



Titel	General directive for Activities involving chemicals at PSI
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Ersetzt

Autoren / Autorinnen	Loertscher Yves, Hasler Peter
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Summary of contents:

This general directive outlines the most important statutory and operational instructions regarding activities involving chemicals at the Paul Scherrer Institute, and governs the relevant responsibilities. It also refers to basic codes of conduct adopted in order to protect personnel from the hazards presented by chemicals.

This directive is structured in line with the various uses of chemicals at the Paul Scherrer Institute, and therefore provides each individual with information about his/her responsibility with regard to activities involving chemicals at the Institute.

This directive is binding on every person working at the Paul Scherrer Institute.

This directive was approved at the 11/05 Conference of the Directorate (DIRK) on 17.05.2011.

Following the form of wording used in the statutory texts, personal descriptions are often shown in the masculine form only. All descriptions always apply equally to women.

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1 Introduction

A large number of chemicals are used within the course of research activities at the Paul Scherrer Institute (PSI). The line managers bear the responsibility for adherence to the statutory regulations governing employee protection in relation to activities involving chemicals, in accordance with the employment legislation. The line managers are supported in this duty on the part of PSI by the official chemicals expert. This directive contains a concept and regulations for internal activities involving chemicals within the institution. The aim of the directive is to ensure that chemicals are handled safely and sensibly at PSI, and to guarantee that the statutory provisions are fulfilled. It should be regarded as a supplement to the other applicable laws, ordinances and safety at work directives, in accordance with Chapter 8.1.

The first, general part of the directive describes a number of principles relating to possible risks arising from chemicals. These lists are not conclusive, but (together with the relevant appendices) they should give the reader an insight into the subject and provide him/her with the most important key figures and information, or make those figures and information accessible to him/her. The second part of the directive is contained in chapters on the distribution, storage, use and disposal of chemicals. These chapters describe the specific regulations and problems relating to this area of activity. The Appendix contains a list of the responsibilities for chemicals at PSI, as well as various other items of information (see Appendix).

2 General principles

2.1 Old law

Up to 31st December 2004, the use of chemicals in Switzerland was governed by the poisons legislation. In this law, the chemicals were sub-divided into toxicity classes:

Swiss toxicity class	LD 50 value [mg/kg body weight]
1	< 5
2	5-50
3	50-500
4	500-2000
5	2000-5000

The new law (see Chapter 8.1.1) removes these classes and replaces them with the EU designations (see Chapter 2.4).

2.2 Definitions

Substance 1:

“Natural or manufactured chemical elements and their compounds.”

Preparations ¹:

“Batches, mixtures and solutions consisting of two or more substances.”

Preparations or substances that affect the body exclusively via ionizing radiation are covered by the radiation protection legislation, not the chemicals legislation (see AW 23-96-13: General directive for radiation protection at PSI). However, radioactive compounds can simultaneously be chemically hazardous, and such compounds also fall under the chemicals legislation for this reason.

Key toxicity figures:

LD₅₀ value [mg/kg body weight]: **Dose** at which 50% of laboratory animals survive; usually with a one-off dose (= acute).

LC₅₀ value [various concentration units]: **Concentration** at which 50% of laboratory animals survive; value is independent of duration of administration

TD₅₀ value [mg/kg body weight]: **Dose** at which 50% of laboratory animals produce a tumour, value used to describe the carcinogenicity of chemicals

Application methods: inl=inhalation, skn=skin, orl=oral

MAK value [ml/m³(ppm) or mg/m³]:

(Maximum concentration at the workplace, or *Maximale Arbeitsplatz-Konzentration*): This value describes the highest permissible concentration in the air of a working substance (chemical) in the form of gas, vapour or dust, that **according to current information** does not usually endanger the vast majority of healthy employees working for 8 hours every day and up to 42 hours per week, even for extended periods (NB: This value does not apply to pregnant women in every respect).

BAT value [ml/m³(ppm) or mg/m³]:

(Biological working substance tolerance level, or *Biologischer Arbeitsstoff-Toleranzwert*) This is the maximum permissible quantity for human beings of a working substance or metabolites of a working substance, or the deviation thus caused of a biological indicator from its standard value, that would (according to the current status of scientific knowledge) not usually affect the health of the employee, even if it is regularly achieved as a result of factors at the workplace.

Flashpoint [°C]:

The flashpoint of an inflammable liquid is the lowest temperature at which a sample of the liquid develops enough vapour, after being warmed as instructed, to combine with the surrounding air to form a mixture that will ignite briefly when a flame is brought close to it.

Explosion threshold/ignition threshold [Vol-% or g/m³]:

This is the concentration range at which a gas-air, vapour-air or dust-air mixture is ignitable (explosive). The smallest and largest concentration in the ignition range are called the lower / upper explosion or ignition threshold.

Ignition temperature [°C, usually in air]:

¹ Art. 4, al. 1 of the Swiss Chemicals Act, the *ChemG SR 813.1*

The ignition temperature (spontaneous ignition temperature) is the lowest temperature at which an ignitable vapour/air or gas/air mixture ignites spontaneously, according to a specified test instruction.

2.3 Chemicals legislation

A summary of the chemicals legislation applicable within Switzerland and with respect to PSI is set out in Chapter 8.1.

2.4 Classification of chemicals

In Europe is used since the 1st December a new labelling's system, the global harmonized system (GHS), for the classification of chemical. The old labelling's system can be used till the end of 2015. This section give an overview between the old (orange sticker) and the GHS (whote sticker) labelling's system.

Substances with characteristics that are highly toxic, toxic or damaging to health

Old labelling
(can be used till
the end of 2015)



- **Highly toxic**
Substances that cause severe damage to health, or death, even in very small quantities, e.g. arsenic, hydrogen cyanide



- **Toxic**²
Substances that can cause serious damage to health, or even death, e.g. ammonia gas, mercury



- **Damaging to health**³
Substances that can cause damage to health, or even death, e.g. methylene chloride, iodine

GHS labelling
(since
01.12.2010)



Substances with caustic or irritating characteristics



- **Caustic**
Substances that can cause obvious damage to the skin, eyes and mucous membranes, e.g. hydrofluoric acid, caustic soda



- **Irritating**
Substances than can cause redness or inflammation on contact with skin, eyes and mucous membranes (sensitising substances also)



² Substances that are carcinogenic, mutagenic and present a hazard to reproduction are also designated by this hazard symbol (⇒ Note R and S phrases!)

belong in this category),
e.g. washing soda, bleach

Substances with highly-inflammable, slightly-inflammable or inflammable characteristics



- **Highly inflammable**
Substances whose gases and vapours form explosive compounds with the surrounding air. These can be ignited **very easily** in the presence of a flame.
Ignition point under 0°C, boiling point under 35°C
e.g. hydrogen, acetylene



- **Easily inflammable**
Substances whose gases and vapours form explosive compounds with the surrounding air. These can be ignited **easily** in the presence of a flame.
Ignition point under 21°C
e.g. petrol, acetone



No hazard symbol

- **Inflammable**
Substances whose gases and vapours form explosive compounds with the surrounding air. These can be ignited in the presence of a flame.
Ignition point between 21°C and 55°C
e.g. styrene, white spirit



Substances with characteristics that support fire



- **Oxidising**
Substances that can maintain a fire without an air supply (oxygen),
e.g. potassium nitrate, hydrogen peroxide



Substances with characteristics that produce the risk of explosion



- **Explosion hazard**
Substances that could be made to explode, possibly by applying heat, friction, a blow or an initial spark.
e.g. Lead azide, picric acid



Substances with characteristics that endanger the environment



- **Environmental hazard**
Substances that cause severe damage to organisms living in the water (fish, daphnia, algae), do not easily degrade and/or accumulate in the environment.



Those new label are introduce with the GHS:

label	explanation
	<ul style="list-style-type: none"> • Gas gas under pressure, compressed, liquefied, refrigerated liquefied, dissolved gas
	<ul style="list-style-type: none"> • Damaging to health
	<ul style="list-style-type: none"> • Warning This mark can be used alone or with other marks.

2.5 Type of hazard

This section provides a brief outline of the main risks that might arise when dealing with chemicals, and explains some of the relevant coefficients. The types of hazard are divided into five classes: acute and chronic toxicity, local toxicity, fire risk and reaction capability, environmental toxicity and oxygen deprivation. One individual chemical may involve hazards from all of these classes.

2.5.1 Acute and chronic toxicity

The different methods of chemical absorption must be taken into account when choosing employment protection measures to use against toxicity. Basically, chemicals may be absorbed by swallowing or inhaling, or directly through the skin. Various coefficients are used to produce a more precise classification of the risk associated with a substance. They describe the risk level of a substance as a function of the method (e.g. oral) and the duration (acute, chronic, etc.) of application. Apart from the LD₅₀ value, the **MAK value (maximum concentration at the workplace, or *Maximale Arbeitsplatz-Konzentration*, see definition in Section 2.2) is the most important coefficient for safety at work.** Suva determines and publishes this figure for a large number of substances.

The MAK value is a mandatory threshold limit for PSI, and all safety at work methods must therefore be chosen or organised so that this value is never exceeded.

2.5.2 Local toxicity

The substances with a mainly local effect are **caustic or irritating substances** that cause more or less severe damage at the application location (skin, eyes, and respiratory system) or its surroundings. **The harmful effect usually occurs very quickly.** The warning labels usually provide the warning of possible local effects. **Eyes must be**

properly protected from caustic and irritating substances by using suitable safety glasses, protective face shields or protective hoods (work may have to be carried out in a fume cupboard, depending on the characteristics of the substance). The necessary precautions must also be taken to protect the skin and the respiratory system.

The possibility of allergic eczema and other allergies should not be underestimated in connection with the local effect of chemicals. It is therefore worth avoiding contact with chemicals, even if there is no existing proof of toxicity.

2.5.3 Fire risk and reaction capability

Most accidents involving the risk of fire and explosions could be prevented if attention were paid to the conditions that have to be present for an explosion to take place. An explosion can only take place if an **flammable substance**, an **oxygen delivery agent** (usually air) and an **ignition source** are all available. If any of these three components are missing, no explosion can happen. The quantitative description of the fire risk of a substance is obtained from the explosion threshold limits, the flashpoint and the ignition temperature; further references relating to this subject are listed in Chapter 8.4. It should be noted that ignition sources include electrically and mechanically generated sparks, hot surfaces (hotplates and heating mantles) and electrostatic discharges, as well as open flames. Electrostatic charges can be produced by spilling large quantities of solvents or powders, and may act as ignition sources when they discharge. (NB: Accidents resulting in the burning down of a whole laboratory unfortunately happen over and over again. Some examples of accidents involving flammable solvents have been caused by a failure to protect drying compartments against explosions or other sources of ignition because the fact of the explosion risk had been severely underestimated).

Fires and explosions can also be caused by powerful reactions between two substances, or by the spontaneous decomposition of a substance (e.g. peroxide). This possibility must be taken into account when producing an instruction or designing a synthesis. In addition to the usual general literature, reference works such as Bretherick's Handbook of Reactive Chemical Hazards also provide a good summary of the recognised risks associated with individual substances when they react with other substances or classes of substance.

2.5.4 Environmental toxicity (ecological toxicity)

It is particularly important that environmental toxicity should be borne in mind when chemicals are discharged together with exhaust air (solvent vapour, dusts, etc.) or waste water. Some substances lead to negative environmental effects even at low concentration (dying fish, etc.) and must therefore not enter the exhaust air or waste water at all. The **Swiss law on water protection** and **ordinance on air pollution** provide the relevant limits for the introduction of chemicals.

2.5.5 Oxygen deprivation

Volatile solvents and gases (e.g. nitrogen and argon) can cause oxygen deprivation, which has a suffocating effect (NB: The maximum permissible concentration for solvents is usually given by the MAK value). Sufficient ventilation must be provided when these substances are being handled in closed rooms. This hazard is often underestimated in association with liquid gases, **and especially with liquid nitrogen**, which has led to fatal accidents in recent years.

2.6 Safety data sheet

A safety data sheet provides a summary of safety-relevant information about the substance. Only by knowing this information can there be a guarantee that the chemicals will be handled safely i.e. that safety measures will be selected and used as necessary. The safety data sheets must be made available by the manufacturers or suppliers. If a safety data sheet can no longer be found, another copy can be requested from the supplier.

3 Organisation of the chemical safety system and structure of responsibilities

3.1 Supervisory authority

The Office for Consumer Protection, chemical safety subdivision (the *Amt für Verbraucherschutz, Unterabteilung Chemiesicherheit*) in the Canton of Aargau acts as the PSI's supervisory authority for chemical safety.

3.2 Responsibility

The directive on safety, health protection and environmental protection at PSI ("*Sicherheit, Gesundheitsschutz und Umweltschutz am PSI*", AW-01-07-02) regulates the overall responsibility for chemical safety at PSI's facilities.

3.3 Official Chemicals Expert

The line managers and safety officer are supported by the Official Chemicals Expert in relation to safety involving chemicals.

The Official Chemicals Expert is the PSI's chemicals specialist, appointed in accordance with Directive 6508, the directive governing the use of occupational physicians and other safety at work experts (the *Richtlinie über den Beizug von Arbeitsärzten und anderen Spezialisten der Arbeitssicherheit*, or ASA-Richtlinie) issued by the Swiss committee responsible for safety at work (the *Eidgenössische Kommission für Arbeitssicherheit*)

3.3.1 Duties

- ☞ Responsibility for the production of regulations for the use of chemicals at PSI.
- ☞ Appointing a sufficient number of people with a partial responsibility for chemicals at PSI. Responsibility for maintaining the standard of their training.
- ☞ Supervision of the PSI chemicals storage facilities.

- ☞ Approval of special purchases of chemicals (see 4.6).
- ☞ Expert consultant on chemistry to the emergency response organisation.

3.3.2 Competences

The holder of this post is authorised to:

- ☞ Issue directives on the use of chemicals at PSI, in consultation with the safety officer.
- ☞ Prohibit the use of chemicals at PSI, in consultation with the safety officer and the line managers, if the statutory provisions have not been maintained, or if the risk seems too high in his/her opinion. Prohibition in the latter case is permitted without previous consultation with the safety officer if there is any immediate danger
- ☞ Sign the requisition forms for the PSI purchasing department.
- ☞ Delegate part of his/her responsibility as Official Chemicals Expert to suitable people with partial responsibility for chemicals at PSI, in writing and by agreement with the safety officer.
- ☞ Issue instructions regarding the disposal of chemicals and hazardous waste at PSI, in consultation with the safety officer.
- ☞ Request information from all the people dealing with chemicals and hazardous waste at PSI.
- ☞ Communicate independently, verbally and in writing, with the authorities and other external offices, by agreement with the safety officer, as long as this does not result in any legal or financial obligations on the part of PSI.

4 Distribution of chemicals

4.1 Basic regulations

The number of distribution points is restricted so that the distribution of chemicals at PSI can be controlled. These distribution points and their functions are described in Section 4.5. Chemicals can only be obtained through routes other than the specified distribution points in exceptional cases, and must be approved by the Official Chemicals Expert.

4.2 Responsibility for the distribution points

In the case of chemicals, those responsible for the distribution points are required to ensure:

- ☞ That one copy of the safety data sheets for the substances available in the store is supplied to the Official Chemicals Expert.

- ☞ That one copy of the safety data sheets for the substances handed over is supplied on paper or in electronic form to the procurer of the substances.
- ☞ that the disposal of chemicals is carried out only by the authorized signatory or by a person upon presentation of an order signed by an authorized signatory.
- ☞ that the disposal of extremely poisonous chemicals (T+) is carried out only by the authorized signatory upon presentation of a statement signed by the department head declaring its designated use.

Those responsible for the distribution points must also keep a card index, showing who has obtained which substances, and when.

4.3 Duties of the procurer

Procurers of chemicals have a duty to inform themselves of their risks and to be aware of the important safety information. The procurer has a duty to take the measures required to protect life, health and the environment, and remains responsible for chemicals procured by him/her for the whole period of use at PSI, up to and including lawful disposal (see also Section 7).

4.4 Authority signatory for chemical substances

Every organisational unit (group, section, project or laboratory) which requires chemical substances must appoint an authorized signatory and communicate his name to the Chemistry Officer. The appointees are responsible for the proper handling of chemicals within their organisational unit (the current directory of authorized signatories can be found in Intranet at the address: https://intranet.psi.ch/ASI/SicherheitAsi#Toxische_Chemikalien). **Only authority signatories are allowed to perform chemical's orders. The responsibility for the training of authorized signatories rests with their supervisors.**

4.5 Distribution points

4.5.1 Chemicals manager

The chemicals manager is authorised to distribute chemicals. This office is responsible for the administration of chemicals in accordance with the statutory and internal regulations, and runs the ordering function for chemicals, in collaboration with the purchasing department. The specialist pre-requirements for the post are a completed training course as a laboratory technician or (non-dispensing) chemist. This position reports to the Official Chemicals Expert on matters relating to chemicals.

4.5.2 Centre for Radiopharmaceutical Sciences

The ordering of chemicals for the Center of Radiopharmaceutical Sciences should normally be done by the Office of Chemicals Management. For urgent orders the Center provides a post that can process orders directly. The responsibilities of the person supervising this post are specified in AW-22-89-02. The provisions described in 4.2 regulate the technical qualifications of this person and provide directives with respect to chemical handling.

4.5.3 Central depot

Certain chemicals (mainly solvents) that are required in large quantities at PSI can be procured via the central depot. The manager of the central depot is responsible to the Official Chemicals Expert for orderly distribution (clean labelling of containers) and storage of the chemicals.

4.6 Procurement of special gases

Special gases not listed in the internal catalogue are procured via the central depot. Highly hazardous gases may also be procured by this route. A list of safety classifications (see Chapter 8.3) for gases will be made available to the central depot in order to maintain control of the gases that have been ordered. Using this list, the central depot can decide whether or not the ordered gases represent an increased risk, and must be signed out by the Official Chemistry Expert. The PSI's Official Chemicals Expert decides on the required safety measures in collaboration with the safety officer, and contacts the procurer.

4.7 External researchers

The external researchers' PSI contact is responsible to the Official Chemicals Expert for ensuring that the chemicals brought in by the researchers themselves are declared on the appropriate fact sheet and notified to the PSI's Official Chemistry Expert. The external researchers themselves are responsible for the lawful disposal of any chemicals they bring in with them.

5 Storage of chemicals

5.1 Containers and packaging

The original packaging or containers must be used to store chemicals. If the chemicals have to be poured out for any reason, the new packaging and containers must fulfil the requirements for identification, labelling and consistency set out in the Swiss chemicals ordinance. Packaging and containers for chemicals must not permit any confusion to occur with foodstuffs for humans or animals, or with medicinal remedies.

Empty containers or bottles must be cleaned before disposal in such a way that no hazardous chemicals enter the refuse or the recycling collection points (glass, metal, cardboard).

5.2 Storage location

Chemicals must be stored in locked cabinets or rooms. Inflammable substances must be stored in well-ventilated cabinets or rooms. Acids, alkalis and any other substances that might react dangerously if they came into contact with each other must be stored separately from each other. An unwipeable warning sign or combination of warning signs must be erected at the entrance to rooms in which chemicals are stored:

- **Warning against substances that are irritant or hazardous to health** ,
- **Warning against caustic substances** 

- **Warning against toxic substances** ,
- **Warning against substances presenting a fire risk** ,
- **Warning against gas cylinders** ,
- **Warning against substances at risk of explosion** .

The quantities of chemicals required at the workplace for the unimpeded execution of the work in progress are an exception to this rule. Nevertheless, they must also be labelled correctly and must not be accessible to unauthorised persons.

In addition, the following instructions issued by the Swiss committee for safety at work and health protection (the *Eidgenössischen Kommission für Arbeitssicherheit und Gesundheitsschutz*, EKAS), available from www.ekas.ch or www.suva.ch/waswo, also apply:

- ☞ Guideline No. 1871 on «Chemical laboratories».
- ☞ The provisions of EKAS Guideline No. 6501 on «Acids and alkalis » apply to the storage of irritating substances.
- ☞ The relevant cabinets or compartments of cabinets must be equipped with suitable drip trays for smaller quantities of irritating substances in smaller laboratory batches. The provisions of the «Guidelines for the storage and filling of combustible liquids with a flashpoint below 55°C» (EKAS Guideline No. 1825 on combustible liquids, «*Brennbare Flüssigkeiten*») apply to the storage of combustible liquids.
- ☞ Cabinets and sections of cabinets made of non-combustible or flame-retardant material are envisaged for highly-combustible liquids (flashpoint under 21°C) in small batches within the laboratory. These may not be placed in close proximity to the exit. The internal areas of warm or refrigerated cabinets where substances that might form an explosive mixture are stored must be rated at an equivalent level to EX Zone 1 (Suva Form 2153).

NB: The relevant radiation protection guidelines must be followed when handling and storing explosive and highly-combustible substances in conjunction with radioactive substances.

5.3 Storage quantities

The storage quantities of the individual chemicals must be kept as small as possible. This applies in particular to combustible solvents. Even in small quantities they often represent a high risk. Most laboratories are not suitable for the storage of larger quantities of solvents or solvent waste products.

The chemicals stores must be cleaned out once every year, and chemicals that are no longer needed should be discarded.

Only those quantities of hazardous substances that are required for the unimpeded execution of the work in progress may be kept at the workplace.

6 Working with chemicals

Knowledge of the safety data sheets for the individual chemicals forms the basis for safe handling of those chemicals. **It is therefore imperative that the safety data sheet is always available for consultation in the workroom.** To list all the safety at work measures that should be carried out would exceed the scope of this directive. **The mandatory safety at work guidelines issued by Suva must be followed at PSI** (see Chapter 8.4). These Suva safety at work guidelines can either be ordered directly from

Suva or via the safety officer at PSI. The Official Chemicals Expert is responsible for general information about dealing with chemicals.

The duty of information of the individual with regard to the danger associated with the substances being used does not release the line manager from his/her duty of supervision according to the statutory principles.

7 Waste products and disposal

Care must be taken to ensure that no chemicals that are hazardous to the environment enter the waste water or the exhaust air.

If it can not be avoided that chemicals leave PSI in the waste water or the exhaust air, then the relevant threshold limits must be observed in accordance with the law governing protection against water pollution (the *Gewässerschutzgesetz*) and the clean air ordinance (the *Luftreinhalteverordnung*)

The experiments must be set out so that the chemical waste products occur in as concentrated a form as possible. Care should be taken to achieve a sensible separation when collecting chemical waste (e.g. collect chlorinated and non-chlorinated solvents separately). A collection point for oil and chemicals can be used for the disposal of the collected waste products and the reagents no longer required.

7.1 Collection point for oil and chemicals

The oil and chemicals collection point is responsible for disposal of the chemicals at PSI. The chemicals for disposal are accepted and are either stored there as an interim measure before handover to a disposal company, or disposed of at PSI itself.

The chemicals for disposal should be handed over at the collection points in PSI-West (WCEA) and PSI-East (OBLA). Each of these collection points is open for two hours once every month. The exact location and opening times are shown on the back of the internal telephone directory.

If the chemicals are handed over in the original packaging, and if the label is still legible, no further details will be required. The following details will be required for all other containers: 1. Contents (as precisely as possible); 2. Name and internal telephone number of the person handing over the chemicals.

7.2 Neutralisation of the waste water

In principle, acid and alkali waste may only enter the waste water system if it exits from premises connected to a chemical waste water neutralisation facility. In the case of premises without neutralisation facilities, the acids and alkalis must be neutralised before they are released into the waste water.

The person responsible for chemical neutralisation must be contacted **before the disposal of larger quantities of concentrated acids and alkalis**. The person responsible for chemical neutralisation is responsible for advising people who want to introduce acids and alkalis into the waste water system. He/she sets out the conditions under which acids and alkalis may be introduced (acceptance conditions). He/she also checks the activities of the control staff in the chemical neutralisation facilities.

8 Regulations

8.1 Statutory principles

This list includes the most significant Swiss laws and ordinances relating to activities involving chemicals and their consequences. The currently valid versions of the laws and ordinances can be consulted at any time at <http://www.admin.ch/ch/d/sr/sr.html>.

The Suva safety at work guidelines can be found under “Literature” in Chapter 8.4:

8.1.1 Dealing with chemicals

- The Swiss law on protection against hazardous substances and preparations (the chemicals law, *ChemG*) SR 813.1
- The Swiss ordinance on hazardous substances and preparations (the chemicals ordinance, *ChemV*) SR 813.11
- The ordinance dated 18th May 2005 on the reduction of risks relating to activities involving certain particularly dangerous substances, preparations and items (the chemicals risk reduction ordinance, *ChemRRV*) SR814.81
- The EDI (Swiss department of home affairs) ordinance dated 28th June 2005 on the contact person for chemicals, SR 813.113

8.1.2 Environmental protection

- The Swiss law dated 7th October 1983 on environmental protection (the *Umweltschutzgesetz, USG*) SR 814.01
- The Swiss clean air ordinance dated 16th December 1985 (the *LRV*) SR 814.318.142.1
- The ordinance on ground pollution dated 1st July 1998 (the *VBo*) SR 814.12
- The ordinance dated 27th February 1991 on protection against accidents (the *Störfallverordnung, StFV*) SR 814.012
- The law dated 24th January 1991 on water protection (the *Gewässerschutzgesetz, GSchG*) SR 814.20
- The water protection ordinance dated 28th October 1998 (the *GSchV*) SR 814.201

8.1.3 Safety at work

- The Swiss employment law dated 13th March 1964 SR 822.11
- The accident insurance law dated 20th March 1981 (the *UVG*) SR 832.20
- The ordinance on the prevention of accidents and occupational diseases dated 19th December 1983 (the *VUV*) SR 832.30
- Various safety at work guidelines can be obtained from Suva at www.suva.ch/waswo.

8.2 Responsible persons

The list of responsible persons appears in Appendix.

8.3 Safety classification for ordering gases

The classification is given in the paragraph 12.3 from the general directive "Allgemeine Weisung für den Umgang mit Druckgasflaschen AW-96-09-08".

8.4 Documentation

8.4.1 General literature:

Location: PSI library:

- Hommel, G.D. «*Handbuch der gefährlichen Güter*» (Hazardous goods handbook), 6 volumes, Springer, 1997 (continuously re-stocked), PSI lib. 360-B-100
- Roth/Daunderer «*GIFTLISTE - Gifte, gesundheitsschädliche, reizende und krebserregende Stoffe*» (Toxins, noxious, irritating and carcinogenic substances), 5 volumes, ecomed, 1997 (continuously re-stocked) PSI-lib 300-G-65
- Kühn/Birkett «*Merkblätter: Gefährliche Arbeitsstoffe*» (Fact sheets: hazardous working substances), 9 volumes, ecomed, 1997 (continuously re-stocked), PSI-lib 300-G-50
- Roth/Weller «*Gefährliche chemische Reaktionen*» (Dangerous chemical reactions), 2 volumes; ecomed, 1997 (continuously re-stocked), PSI-lib 300-G-200
- Seiler, H.G. and Sigel, H. «*Handbook on Toxicity of Inorganic Compounds*», Marcel Dekker Inc., 1988, PSI-lib 305-T-1

Location: Official chemistry expert's office area:

- P.G. Urban «*Brethericks's Handbook of Reactive Chemical Hazards*», 5th Edition, Butterworth and Heinemann; 1995.
- NISOH «*Pocket Guide to Chemical Hazards*», 1994
- Grein, H. and Deml, E. «*Toxicology*», VCH 1996
- Swiss Ministry of Health «*Giftliste 1 (Stoffe)*» (Toxin list 1 (substances))

8.4.2 Material issued by EKAS / Suva:

- «*Chemische Laboratorien*» (Chemical laboratories) (EKAS Guideline No. 1871)
- «*Säuren und Laugen*» (Acids and alkalis) (EKAS Guideline No. 6501)
- «*Brennbare Flüssigkeiten - Lagerung und Umgang*» (Combustible liquids – storage and handling) (EKAS Guideline No. 1825)
- «*Grenzwerte am Arbeitsplatz. MAK-Werte, BAT-Werte, Grenzwerte für physikalische Einwirkungen*» (Threshold values at the workplace, MAK values, BAT values, threshold values for physical effects) (Suva-Form 1903.d)
- «*Sicherheitstechnische Kennzahlen von Flüssigkeiten und Gasen*» (Key safety figures for liquids and gases) (Suva Form 1469.d)
- «*Sicherheit beim Umgang mit Lösemitteln*» (Safety when handling solvents) (Suva SBA 155.d)
- «*Checkliste Umgang mit Lösemitteln*» (Checklist for the handling of solvents) (Suva 67013.d)

- « *Explosionsschutz - Grundsätze, Mindestvorschriften, Zonen* » (Explosion protection – principles, minimum requirements, zones) (Suva Form 2153.d)
- « *Flüssiggas, Teil 1: Behälter, Lagern, Umschlagen und Abfüllen* » (Liquid gas, Part 1: Containers, storage, pouring and filling) (EKAS Guideline 1941.d)
- « *Flüssiggas, Teil 2: Verwendung von Flüssiggas in Haushalt, Gewerbe und Industrie* » (Liquid gas, Part 2: Use of liquid gas in the household, commerce and industry) (EKAS Guideline 1942.d)

For further literature, please refer to the EKAS, www.ekas.ch, or Suva, www.suva.ch/waswo, list of publications

8.4.3 Databases

GESTIS substance database

The hazardous substance information system of the professional industrial associations in Germany (the GESTIS substance database) contains information for the safe use of hazardous substances and other chemical substances at the workplace, e.g. the effects of the substances on human beings, the necessary protective measures and the measures to be taken in the event of danger (including first aid). In addition, users are informed about important physical and chemical data relating to the substances, and about special statutory and professional association regulations for the individual substances. This database contains information on about 8000 substances. Link to database:

<http://www.dguv.de/bgia/de/gestis/stoffdb/index.jsp>

IGS-Check

IGS-Check is a **substance database** and includes information on chemical substances from various sources (manuals, ordinances, databases). The data is recorded true to the original and filed by a fine structure method using over 230 attributes. Information about a substance derived from different origins can therefore be presented together, and compared. IGS-Check currently contains about 1.3 million individual items of information on about 27,000 substances, and about 3 million individual items of information on more than 265,000 products.

IGS-Check is available on the INTRANET

(https://intranet.psi.ch/ASI/SicherheitAsi#Toxische_Chemikalien).

Appendix: People responsible for chemicals at PSI (as at 1 January 2011)

Official Chemistry Expert	Hasler Peter, OFLC/106 Tel. 2842
Responsible for the purchasing of chemicals ; chemicals management	Lüthi Sabrina, OFLB/U01 Tel. 2450/8161 deputy: Stahel Judith, OIPA/13, Tel. 5839
Responsible for the purchasing of chemicals for the pharmacy at the Centre for Radiopharmaceutical Sciences	Müller Cristina, OIPA/8 Tel. 4454/2827
Responsible for disposal; Collection point for oil and chemicals	Frei Alwin, OFLB/U106 Tel. 4302
Responsible for chemical neutralisation OFLE	Neiger Thomas, ODRA/112 Tel. 3760
PSI safety officer	Loertscher Yves, OFLC/U105 Tel. 2350