



2019



Rheinische
Friedrich-Wilhelms-
Universität Bonn



Institut für Physikalische
und
Theoretische Chemie



Safety Instructions



Content overview

- General remarks to the security in the institute
- Ergonomics at the work place
- Handling of hazardous substances
- Personal protective equipment and TOP-Concept

Key Issue 1: Risk Assessment

Key Issue 2: Fire Prevention

Key Issue 3: Operating Instructions



TRENDS in Occupational Safety:
Work 4.0

Obligation of Instructions/Content of Instructions

- § 12 Arbeitsschutzgesetz
- DGUV-Informationen
- Betriebssicherheitsverordnung (BetrSichV)
- TRBS/TRGS (Technical Rules)

Important Advice:

These Instructions are general Safety Instructions (on behalf of the managing director).

It does not replace the work-place specific instructions.

Please sign personally in the list of signatures. Please write your full name in block capitals and give the shortcut of the work group you belong to. All this is necessary for the documentation that you have been instructed.

On the first pages of the documentation you find the content of the instructions.



General security advices I

„We are an open institute“

- HOME SECURITY:

Please close all windows in the Lecture rooms after you have finished

Doors: please lock them when you leave the lecture room

Ventilation of the lecture room: please turn it off after the lesson

Your Group-Key and Transponder are unassignable!

(Key insurance is recommended!)



Opening hours for all staff with Group-Key and Transponder 24h/365d

Closing Time: 19:00-07:00 o'clock (Semester holidays)

18:00-07:30 o'clock (Lecture times/semester)

also: the weekends, official holidays, Rosenmontag,
the days between Christmas and New Year



General security advices II

„We are a tidy Institute“



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- Home security and Hygiene:

Toilets: Please take care of Hygiene and Cleanliness! Please aerate!



Office workplace:

- No tripping hazards, regular recurrent electrical testing of electric equipment
- Take care of the ergonomics of your work place!
(Infos: Abt. 4.2, Frau Baumgärtner, Tel. 6843)

Tea kitchen/Social environment: Please take care of tidiness and Cleanliness

Private Equipment: CAUTION (regular recurrent electrical testing) Lecture rooms: Please take care of tidiness, donot eat or drink in the lecture rooms





General security advices III

„We are a safe institute“

- Experiments and Security:
 - Appropriate construction and removal of equipment/ apparatus
 - Before you start working: A Hazard Analysis has to be made
 - Careful instruction of the students and BSc/MSc into the experiments
 - Appreciation control / Sustainability
 - Work out Operating Instructions
 - The assistants should know the security aspects of the experiments of the practical courses





General security advices IV

„We are a celebrating institute“

- Celebrations in the library:
 - Application at the Facility Management of the University
3 weeks before the celebration takes place:
<https://www.intranet.uni-bonn.de/organisation/verwaltung/dez-4/formulare>
 - No open flames
 - Clear up after the celebration
 - Careful dealing with all furnishing
 - no misuse of all the security equipment (Megaphone, Fire extinguisher etc.)
 - Don't forget the closing time of the outside door



General security advices V

„We are a valuable institute“

- Building work, other works vs. Valuable equipment
 - Works at which dirt, dust or other contaminations can occur have to be announced at the safety officer at least 1 week before the works shall be done. (Including the reasons why this work is necessary)
 - Instructions of the building team has occurred by University administration
 - Doors have to be sealed very properly
 - Fire-/Smoke detectors have to be covered properly
 - Shutdown of affected parts of the Fire alarm system
 - Vibration-free work is necessary
 - When the work is finished: careful cleaning of the area
 - Testing on damage and contamination of area/equipment



Ergonomic design of a workplace I

„We are a health-conscious institute“



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- Ergonomics means more than the position of chairs and desk
- The idea is a positive atmosphere and surrounding of the workplace
- The lightning, the indoor climate and a positive work organisation are as well of great importance
- Intention of ergonomics: „to feel as snug as a bug in a rug“

Example: Sit – are you comfortable?

Example: Lightning – similar to daylight?

Example: Your back – dynamic sitting?



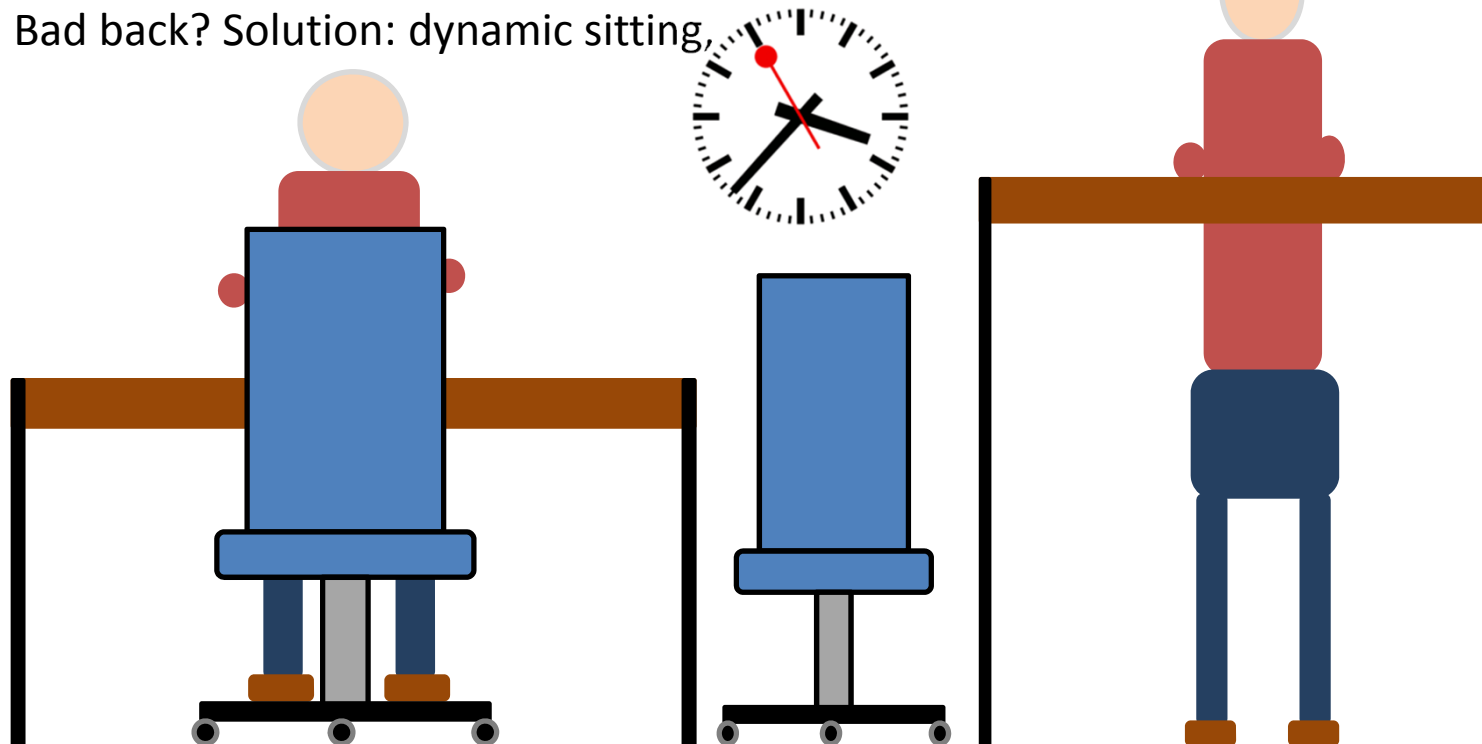


Ergonomic design of a workplace II

„We are a health-conscious institute“

Change your positions , when you are working – alternating sit and stand

- **Sitting work posture – As hazard as smoking ?**
- Bad back? Solution: dynamic sitting,





Ergonomic design of a workplace III

„We are a health-conscious institute“

FACTOR LIGHT I:

Basis for our seeing plus nonvisual effects

Means also individual presence – there is no perfect lighting for everybody

Residents from regions with warmer climate prefer a warmer light

Residents from colder regions prefer a more colder light

The lighting conditions a workplace effect concentrativeness and performance on a high level – Insufficient lighting can make you feel sick.

„The employer has to ensure that at all workspaces have windows and a sufficient amount of daylight. (ArbStättV 3.4)



Ergonomic design of a workplace IV

„We are a health-conscious institute“

FAKTOR LIGHT II:

sufficient daylight:

The technical rules A3.4 emphasizes the importance of daylight. Alternative light sources cannot reach the efficiency of daylight

„At workplaces there must be a sufficient amount of daylight

. (...) Daylight shows first-class quality features (e.g. dynamics, colour, the direction of light) which cannot be simulated by alternative light sources.“ (ASR A3.4, 4.1)

Tip: Take care of an adequate amount of daylight at your workplaces



Ergonomic design of a workplace V

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- **What helps your back:**
- **What can you do?:**
- Move gently to protect your back, use all aids
- Change your sitting position dynamically
- Reduce stress. Move as often as possible, use the lunch breaking for airing!





Ergonomic design of a workplace VI

We are a health-conscious institute



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- **What helps your back:**
- **What can the employer do?**
- He should implement all regulations to prevent back trouble and sponsor healthy workplaces:
 - Improve ergonomics of workplaces
 - **Observe limits of carrying heavy loads**
 - Reduce physical and psychological stress in workflows



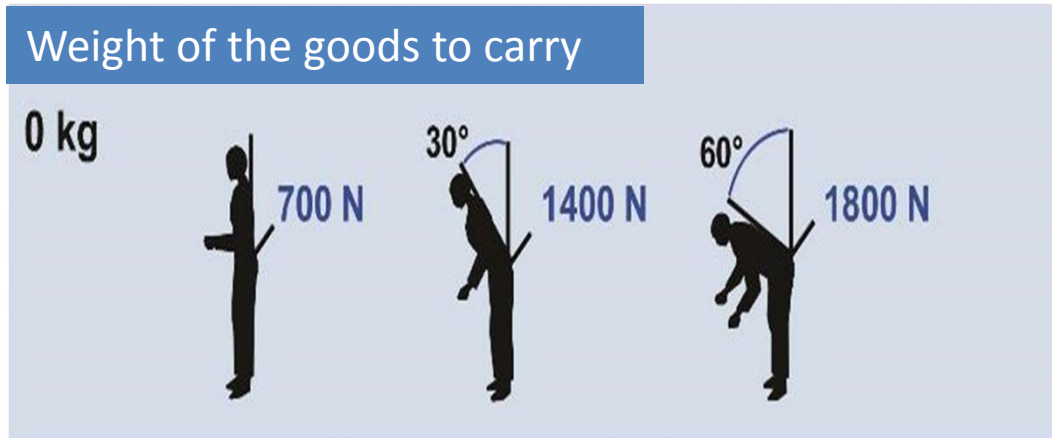


Ergonomic design of a workplace VII

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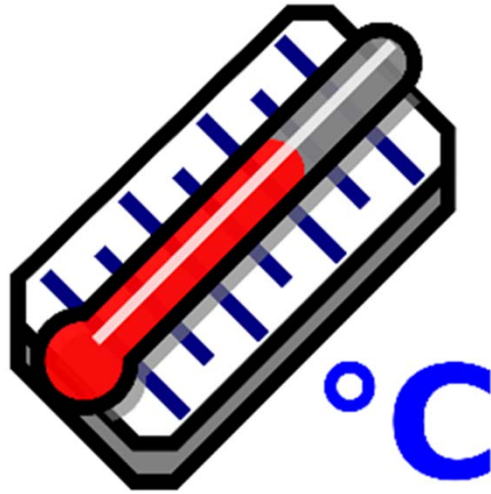


Ergonomic design of a workplace VIII



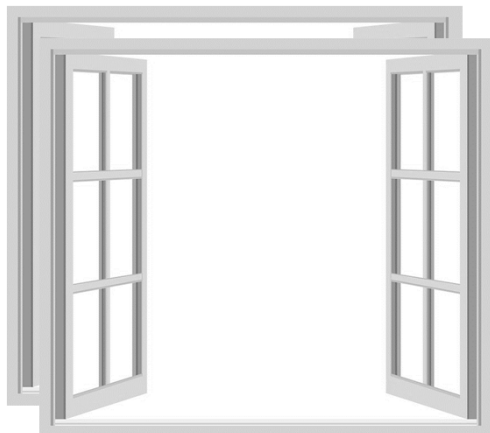
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The temperature of the working environment:

- in offices: approx. 20°C
- In workshops: approx. 18°C



Avoid **draught**:

- Draught upon consultation
- Fitful aring at winter- and summertimes

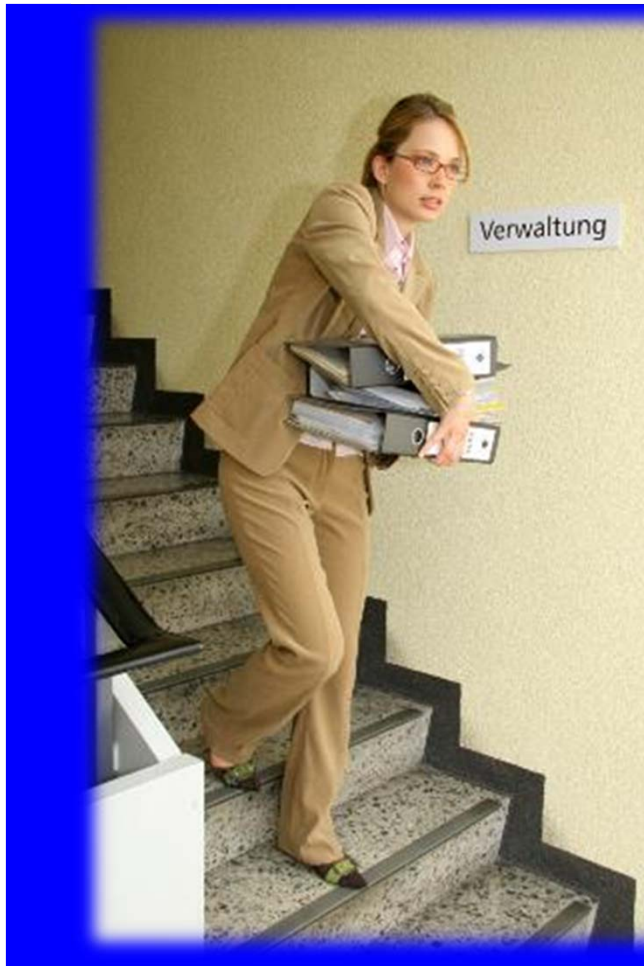


Ergonomic design of a workplace IX

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Staircase: Carry your goods/objects safely!

Please use carry aids

Please use the hand rail at anytime!!





Ergonomic design of a workplace X

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Do you have any questions about the ergonomics of your workplace?

Contact: Frau Bandélé Baumgärtner, Abt. 4.2 Uni-Verwaltung

<http://www.sichtech.uni-bonn.de/Wob/images/84369610.pdf>

Don't forget: The ergonomics of your workplace can just be as good as you have arranged your workplace individually

Perform a **risk assessment** of your workplace and compare the actual conditions with the desired conditions



Handling of hazard chemicals I

„We are a chemical institute“

- For the safe approach with hazard substances the knowledge of their chemical properties is essential
- In Safety Data Sheets you will find all necessary informations
- Before the experiment can start, a risk assessment on basis of the TOP-Principle must be executed.





Handling of hazard chemicals II

„We are a chemical institute“

- Sharing a Chemical Laboratory (e.g. the Multifunktionslabor): Communication with other users must be part of the risk assessment
- Which other experiments are performed ?
- Are they reconcilable with my experiment?
- Are there any off limits necessary?

Are you a lone worker?



- Specific demands
- Approval must be obtained (speak with your Professor)





Handling of hazard chemicals III

„We are a chemical institute“

- Safe working in the Laboratory means a safe institute:
- Labeling of all chemical substances in GHS-Nomenclature
- Which hazard substances are stored at the institute?
- Where and how are the hazard substances in use?
- Which amounts are available?
- **Unknown?** A risk assessment for hazard substances is mandatory! → (§ 7, Gefahrstoffverordnung)



Handling of hazard chemicals IV

„We are a chemical institute“

- Handling of hazard substances is permitted after a risk assessment has been performed and the instructions about the risk the hazard substances have been accomplished
- The uniform application of the GHS-Nomenclature eases the detection of hazard substances

Attention: All unknown substances must be declared as hazard substances as long as their chemical properties are not known



Handling of hazard chemicals V

„We are a chemical institute“

- GHS and CLP-Verordnung are EU law!
- Hazard symbols: rhomboid (diamond with red margin)
-



<http://www.reach-compliance.ch/ghsclp/neuegefahrenpiktogramme/>



Handling of hazard chemicals VI

„Safety first“

- Basically lone working is not prohibited!

But

- DGUV-Regulation 1 defines dangerous work:
- „...all activities, where the working method, the kind of work, the used substances or the surrounding of the workplace lead to extended risks“
- In this context it doesnot matter if somebody works in a chemical laboratory or at a turning lathe or with live parts (Electricity)



Handling of hazard chemicals VII

„Safety first“

- Is there a possibility that lone working and such activities lead to an accident (**risk assessment**)
 - And there would be no possibility for the lone worker to call for help self-initiated
 - and there would be a chance that other colleagues could not realize the dangerous situation,
 - prophylactic measure must be taken
 - or lone working for such activities will be forbidden wird (must be confirmed)



Handling of hazard chemicals VIII

„Safety first“



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- Following the **TOP**-Principle (1.) **T**echnical and (2.) **O**rganizational measures must be determined:
- Person-Emergency-Systems (**T**)
(DGUV-Rules 112-139)
- and/or (**O**): Inspektion round by a second person,
Telefon-Emergency-call-systems or Video-Monitoring
(both are subjects of approval and worker participation)



TOP –Principle I - PSA

„Safety first - self-protection“



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- **TOP** – Prinziple: Persönliche Schutzmaßnahmen
- **Personal Protective Equipment („from head to toe“)**
- Legal basis: ArbSchG, PSA-User-Regulation, DGUV Regulation 1: Grundsätze der Prävention und DGUV-Information 212-515 (Tipps für die Praxis)
- PSA is necessary, when the risk assessment shows, that technical and organisational protective measures are not sufficient.



TOP –Principle II - PSA

„Safety first - self-protection“

- **TOP** – Prinzip: **P**ersönliche Schutzmaßnahmen
- **Personal Protective Equipment („from head to toe“)**
- Please use the PSA which is suited for the application site and operating conditions
- The selection of PSA is subject to ergonomics: Perfect fitting is an important criterion for all protective clothing (Eye-, skin-, feet-protection as well as body-protection)



TOP –Principle III - PSA

„Safety first - self-protection“



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- TOP – Principle: **Personal Safety measure**
- **Personal protective equipment („from head to toe“)**
- IMPORTANT:
 - Intended use
 - Proper storage
 - Cleaning and upkeeping !!!
 - Defects and damages
- Before using PSA a visual check is required
- **Damaged PSA = Disposal**



TOP – Principle IV - PSA

„Safety first - self-protection“

- **TOP** – Principle: **Personal Safety measure**
- **Personal protective equipment („from head to toe“)**
- In **Operating instructions** the PSA should be described accurately
- In Operating instructions you should use the following pictograms:

BGV A8 / VBG 125





Key Issue 1

Risk Assessment I

- Risk assessment / Hazard analysis
 - Basic for the employer to fulfill his obligations:
 - To organize safe workplaces
 - To organize safe tools
 - To organize working conditions, which protects the health of the personnel
 - and Occupational Safety 4.0 (accordingly Work 4.0):
 - Preservation the health of the personnel for a long time and adapt cautiously to the conditions of new working models



Key Issue 1

Risk Assessment II

- The ArbSchG § 5 und die DGUV-Regulation 1 – „Grundsätze der Prävention“ contain the legal basis for suretyship of the risk assessment
 - There is no fix procedure to implement a risk assessment
 - Systematic Operation
 - Careful planning
 - Big work areas: Partition into smaller work areas
 - Determine all activities (work) in the work areas



Key Issue 1

Risk Assessment III

- Implement the risk assessment with the help of the personnel
- All tools, working materials and work will be listed and checked on possible hazardous situations that could occur by them
- Are there any other charges (physical and /or psychological stress)?
- For determination of risks use all information sources like (Personnel, Occupational medical care, producer of the used materials, Technical Rules, Safety data sheet etc.)



Key Issue 1

Risk Assessment IV

- You have detected some risks, the employer must evaluate them by the **TOP-Principle**
- Keep the conditions of the Labour Protection Act (Arbeitsschutzgesetz)
- Aim: Avoid dangers or stem them at the source of dangers
- Deduced from this aim: Binding order of instructions according to the **TOP-Principle**

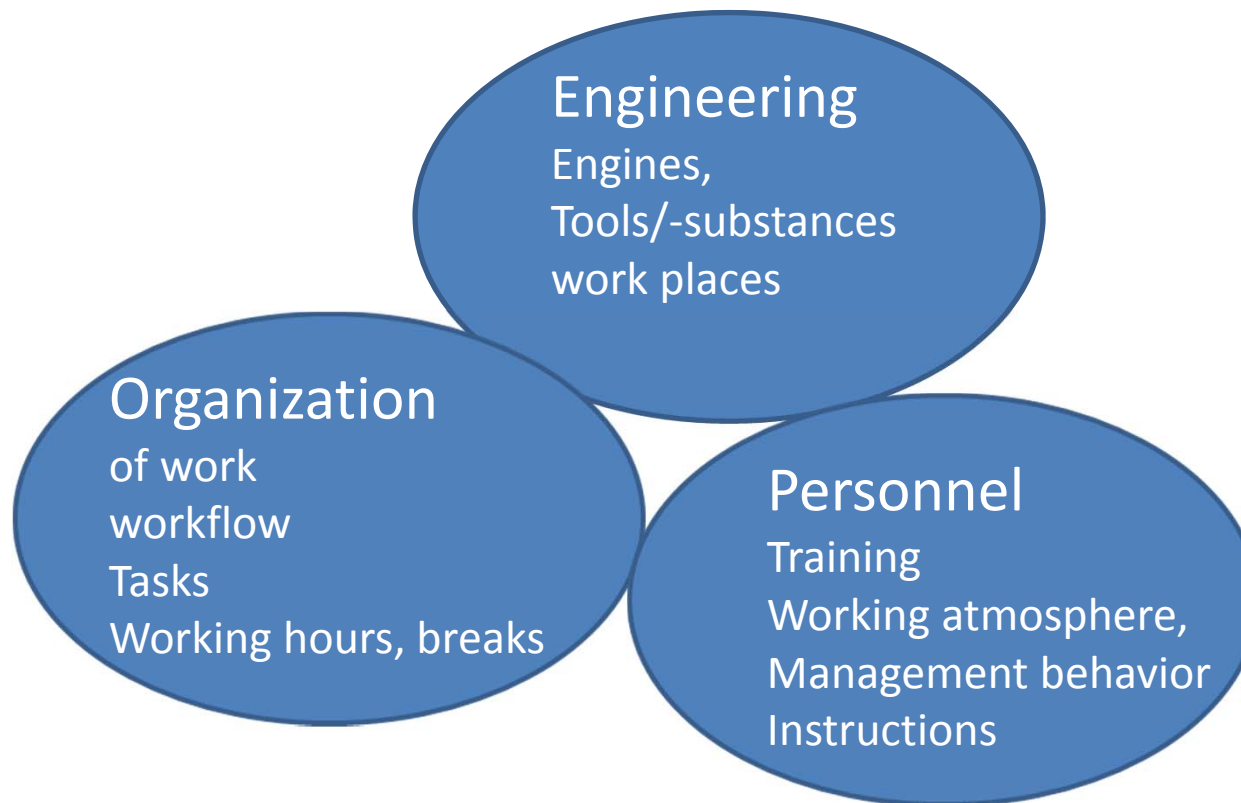


Key Issue1

Risk Assessment V



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Key Issue 1

Risk Assessment VI

- **Essential:**
 - Check the effectiveness of the implemented measures
 - Is the hazard completely eliminated or at least distinctly reduced? Or is a rework necessary?
 - Do the measures produce new hazard situations?
 - For example: An ear protection is necessary! Can you still hear the acoustic warning in case of emergency?

In this case: Install noise abatement measures or add a visual warning system (flashlight)



Key Issue 1

Risk Assessment VII

- **Example for a risk assessment based on the ArbSchG**
 1. Fix the region under examination: office, workshop, laboratory etc.
 2. Determine the risks/dangers:
 - Mechanical, electric, chemical, noise, vibration, heat, magnetic fields etc.
 3. Evaluate the risks:
 - Acceptable? Technical rules are fulfilled?
 - Other rules (z.B. MuSchG, JuSchG etc.) are fulfilled
 4. Fix protective measures (TOP-Principle)
 - **T**echnical Measures: Work in the laboratory hood, **O**rganizational: work out operating instructions, **P**ersonal measures: Use PSA
 5. Proof measures on effectiveness
 6. Assessment is finished (You have to proof it after one or in case of establishing new work methods)



Key Issue 2

Fire Prevention I



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Facts:

- About 600 people every year die through fire
- About 6000 people suffer from serious burns
- All 5 minutes there is a fire in a company in Germany, a lot more than 100000 x per year
- Every third fire in an industrial plant leads to damages > € 500.000.-
- The industrial safety legislation is equal important to the operational fire prevention and other operational safety fields

Zitat: The employer has to install more comprehensive measure to ensure first-aid, fire prevention and has to implement an evacuation plan (based on §10 Abs. 1 ArbSchG, DGUV-Information 205-001)



Key Issue 2

Fire Prevention II



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Zitat: „Es entspricht der Lebenserfahrung, dass mit der Entstehung eines Brandes praktisch jederzeit gerechnet werden muss. Der Umstand, dass in vielen Gebäuden jahrzehntelang kein Brand ausbricht, beweist nicht, dass keine Gefahr besteht, sondern stellt für die Betroffenen einen Glücksfall dar, mit dessen Ende jederzeit gerechnet werden muss.“

(OVG Münster, Az. 10 A 363/86)

Rechtsgrundlagen:

- Model Building Regulations, DGUV-Informationen (z.B. DGUV-Information 205-001: Arbeitssicherheit durch vorbeugenden Brandschutz sowie 5 weitere Informationen)
- ArbSchG, ArbStättV (z.B. ASR A2.2 „Maßnahmen gegen Brände“), GefStoffV (TRGS 800 Brandschutz), BetrSichV (z.B. TRBS 1112 – Instandh.)



Key Issue 2

Fire Prevention III

The chief source of information fire prevention are since 2012 the technical rules for workplaces (ASR A2.2)

Avert and protective fire prevention:

Avert fire prevention: central purpose of the fire brigade

Prophylactic fire prevention:

- To prevent a fire incident
 - Skills for fire fighting like:
 - an adequate knowledge of fire suppression systems
 - fire drill
 - Handling of fire extinguishers zur Lösung von Entstehungsbränden).

Important but not to realize by the institute: structural and technical fire prevention (fire class and fire resistance of components, size of fire prevention sectors, location and accessibility of escape routes, staircases, fire water requirement, fire alarm centre, smoke outlet)



Key Issue 2

Fire Prevention IV

Protective fire prevention :

- **Fire prevention installation engineering:**
Timely perceive of fires, warning and extinguish by the help of a fire-alarm system (BMA/BMZ), fire extinguishers, beepers (fire prevention siren and automatic fire alarm, fire classes
- **Organizational fire prevention:** Evakuere all people fast and secure out of the building by the help of escape route descriptions, instructions and evacuation exercises










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Key Issue 2

Fire Prevention V

Brandklassen nach DIN EN 2

Arten von Feuerlöschern	 A	 B	 C	 D	 F
	Feste, glutbildende Stoffe	Flüssige oder flüssig werdende Stoffe	Gasförmige Stoffe, auch unter Druck	Brennbare Metalle (Einsatz mit Pulverbrause)	Fettbrände in Frittier-Fettbackgeräten
Pulverlöscher mit ABC-Löschpulver	●	●	●	---	---
Pulverlöscher mit BC-Löschpulver	---	●	●	---	---
Pulverlöscher mit Metallbrandpulver	---	---	---	●	---
Kohlendioxidlöscher	---	●	---	---	---
Wasserlöscher (auch mit Zusätzen, z.B. Netzmittel, Frostschutzmittel oder Korrosionsschutz)	●	---	---	---	---
Wasserlöscher mit Zusätzen, die in Verbindung mit Wasser auch Brände der Klasse B löschen	●	●	---	---	---
Schaumlöscher	●	●	---	---	---
Fettbrandlöscher	---	---	---	---	●
● = geeignet --- = nicht geeignet					



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Key Issue 2

Fire prevention VI

Richtiges Löschen mit Feuerlöschgeräten

	RICHTIG	FALSCH
Brand in Windrichtung angreifen !		
Flächenbrände vorn beginnend ablöschen !		
Tropf- und Fließbrände von oben nach unten löschen !		
Wandbrände von unten nach oben löschen !		
Ausreichend Feuerlöcher gleichzeitig einsetzen, nicht nacheinander !		
Rückzündung beachten !		
Nach Gebrauch Feuerlöcher nicht wieder an den Halter hängen. Neu füllen lassen !		

Freiwillige Feuerwehr Unterföhring




Key Issue 2

Fire Prevention VI



Fire action:

- The red alarm sirens (ceiling/wall) resound a continuous tone: FIREALARM!!
- Leave all offices/laboratories or other rooms immediately. Use corridors and staircases! Do use the elevator!
- If there is any spare time: Disable all media (ATTENTION: cooling water)
- Take along all colleagues and other persons which you meet on your way out, Attention: self protection first!
- The fire isolation doors will be closed : avoid the access through smoky areas
- Don't use any elevators!!
- Meeting point outside the institute: gathering point → 
- Wait for further informations by the operational command of the fire brigade





Key Issue 2

Fire Prevention VIII

Important information from the internet:

ASR A2.2: „Maßnahmen gegen Brände“ <https://goo.gl/bwhCE2>

TRGS 800: „Brandschutzmaßnahmen“ <https://goo.gl/6c703y>

DGUV-Information 205-001: „Arbeitssicherheit durch vorbeugenden Brandschutz“ <https://goo.gl/QWXgx5>

DGUV-Information 205-023: „Brandschutz Helfer“ <https://goo.gl/CdcPbf>

DGUV-Information 209-026: „Brand- und Explosionsschutz an Werkzeugmaschinen“ <https://goo.gl/ajdfWf>

Instructions of fire o´ prevention have the same importance as autodidactic learning fire prevention regulations

You should have the ability to answer the following questions:



Schwerpunktthema 2

Fire Prevention X – self-control

Where in the institute are fire hazard areas?

Fire action?

Alerting? Who must be informed

How can I extinguish an initial fire?

How can I handle a fire extinguisher or other fire extinguishing units?

Where are the fire escape routes and the emergency exits?

What are the meanings of the fire prevention identification labels?

Who can I help disabled or confused persons?





Key Issue 3

Operating Instructions I

Operating Instructions:

- Binding written instructions and rules of conduction for safe handling of tools and / or hazardous substances
- The obligation of generation of operating instructions rest with the employer
- These duties can be delegated to an experienced assistant by written instruction

Have to be prepared:

- Approach to very dangerous hazard substances
- Approach to very dangerous biological substances
- Approach to electrical and / or mechanical hazards
- (§14 Gefahrstoffverordnung (TRGS 555), §12 Biostoffverordnung, § 9 Arbeitssicherheitsgesetz bzw. §9 Betriebssicherheitsverordnung)



Key Issue 3

Operating Instructions II

Operating Instructions:

- must be generated for concrete works workflow
- Description of similar hazards and safety measures can be summarized in same operating instructions
- If the maintenance of machines afford different working steps a separate operating instruction must be generated
- The schematic view should be the same over all operating instructions
- Hazard substances with orange-coloured margin and machines with a blue-coloured margin
- Must be posted clearly visible at every workplace and are part of the workplace specific instructions



Key Issue 3

Operating Instructions III

Operating Instructions:

- Informations must be up to date
- In case of changes in workflow or machines: operating instructions must be updated
- The realization of the operating instructions must be proved!



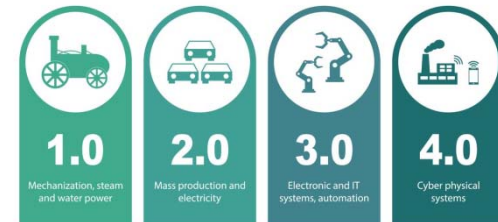


Trends in occupational safety

Work/Occupational safety

Work / Occupational Safety 4.0

Elements: (aus DGUV-thematic priority 2018)



Digitization: Fast Information techniques

Networking: Information exchange between man (man-machine dialog)

Congestion: higher Workload

Complexity: Cyber-physical systems (virtual↔real world)

Acceleration: e.g. faster technological progress

Dissolution of boundaries: Rejection from standard work conditions

To work is possible at any and any place

Specialization: Next to basis competence a digital expertise is requested (Digital Literacy)



Trends in occupational safety

Work/Occupational safety 4.0 (II)

Work/Occupational safety

Environmental commitment:

Environmental protection extensives quickly

Company wide regulations ecoconscious acting must be determined

Training of the personel is necessary

The „top-down“ determinations should be complement by good ideas from the employees („bottom-up“)

Which internal channels can be used for brainstorming?

Headquaters should set an example of environmental commitment!!



Trends in occupational safety

Work/Occupational safety 4.0 (III)



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Work/Occupational safety 4.0

Achieve good environmental performance:

- Periodic informations about the environmental commitment
- An employee idea system for environmental protection should be activated
- Effective instruments of internal communication in occupational and environmental protection should be strengthened and adapted to the working conditions
- The employer should make apps available on the subjects of occupational and environmental safety



Trends in occupational safety

Work/Occupational safety 4.0 (IV)

Work/Occupational safety 4.0

Further training at times of digitalization /networking and continuous accessibility:

- **Work-Life-Balance**

Training of managers, parenting instruction

- **Older employees**

Health of the back, cancer check-up, Burnout-Prevention, mental burdens

- **Both target groups**

Working in age-appropriate teams

Stressmanagement, Timemanagement, Ergonomics



Trends in occupational safety

Work/Occupational safety 4.0 (V)

Work/Occupational safety 4.0

The number of older employees rises:

Occupational safety/Health Protection are faced with new challenges:

- Cardio-vascular diseases, skeletal diseases, psychic diseases
- Ergonomics and worktime-management have priority
- An demography management must be established



Trends in occupational safety

Work/Occupational safety 4.0 (VI)



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Work/Occupational safety 4.0

The number of older employees rises:

Active and attractive Employee recruitment among the aspects of an outstanding Health and occupational safety (further training, qualitative valuable ergonomic design of workplaces, prophylactic medical examinations, mobility concepts)

Proposals to the conservation of employability in old age (high , work flexibility, Offering of rest periods during the working time)

Optimize occupational safety , because from lacks in occupational safety stress factors can (Noise, Heat, missing daylight, lack in ergonomics)



Trends in occupational safety

Work/Occupational safety 4.0 (VII)

Work/Occupational safety 4.0

Safety culture:

Are work-, environmental and occupational safety firmly fixed in the brains of employees?

- Do the leading employees accept long running and maybe expensive prevention measures?
- Do you have the impression that the headquarters and leading employees are prepared for digitalization and networking?



Trends in Occupational safety

Work/Occupational Safety 4.0 (VIII)

Work/Occupational safety – Permanent Reachability

Approach to Depressions at work place:

Psychological troubles at the workplace can have serious implications

- Excess risks, lack in quality of work and high irreliability

The 5-point plan of prevention

- Management training
- Useful informations for the employees (events conductive to health, Intranet)
- Risk assessment on psychic (Germany: ISO 10075)
- Are there depressive tendencies in the institut?
- Special training of experts in field of work (conflict counselling, stuff department)



Trends in Occupational safety

Work/Occupational Safety 4.0 (VIII)

TROS: Technical Rules for optical radiation, Laser

Valid for Laser irradiation with wave length between 100 nm und
1 mm

Contains explanatory notes on the new Laser class 1C

(in line with DIN EN 60825-1:2015-07)

Laser class 1C. Only used for applications on skin/tissue (with
the exception of the eyes)