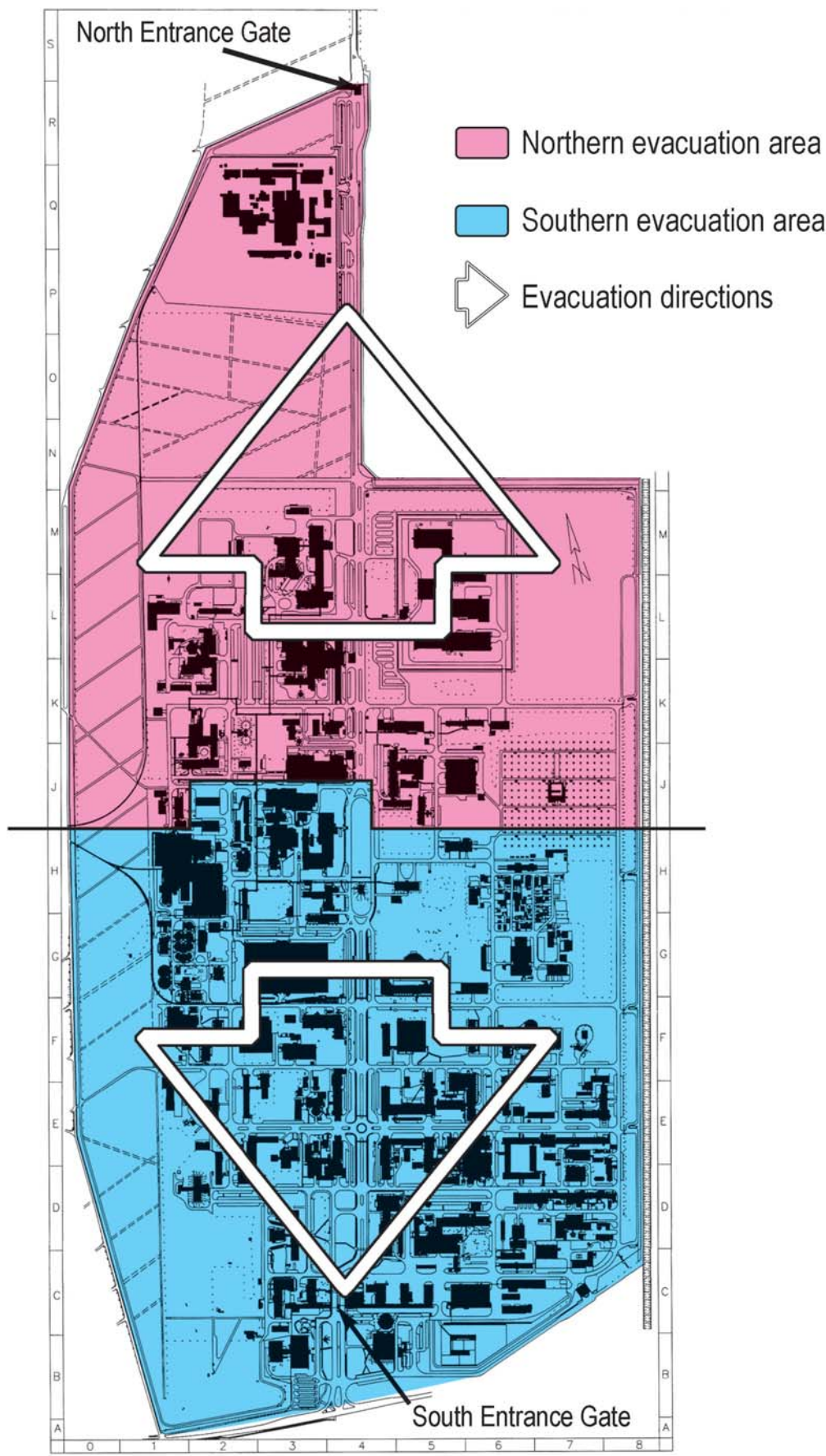
Zone	Activity* of un-sealed radioactive substances	Minimum Posting according to Art. 68 Rad. Prot. Ord.	Protective clothes (permanent staff)
Zone I Operating premises - grey/blue -	\leq Exemption level**	None	Working clothes without yellow or green marking or own clothes
Zone II "Überwachungsbereich" (Supervised area) with risk of contamination and "Kontrollbereich" (controlled area) with low risk of contamination - green/yellow -	$>$ Exemption level $\leq 10^2$ times the exemption level	Radioactive Caution - radiation Contamination	Laboratory coat with yellow or green marking Working shoes or private shoes with overshoes
Zone III "Kontrollbereich" (Controlled area) - yellow -	$> 10^2$ times the exemption level \leq Scope as listed in license	Radioactive Caution – radiation Contamination	Yellow contamination protection clothing, laboratory coat only in connection with working clothes (grey/blue) Yellow working shoes
Zone IV Contamination area in a "Kontrollbereich" (controlled area) - red -	\leq Scope as listed in license	Radioactive Caution – radiation Contamination	Yellow combination protection clothing Yellow working shoes and overshoes or special protective clothing

Note: The classification of zones can be modified in agreement with HS-ÜM to include higher protection measures and on the basis of operations experience.

* Activity: Activity in functionally connected rooms, determined using the sum formula.

** Exemption level according to Annex III, Tab. 1, column 2, Rad. Prot. Ord., determined using the sum formula.

Annex VI: Evacuation Areas



Annex VII: Persons and Bodies with Safety Functions

“Arbeitsschutzausschuss“ (Work Safety Committee)	An advisory body to the employer, in which all groups involved in work safety are represented (employer’s representatives, Works Physicians, Work Safety Experts, Safety Commissioners according to the Code of Social Law VII, members of the works council). Any staff member may draw the committee’s attention to issues to be treated through the secretary of the Work Safety Committee.
“Beauftragter für die Biologische Sicherheit” (Biological Safety Officer); „Gentechnikgesetz“ (Genetic Engineering Act) – GenTG,	The Biological Safety Officer (Beauftragter für die Biologische Sicherheit) are responsible for the safety of genetic engineering activities. According to the Genetic Engineering Act, their responsibilities include the specification of safety measures (equipment, materials), the advising of the heads of projects (GenTG), as well as the monitoring and control of the genetic engineering facilities/work.
“Betriebsärzte” (Works Physicians) and “Fachkräfte für Arbeitssicherheit” (Work Safety Experts)	Works Physicians and Work Safety Experts are required to support the employer in matters of work safety and accident prevention whenever questions of work safety arise (Articles 3 and 6, Work Safety Act).
“Betriebsbeauftragter”	Support the heads of the organisational units in all matters related to running a technical-scientific organisational unit. They are responsible for ensuring that all technical infrastructure systems are in functioning order, operated economically, and that safety regulations (work safety, environmental protection) are implemented and observed in the organisational unit. They are the consulting partners for the central infrastructure institutions and work together closely with the other “advisors and officers”.
“Betriebsbeauftragter für Abfall” (Waste Management Advisor)	He/she is responsible for monitoring waste streams from their origins to their utilisation or disposal, and for ensuring that all laws pertaining to waste management are observed. He informs employees of possibilities of avoiding and reusing waste and of dangerous environmental impacts, which could arise from waste. He works on improving waste disposal techniques and documents the whereabouts of waste.
“Einsatzleiter” (Task Force Leader)	The Task Force Leader assumes the tasks mentioned in the alarm plan of the Forschungszentrum. The Task Force Leader in principle acts on behalf of the “Vorstand” (Board of Directors) or the “Sicherheitsbeauftragter” of the Forschungszentrum (Safety Commissioner of the Forschungszentrum).
“Gewässerschutzbeauftragter” (Water Protection Advisor)	He/she controls and overlooks the observance of rules and regulations in the Forschungszentrum for the protection of water, the proper use of sewage systems, and the handling of substances hazardous to water. He informs the employees of new regulations and works on implementing them and improving the protection of water at the Forschungszentrum.
“Gefahrgutbeauftragter” (Dangerous Goods Advisor)	He/she controls and overlooks the transportation of dangerous goods and persons authorised transport such goods. He/she works on eliminating any transport problems. He is obliged to inform, consult, and train the employees in matters of dangerous goods transportation. He gives an annual report and, if necessary, sets up an accident report.
“Immissionsschutzbeauftragter” (Immission Control Advisor)	Controls and supervise the immission control regulations in the Forschungszentrum and the safe operation of combustion plants and of the district-heating plant. He/she informs the employees of new regulations and works on implementing them and improving the Center’s Immission protection.

**“Laserschutzbeauftragte”
(Laser Protection Officers)**

Have the duty to advise the employer in matters of protection against laser radiation when dealing with the purchase and commissioning of laser facilities. In addition, they are responsible for instructing employees in laser facilities and for monitoring the observance of safety and protection measures.

“Projektleiter für gentechnische Anlagen” (Project Leader in Genetic Engineering Facilities)

Are responsible for planning, managing, and supervising genetic engineering activities in an accordingly designated genetic engineering facility. In addition, they are responsible for the qualification and instruction of employees as well as of preventative medical examinations. The Project Leader immediately reports any events with an unforeseen course happen during the genetic engineering activities and possible hazards to the Biological Safety Officer and the licensee (Licensee is the Forschungszentrum Karlsruhe GmbH; HS-TBG is dispatched to fulfill the duties for the Board of Directors of the Forschungszentrum).

**“Sicherheitsbeauftragter des Forschungszentrums”
(Safety Commissioner of the Forschungszentrum)**

Acts on behalf of the Board of Directors of the Forschungszentrum in accordance with his service instructions. He/she assumes all functions relating to conventional and radiological safety.

“Sicherheitsbeauftragte Arbeitsschutz nach Sozialgesetzbuch VII” (Work Safety Commissioners According to the Code of Social Law VII)

Are responsible for the individual organisational units and support the leaders of the Organisational unit and Work Safety Experts in the execution of work safety measures.

**“Strahlenschutzbeauftragte”
(Radiation Protection Officers SSB,)**

The SSB fulfill their duties according to the Radiation Protection Ordinance and the X-ray Ordinance manage and control activities of relevance to the Atomic Energy Act. Their areas of competence include the observation of general radiation protection regulations, safety regulations, and the observance of the permits granted under the Atomic Energy Act with their requirements, directives, and instructions of the competent authority. They are responsible for the implementation of the General Safety Regulations of Forschungszentrum Karlsruhe GmbH and the internal instructions of the “Sicherheitsbeauftragter” (Safety Commissioner) of the Forschungszentrum Karlsruhe GmbH (KISS, “Strahlenschutzordner” (Radiation Protection File), unless these tasks are fulfilled by the Central Safety Department under a cooperative agreement concluded between the Central Safety Department and the respective organisational unit.

“Strahlenschutzverantwortlicher”

“Strahlenschutzverantwortlicher” is the Forschungs-zentrum Karlsruhe GmbH, as body corporate with the legal responsibility for radiation protection according to the Radiation Protection Ordinance and the X-ray Ordinance. As natural person, the Chairman of the Board of Directors is named to the authorities. He/she is responsible for the correct implementation of radiation protection regulations, especially by appointing a sufficient number of Radiation Protection Officers. To fulfill his tasks, he dispatches the “Sicherheitsbeauftragter” of the Forschungszentrum (Safety Commissioner of the Forschungszentrum) and his “Hauptabteilung Sicherheit” (Central Safety Department).

**“Verantwortlicher Betriebsbeauftragter für Abwasser”
(Head of Wastewater Treatment Plant)**

Is responsible for supervising the treatment of all sewage and the operation and maintenance of sewage facilities of the Technical Infrastructure Department within the framework of the permit held by the Forschungszentrum under the laws pertaining to the use of water.

10. Register

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		transport	6, 9, 15, 16
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radiation protection instructions.....		visitors	2, 10, 12
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