

BASIC CONCEPTS
in
**OCCUPATIONAL
HEALTH & SAFETY**



Dr. Elif AKISKA



At the end of this lecture you are going to learn;

What does OHS mean?

What is the main purpose of OHS concept?

Conduct and acting risk management concept in your life

Where does the world go about OHS?

What are safety-quality – environment management systems?

How do we applicate these systems to our work-life

What does «**OHS SYSTEM**» do at workplaces?



At the end of this lecture you are going to learn;

What kind of **risk factors** at your surroundings – workplace chemical, biologic, ergonomic, physical, fire, explosion, radioactivity etc.. And how to prevent from them ?

What does «**accident and occupational diseases**» mean and how to prevent from them ?

What does **positive safety culture** mean?

The OHS Law No 6331



At the end of this lecture you are going to learn;

- Who can be an OHS expert?
- What does/must an OHS expert do?
- Why is this concept so important?
- How can we learn to be in safe?

At the end of this lecture you are going to learn;

- personal protection from hazards; ergonomics-eye, body posture etc.





*trust your life to another
person ??*









OCCUPATIONAL HEALTH AND SAFETY has become necessary due to these examples.

The concept of **safety culture** has been developed due to employees' negligence and violations.

SAFETY CULTURE

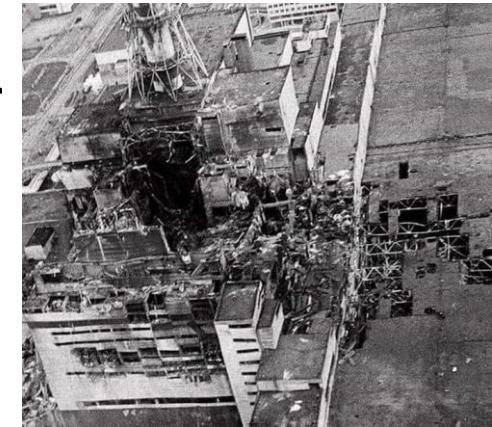
-*definition* -

It is the way in which safety is managed in a workplace. It is the combination of beliefs, perceptions and attitudes of employees toward the safety of workers and the overall safety of the work environment.



Occupational Health and Safety Culture

As a concept, it was first used in a **report** prepared after the nuclear accident that took place in Chernobyl in 1986.



This **report** points out that significant design deficiencies, organizational errors and employee violations played an important role in the Chernobyl accident.

Therefore,

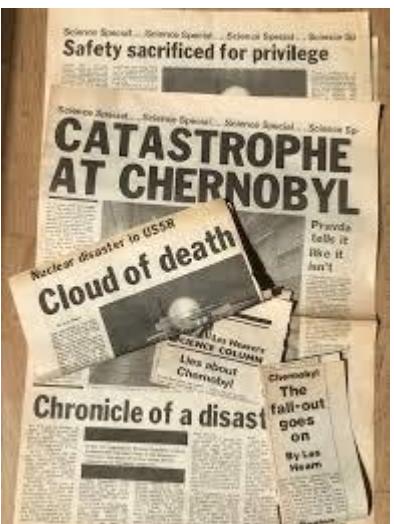
'Safety culture' has been a key concept explaining the role of human factor in ensuring safety, especially in cases where the risk level is high, both in the accident that occurred in Chernobyl and in other important accidents.

https://zbook.org/chernobyl_MjU1NzMy.html

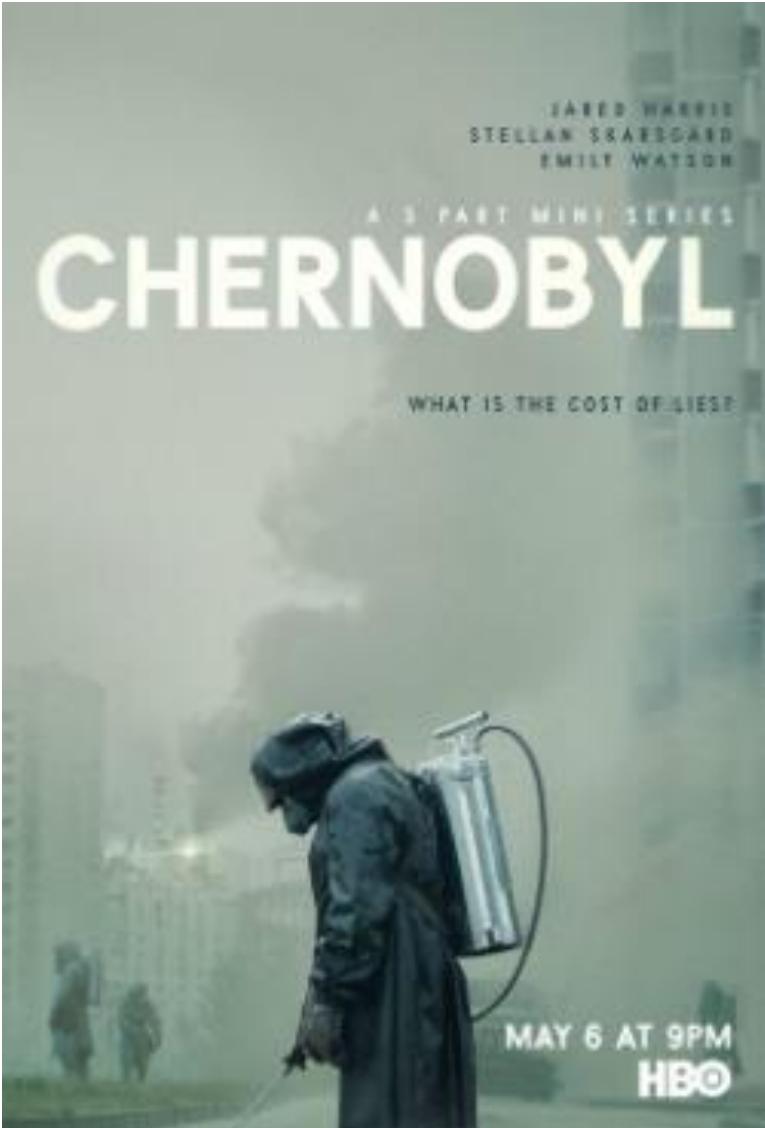
Rana 2019 The Chernobyl reactor accident: Some selected facts



As a result of the explosion of one of the reactors in Chernobyl, a huge amount of radiation was released into the air. It reached as far as South Africa with the effect of the wind of radioactive clouds. The rains brought the radioactive clouds down in Turkey.



As an advice...



Tv Mini Series (5 Episodes)

In April 1986, an explosion at the Chernobyl nuclear power plant in the Union of Soviet Socialist Republics becomes one of the world's worst man-made catastrophes.

The subject is human-induced disasters.



The main purposes of OHS are;

**** to assure safe and healthful working conditions for employees**

(çalışanların sağlığını korumak)



*** *to prevent work accidents and occupational diseases.**

(iş kazalarını ve meslek hastalıklarını önlemek)



*** *to provide security and continuity in production.**

(ürtimde güvenliği ve devamlılığı sağlamak)



*** *to provide a healthy and safe working environment**

(Sağlıklı ve güvenli çalışma ortamı oluşturmak)



As a result, quality and efficiency increase



Because of lacking of H&S;

- Humans (physically and phsicologically)..
- Environment..
- Production.. And
- Economy

will get harm.

What are the Conditions to become an Occupational Safety Expert?

- Graduating from Architecture and Engineering departments,
- Graduating from the physics, chemistry and biology departments of Science and Literature faculties,
- Being a technical teacher,
- To be graduated of the two-year occupational health and safety department,

In case of graduation from any of above departments;

- Those who take at least 70 exam mark out of 100 in OSYM exam, after participating in the trainings given by the Ministry of Labor, and those who fail the first exam, use their second right and receive valid marks,

They fulfill the requirements to become an occupational safety specialist.

It is recommended that you should be careful to be successful in exams to become an occupational safety specialist.

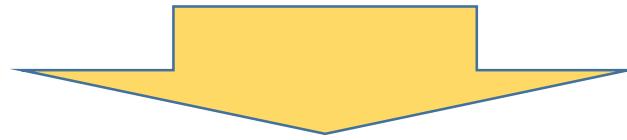
Because, those who cannot pass the exam twice are expected to be re-educated.



training method

After

90 hours formal education, 90 hours online education, 40 hours internship



Certificate to be Given at the End of Training

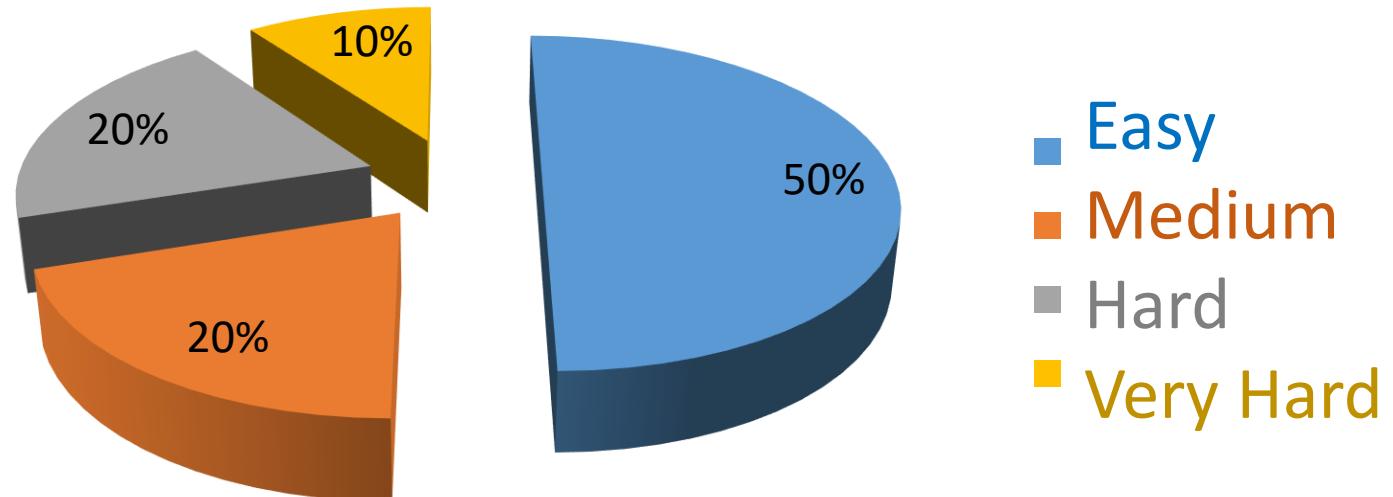
Training Participation Certificate is given to the participants after the training.

Assessment and evaluation

The exam is held by OSYM

You should gain at least 70 points (wrongs do not take the right answers)

degree of difficulty of questions



OSYM Exam topics

NO	Topic	percentage Rate
1	Law	5
2	General OHS Subjects	15
3	Legislation	30
4	Health	10
5	Technical	40

Midterm Exams



Your mid term or final exams
are going to be



Normal exam – face to face
Short answers,
multiple choice test,
True or false questions

DEFINITONS



«Health and safety» definition

A multidisciplinary field concerned with the creation, design, implementation, communication and regulation of structures, systems, law, policy, procedures, processes and regulations that govern the health, safety and welfare of people.

«Health and safety» affects all people in every country and is concerned with the health, safety and welfare of every person. e.g. education, employment.



Briefly; **Systemic** and **scientific** efforts in order to get rid of hazardous conditions at workplaces during work.

ILO and WHO definition of Occupational Health

Since 1950, the **International Labour Organization** (ILO) and the **World Health Organization** (WHO) have shared a common definition of occupational health.

Firstly, according to this definition,
Occupational health should aim at:

the promotion and maintenance of the highest degree of **physical, mental and social well-being of workers in all occupations;**



the protection of workers from risks in their workplaces;

and, to summarize, the adaptation of work to man and adaptation of each man to his job".

Basic Concepts & Definitions



- The World Health Organization (WHO) defined health as '***a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.***'



WHO'ya göre sağlık:

sadece hastalık ve sakatlık
durumu değil, Ruhen + bedenen
+ sosyal açıdan iyi olma
durumudur!!

Basic Concepts & Definitions



Occupational Health & Safety:

- Occupational Health and Safety is an area concerned with protecting safety, health and welfare of the people engaged in the work or environment.



What is the relationship between H&S and Science

H&S is multidisciplinary science consisting of;

Engineering
Medicine
Economy
Law
Sociology
Psychological
Ergonomics

Basic Concepts & Definitions

Occupational Health & Safety:

Occupational health and safety is concerned with many types of *workplace hazards*, such as:



- Chemical hazards
- Physical hazards
- Biological hazards
- Psychological hazards
- Ergonomic hazards

• So;





«Occupational Health and Safe» is the whole of the work done to protect and improve the physical and mental health of the employee.



These studies are; **systematic and scientific studies** that are carried out in order to protect themselves from conditions that may harm health at workplaces.

Health and Safety Responsibilities and its cost

Employees should be the priority of the organization to ensure health and safety precautions are taken in the workplace.

It is also legally obligatory to ensure that employees are aware of all safety precautions.

If the workplace is not capable of making its employees healthy and safe the company will have very costly problems.

The other cost that this company will undertake is loss of skilled workers, decrease in productivity, loss of business reputation.

To reduce these additional costs, each company must have occupational health and safety system.

SAFETY IS EVERYONE'S RESPONSIBILITY

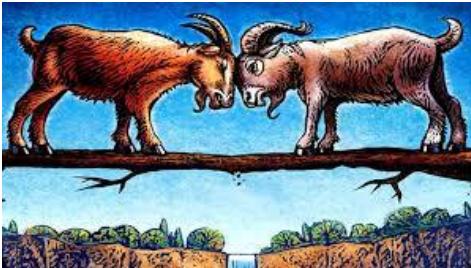


Instead of Saying «be careful» only,
try to establish a “**system**”
which does not allow accidents.



System approach; Do not leave human's care; make workplace safe!

- For example;
- You know mosquitos. The best way to get rid of them is to drain swamp.
- By killing one by one you can not manage.
- Like this; you must prepare a workplace which does not cause any harm:
- No fire -no electricity shortcut-no slip, no poisonous gas etc...
- If your workplace is full of these kind of hazards WAIT FOR an ACCIDENT.....
- Why?
- Because human being has got some characteristic failures such as forge unconsciousness, stubbornness, thoughtfulness, working high speed etc



An accident is unavoidable



- For example; in a workplace if 1 in every 300 people slips and falls down because of a banana peel on the road.

- Should we blame the person who slipped

- or

- Should we blame the person who threw that peel there



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- Or prevent people from throwing peel on road?



Occupational Health & Safety

OCCUPATIONAL HEALTH & SAFETY



Dr. Elif AKISKA





to Become an Occupational Safety Expert

- Graduating from Architecture and Engineering departments,
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 - To be graduated of the 2-year OHS departments,
 - at least 70 points out of 100 ----- (OSYM)



The main purposes of OHS are;

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-definition -

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DEFINITONS



Basic Concepts & Definitions



- According to The World Health Organization (WHO), «**health**» is not simply the absence of disease or infirmity, but rather, is '*a state of complete physical, mental and social well-being.*'



Callahan D. The WHO definition of "health." Hastings Cent Stud. 1973;1, 3, 77–87.

WHO'ya göre sağlık:

sadece hastalık ve sakatlık
durumu değil, Ruhen + bedenen
+ sosyal açıdan iyi olma
durumudur!!

Basic Concepts & Definitions



Workplace Hazards:

Occupational health and safety is concerned with many types of *workplace hazards*:

- Chemical hazards
- Physical hazards
- Biological hazards
- Psychological hazards
- Ergonomic hazards

HAZARD and RISK Definitions



Here, the shark is;

Hazard?

Risk?



Basic Concepts & Definitions

Hazard:

- Source, situation or act with a potential for harm in terms of human injury or illness, or combination of these. (OHSAS 18001 Article 3.6.)
- **Potential which exists at the workplace or may arise from outside the workplace to cause harm or damage which could affect the worker or the workplace; (OHS Law #6331, Article 3 (1))**



Basic Concepts & Definitions

Risk:

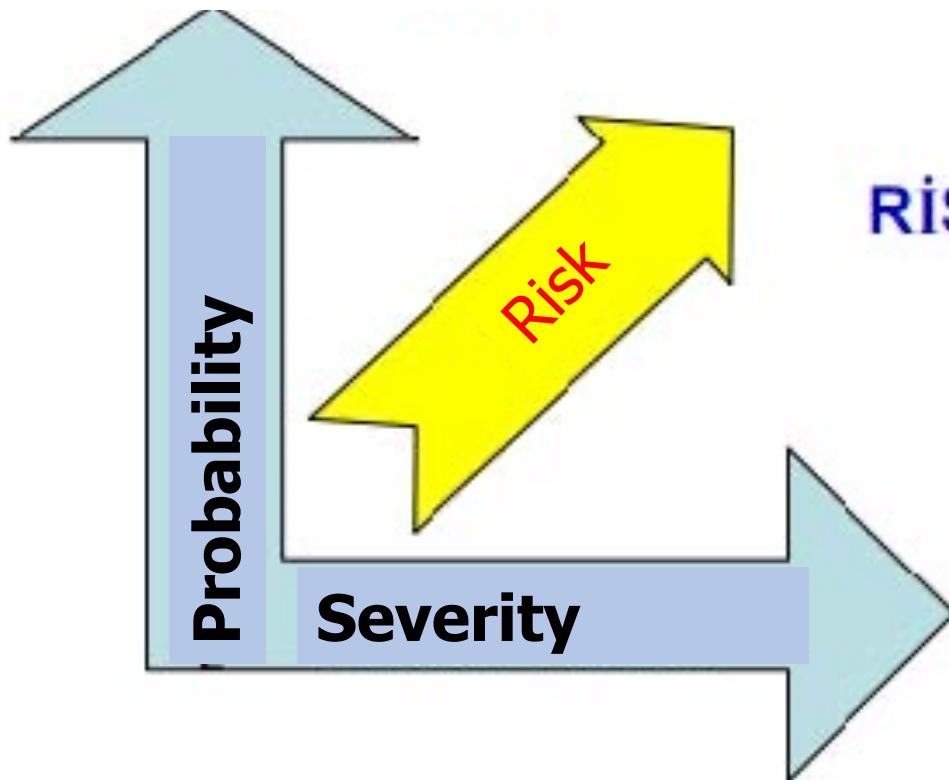
- Combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or illness that can be caused by the event or exposure(s)

(OHSAS 18001 Article 3.21)

the combination of the **probability** of harm occurring and the **severity** of the harm once it occurs.



the combination of
the **probability** of harm occurring and the **severity** of the harm



$$\text{RISK} = P \times S$$

P: Probability
S: Severity

Basic Concepts & Definitions

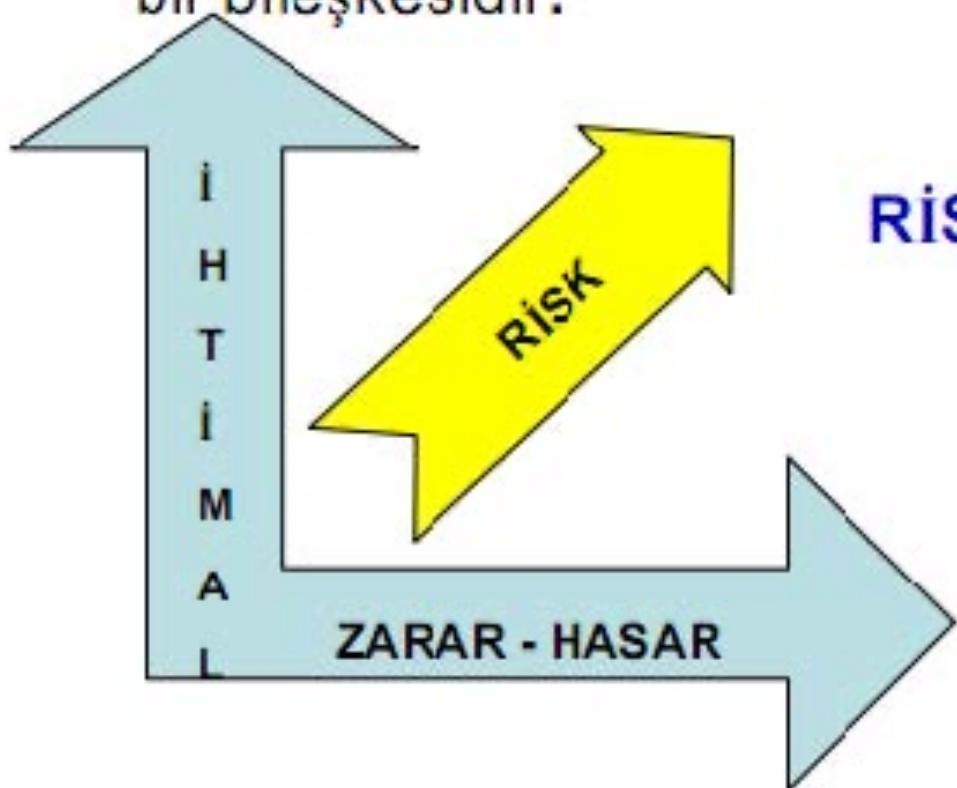
- Hazard and risk relationship likes **potential energy vs kinetic energy relationship.**
- Hazard is accepted as potential energy,
 - risk is accepted as kinetic energy.

TEHLİKE / HAZARD

**İşyerinde var olan ya da dışarıdan gelebilecek,
çalışanı veya işyerini etkileyebilecek zarar veya
hasar verme potansiyeli : 6331**

RİSK

Tehlikelerden kaynaklanan bir olayın, meydana gelme ihtimali ile zarar verme derecesinin bir bileşkesidir.



$$\text{RİSK} = i \times D$$

i : İhtimal

D: Zararın derecesi

HAZARD and RISK Definitions



Here, the shark is;

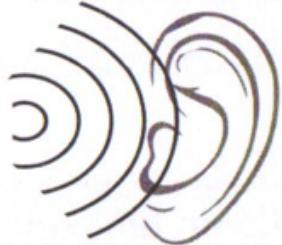
Hazard?

Risk?



Let's take a look of some examples about
Hazard and Risk



Hazard		Risk
Noise		Permanent hearing loss for those working in loud noises
Blood-borne Disease		<u>contagious disease</u>
Oxy-combustible gas system		accident of a person working with a non-protective oxy-gas system
Working at height		Falling from height Material drop



Tablo 1: Tehlike-risk kavramı

*Hunting in the area which is full of sharks: Hazard
possibility of loss of life: Risk

* Long working hours : Hazard
life imbalance : Risk

* working without helmets in the mining areas: Hazard
Possibility of falling stones: Risk

working with chemicals : Hazard
Breathing-tasting- contact : Risk

(According to the records, the number of children who drink bleach is very high)



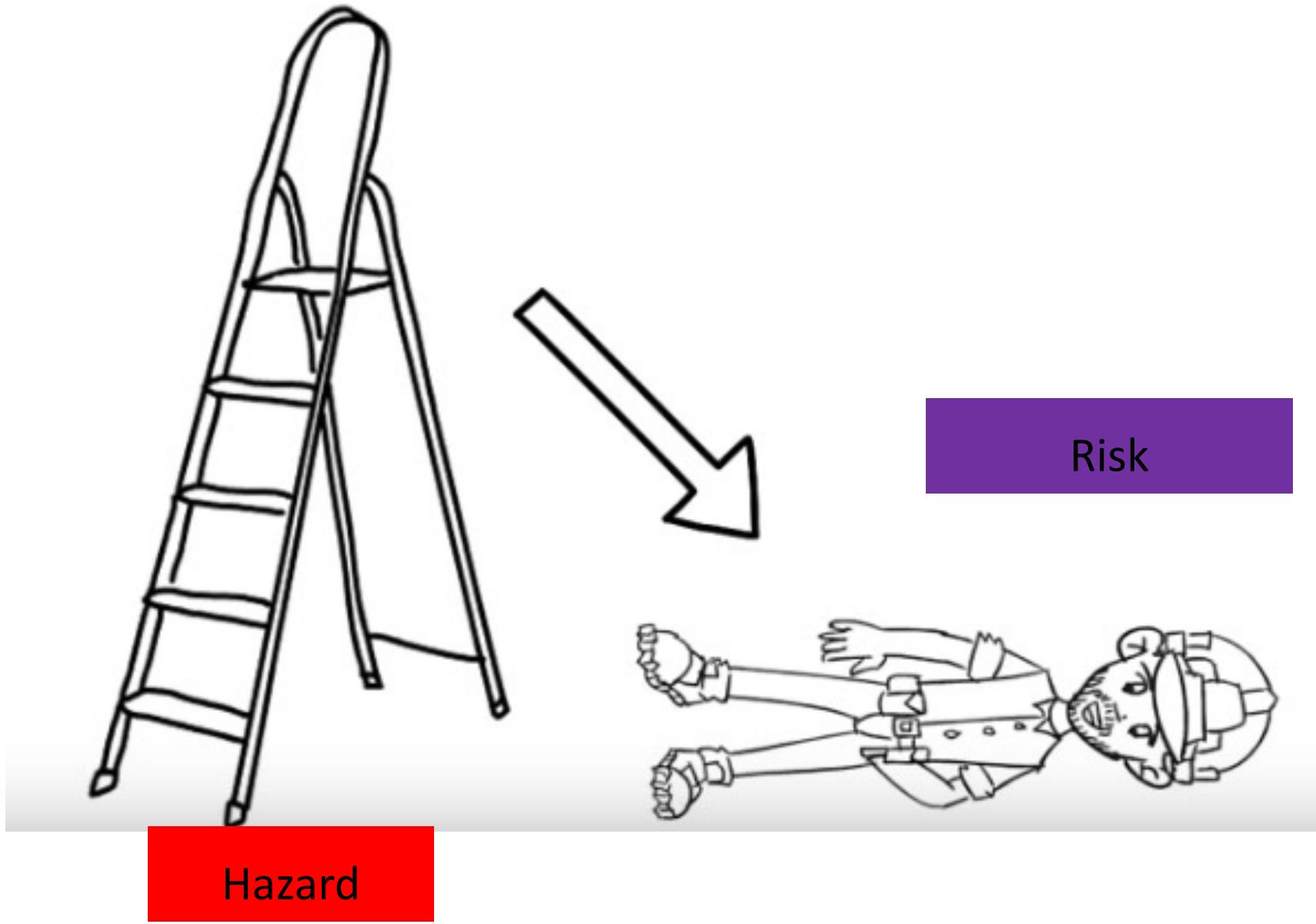
*Hand tools: Hazard

Hand cut: Risk

* Working with flammable materials, like petrol: Hazard

Fire: Risk







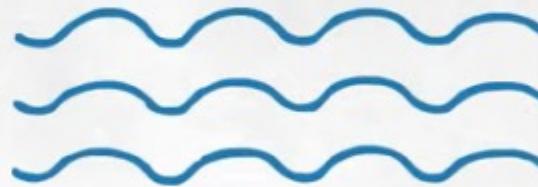
HAZARD



RISK

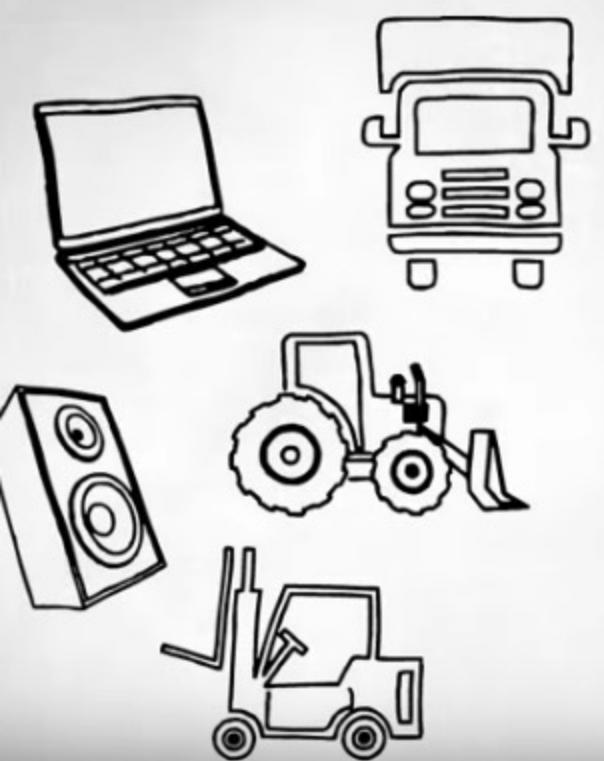


A RIVER
IS A
HAZARD



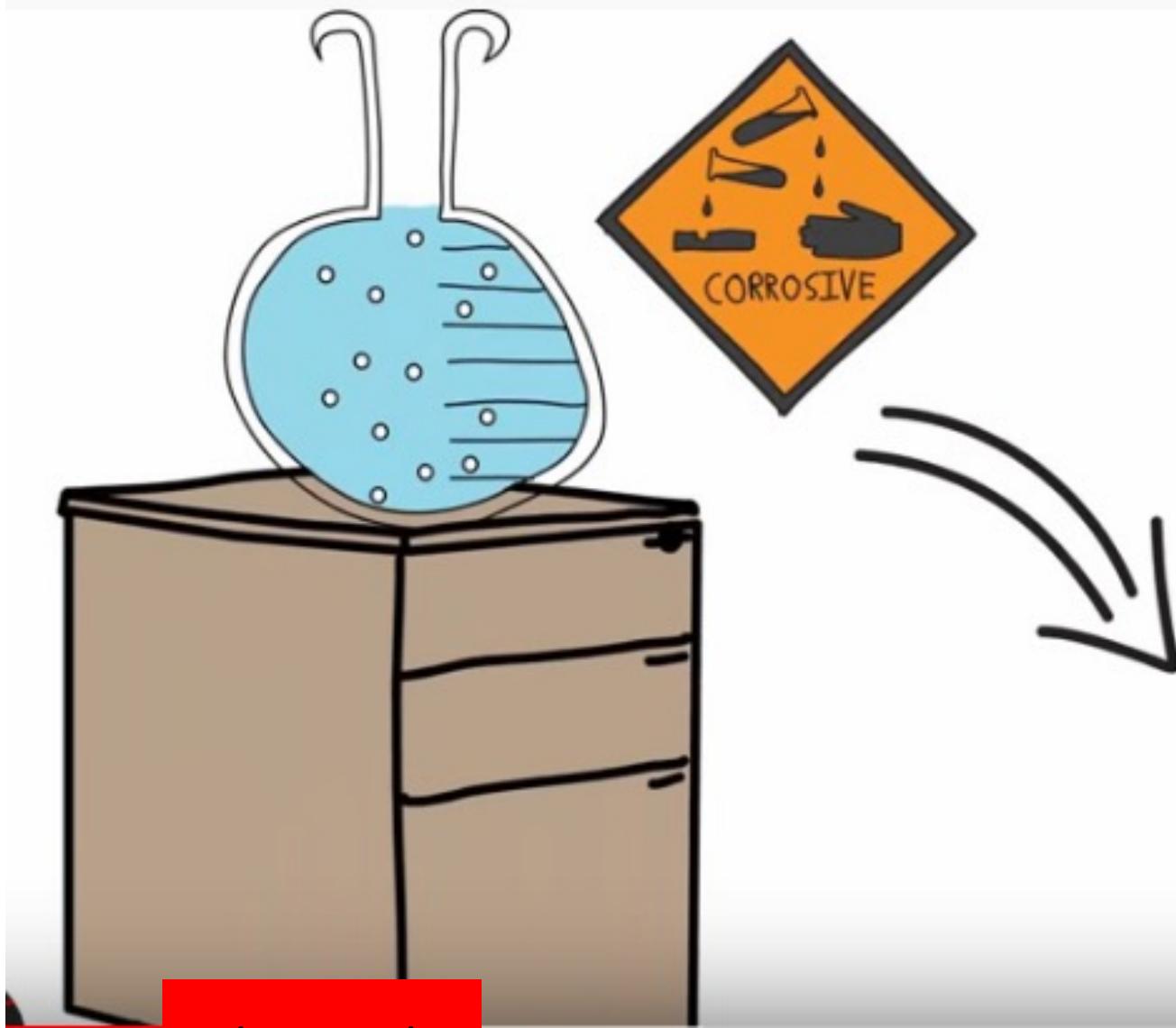
FLOODING
IS A
RISK





leaving things
UNGUARDED
is a
HAZARD

having them
STOLEN
is a
RISK



Chemicals
Hazard

Contact to the skin
Risk





Risk





HAZARD



RISK

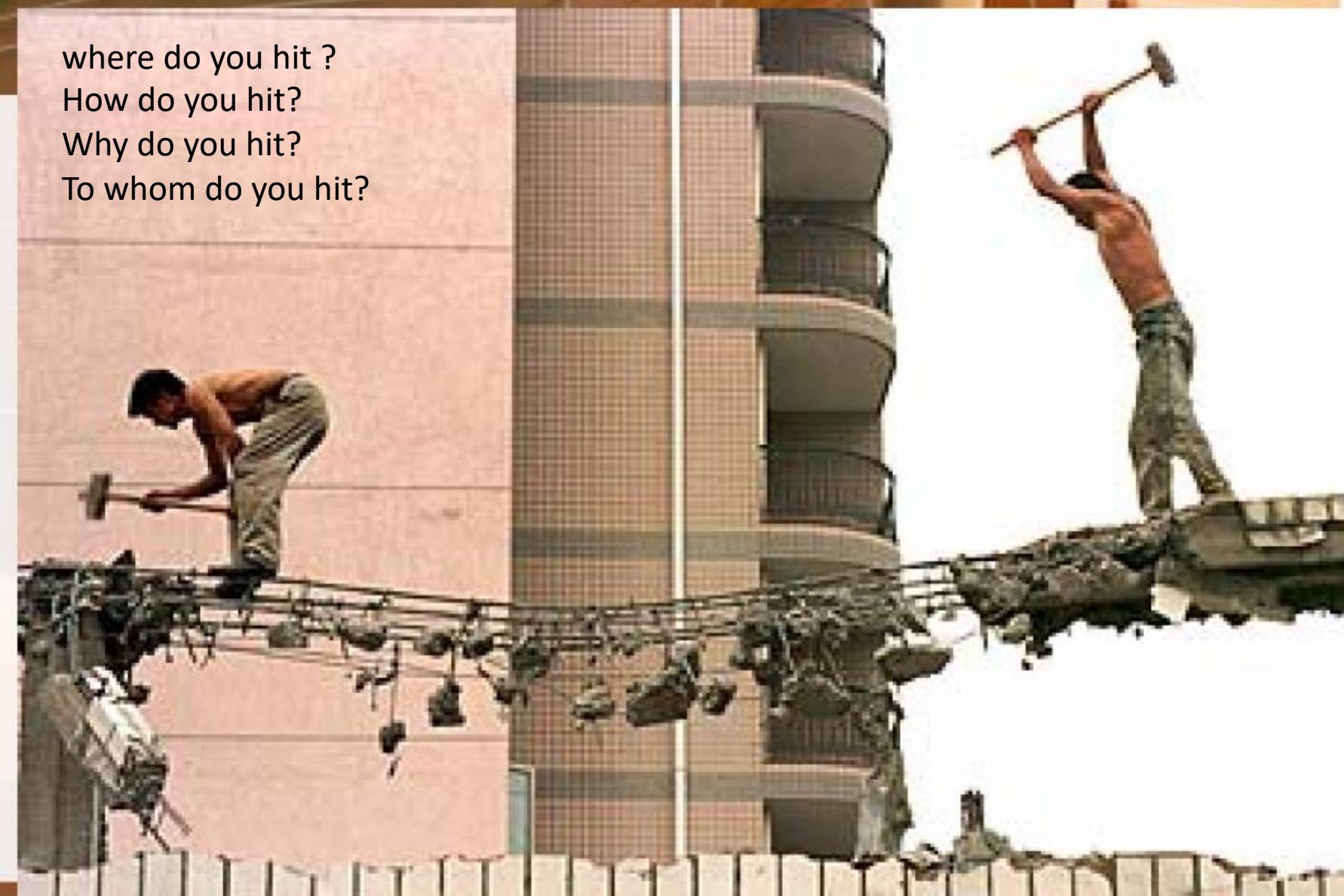
Taking Precaution (önlem)

It refers to eliminate or reduce the risks related to occupational health and safety at all stages of the work carried out in the workplace.



İşyerinde yürütülen işlerin bütün safhalarında iş sağlığı ve güvenliği ile ilgili riskleri ortadan kaldırmak veya azaltmak için planlanan ve alınan tedbirlerdir.

where do you hit ?
How do you hit?
Why do you hit?
To whom do you hit?



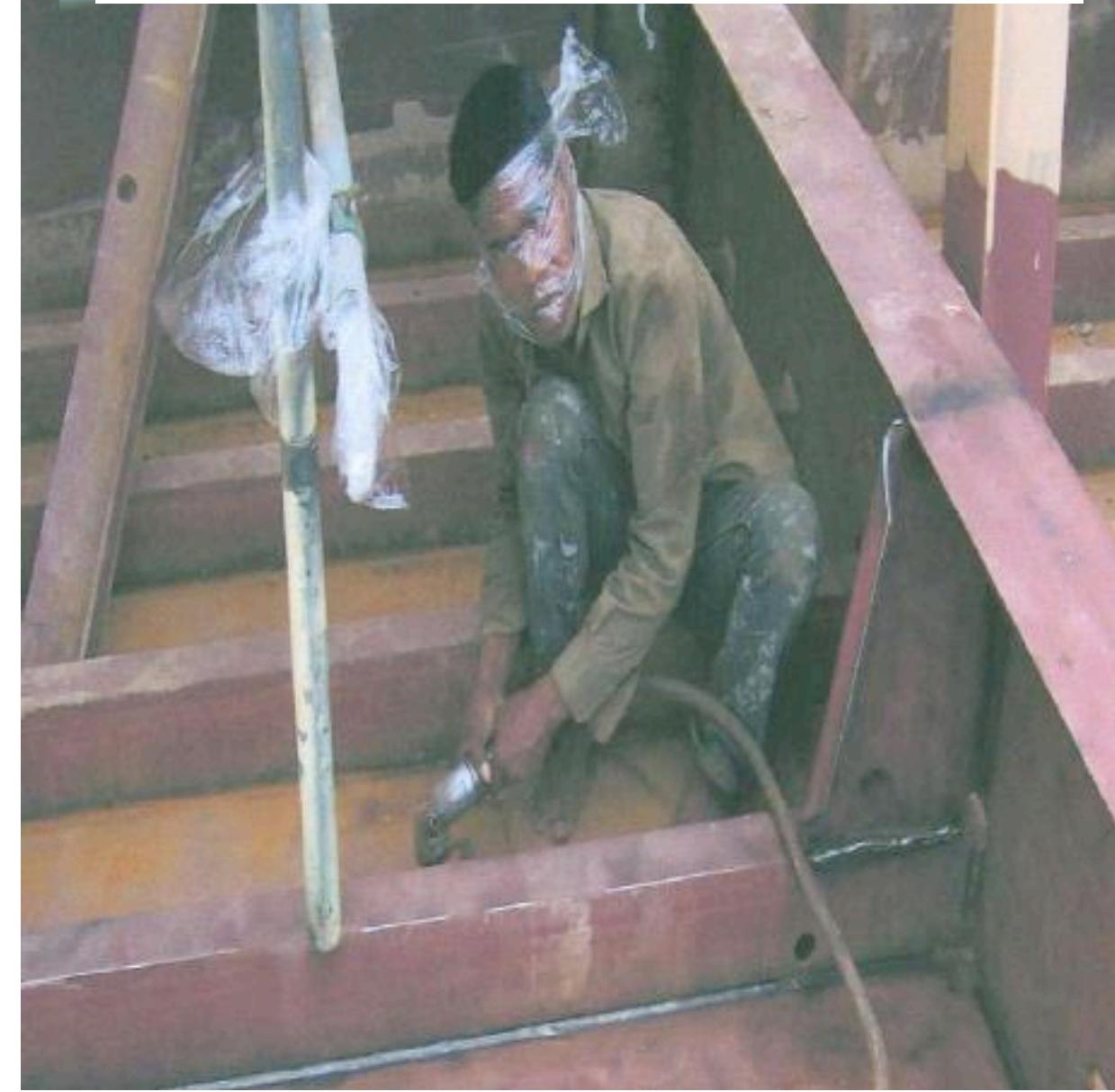
work machine as an umbrella



As an helmet?



Stay out of brath so that nothing splashes in your face



fire to flammable gases?



Basic Concepts & Definitions

Hazard sources are listed below:

- Individual factors
- Environmental factors
- Work related factors
- Factors related with material used
- Factors related with machine/equipment used

They all can cause hazards!

Basic Concepts & Definitions

Incident:



- A work related event in which an injury or ill health or fatality occurred or could have occurred

Accident:

- An incident which an injury or illness actually occurs



Near –Miss :

- An incident where no injury or illness occurs
(an event not causing harm, but **has the potential to cause injury or illness**)

Basic Concepts & Definitions

Accident as a type of Incident
(based on OHSAS)

Incident a work-related event(s) in which an injury or ill health or fatality occurred, or could have occurred.

Accident incident in which an injury or illness actually occurs

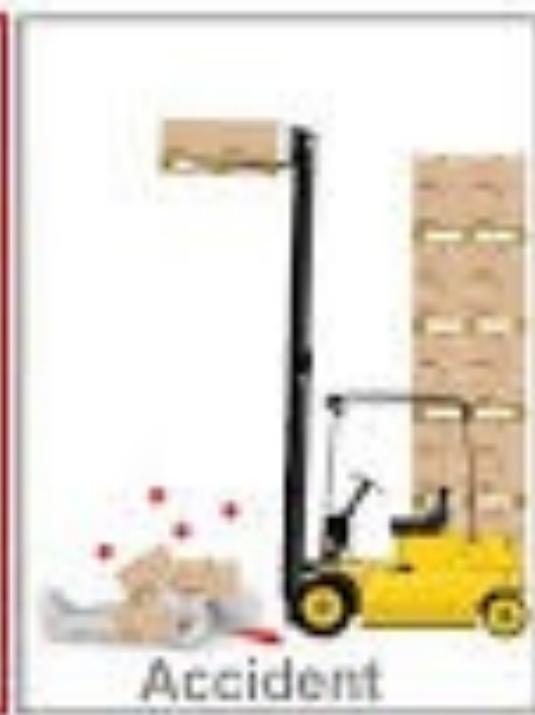
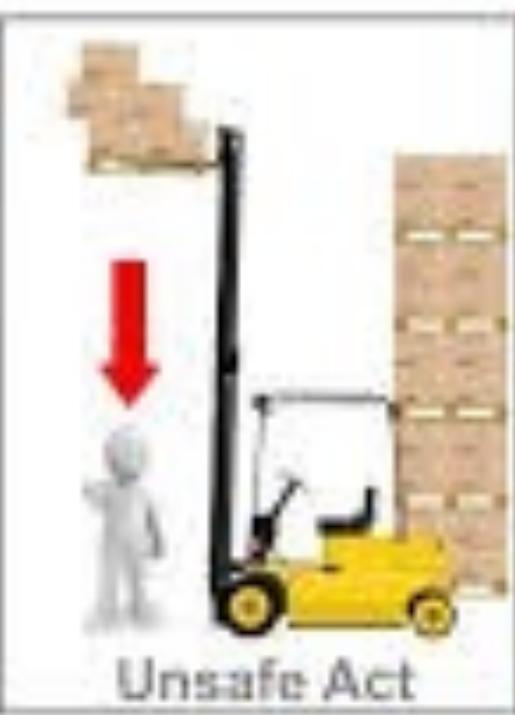
Near-miss an incident where no injury or illness occurs

Near miss



Luckily, the box didn't hurt him.





OCCUPATIONAL HEALTH & SAFETY



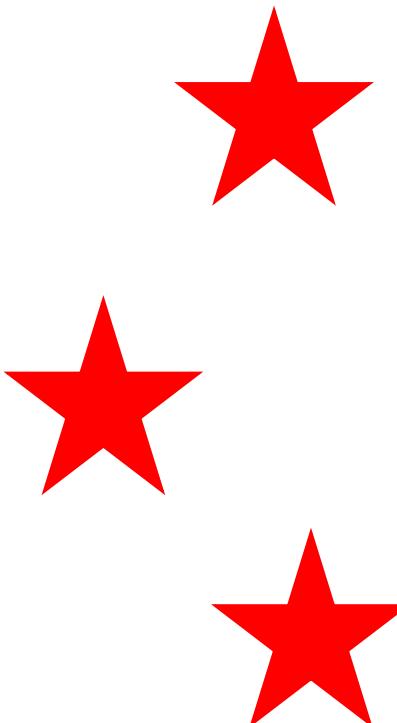
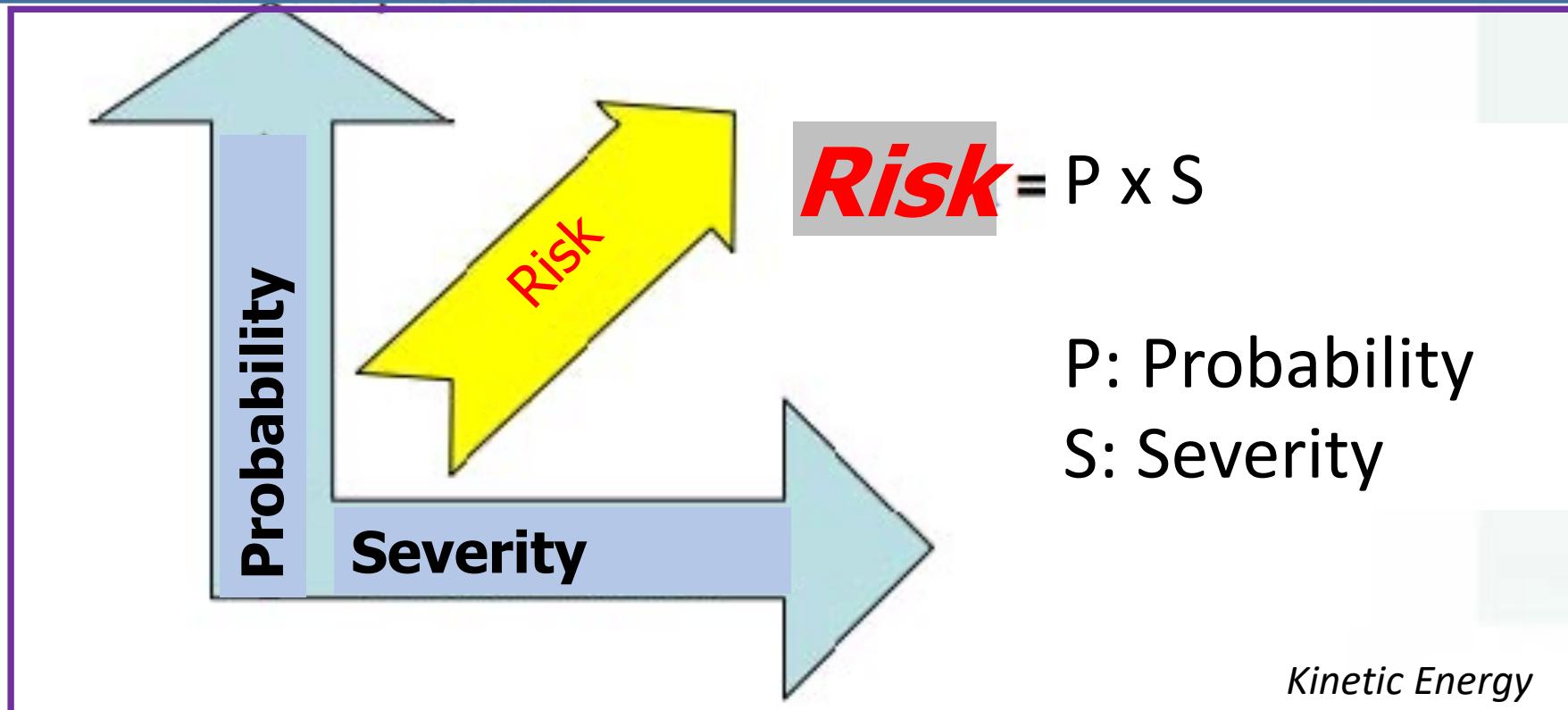
Dr. Elif AKISKA



HAZARD

Potential Energy

- **Potential to cause harm or damage which could affect the worker/the workplace. (OHS Law #6331, Article 3 (1))**



According to these definitions,

the shark is;

Hazard?

Risk ?

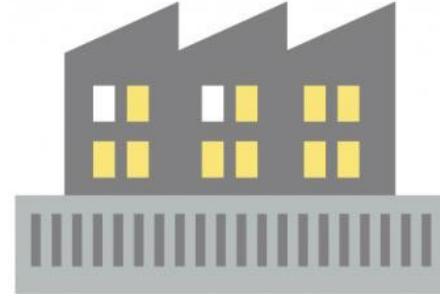


Taking Precaution

It refers to eliminate or reduce the risks related to occupational health and safety at all stages of the work carried out in the workplace.



Status of Turkey (2016) –recorded!



NUMBER OF WORKPLACE

App.1,900,000



NUMBER OF WORKERS

App.18,000,000



NUMBER OF WORK
ACCIDENTS

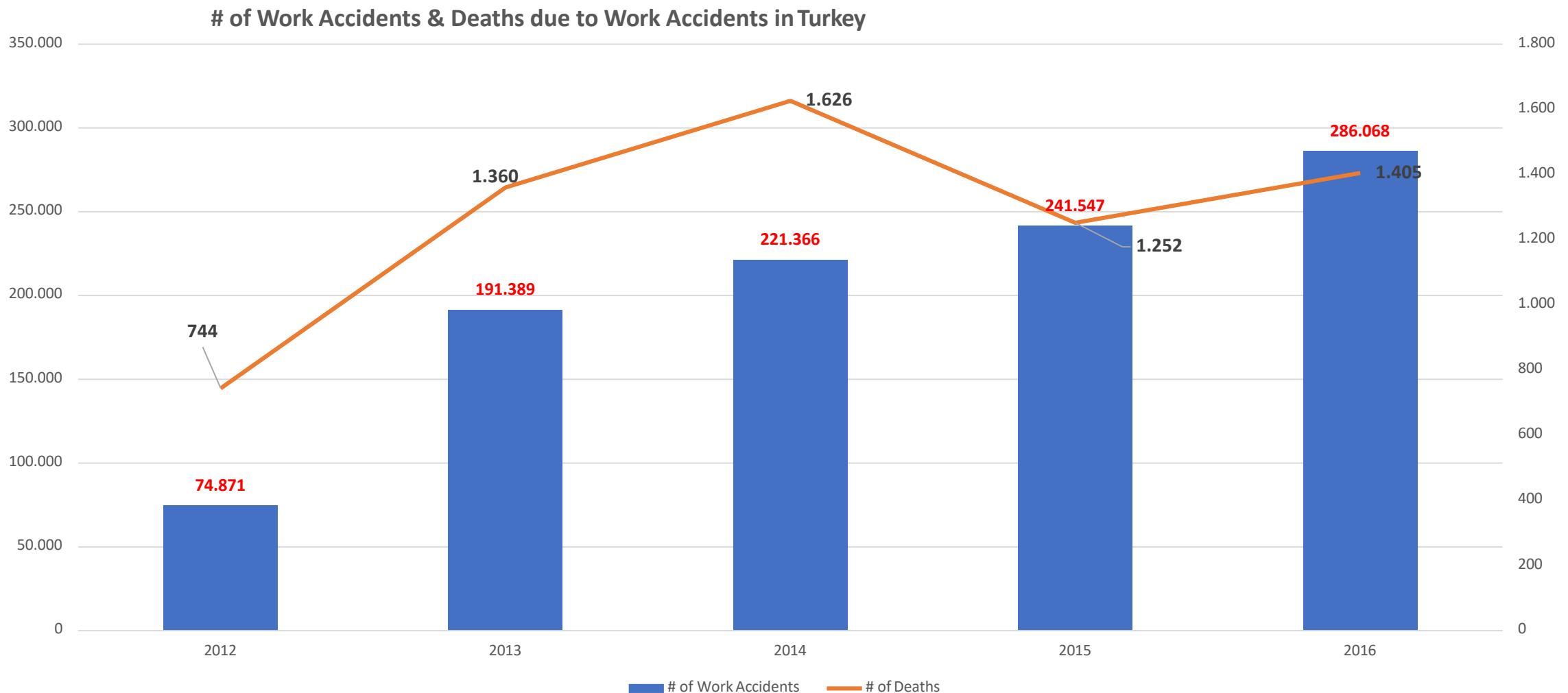
286,068



NUMBER OF WORKERS DIED IN
ACCIDENTS

1,405

STATISTICAL DATA*



*: SGK Statistical Annual

Basic Concepts & Definitions

Occupational Disease:

Any illness associated with a particular occupation or industry. Such diseases result from a variety of biological, chemical, physical, and psychological hazards that are present in the work environment.





98% of work accidents can be prevented !
2% of work accidents are unpredictable,
so it can not be prevented



100 % of occupational diseases can be prevented
by true OHS System!

Basic Concepts & Definitions

Occupational Disease Examples:

Contact Dermatitis  Sourced from working with chemicals (Chemical Hazard)

Occupational Cancer  Sourced from working with chemicals (Chemical Hazard)

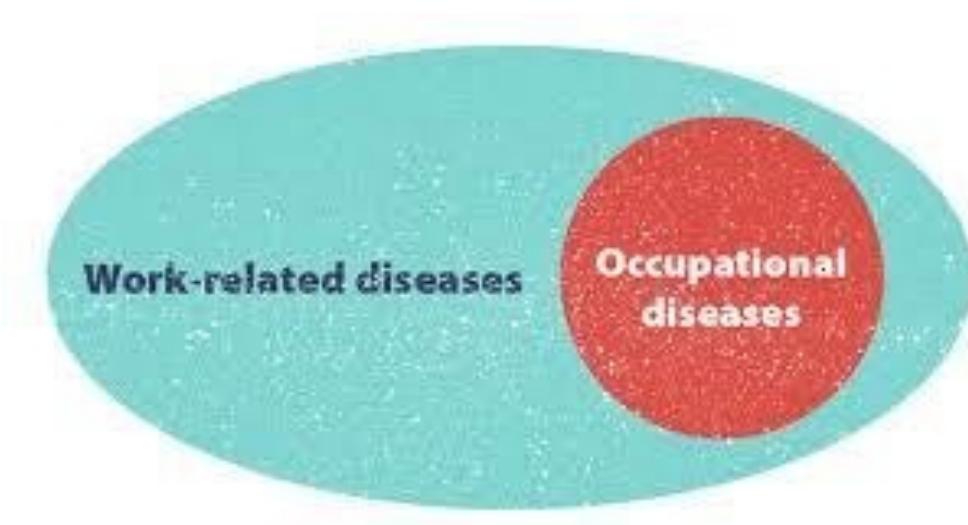
Musculoskeletal Diseases  Sourced from working position(s) (Ergonomical Hazard)

Silicosis  Sourced from fine particles/dust (Physical Hazard)

Basic Concepts & Definitions

Work-Related Disease:

“**Work-related diseases**” have multiple causes, where factors in the **work** environment may play a role, together with other risk factors, in the development of such **diseases**.



In daily life



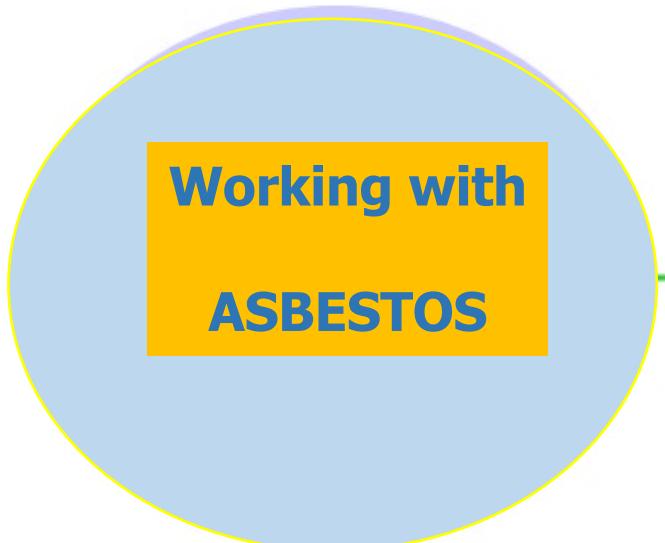
Trigger →

*accelerating
the development
of the disease*

Formaldehyde
Carbon disulphide
Arsenic

**Coronary heart disease
Asthma**

*Work – Related
Diseases*



DIRECT EFFECT

ASBESTOSIS

Occupational Disease !

Basic Concepts & Definitions

Occupational Medicine:

This is concerned with the effect of all kinds of work on health and the effect of health on a worker's ability and efficiency.



Risk Assessment

It is the careful examination of what could cause harm to people, equipment, environment or property.

It is required to know **what the OHS hazards and risks are**,
And to prevent «*personal injury*» , and «*Death*»
and also to prevent the **direct and indirect costs** that follow the accidents.

Basic Concepts & Definitions

Risk Assessment

Risk assessment is a term used to describe the overall process or method where you:

- Identify hazards and risk factors that have the potential to cause harm ([hazard identification](#)).
- Analyze and evaluate the risk associated with that hazard ([risk analysis, and risk evaluation](#)).
- Determine appropriate ways to eliminate the hazard, or control the risk
when the hazard cannot be eliminated (risk control)



Is the risk acceptable or not ?

Risk assessment



Step 1: Identify the hazards.



Step 2: Decide who might be harmed and how.



Step 3: Evaluate the risks and decide on precautions.



Step 4: Record your findings and implement them.

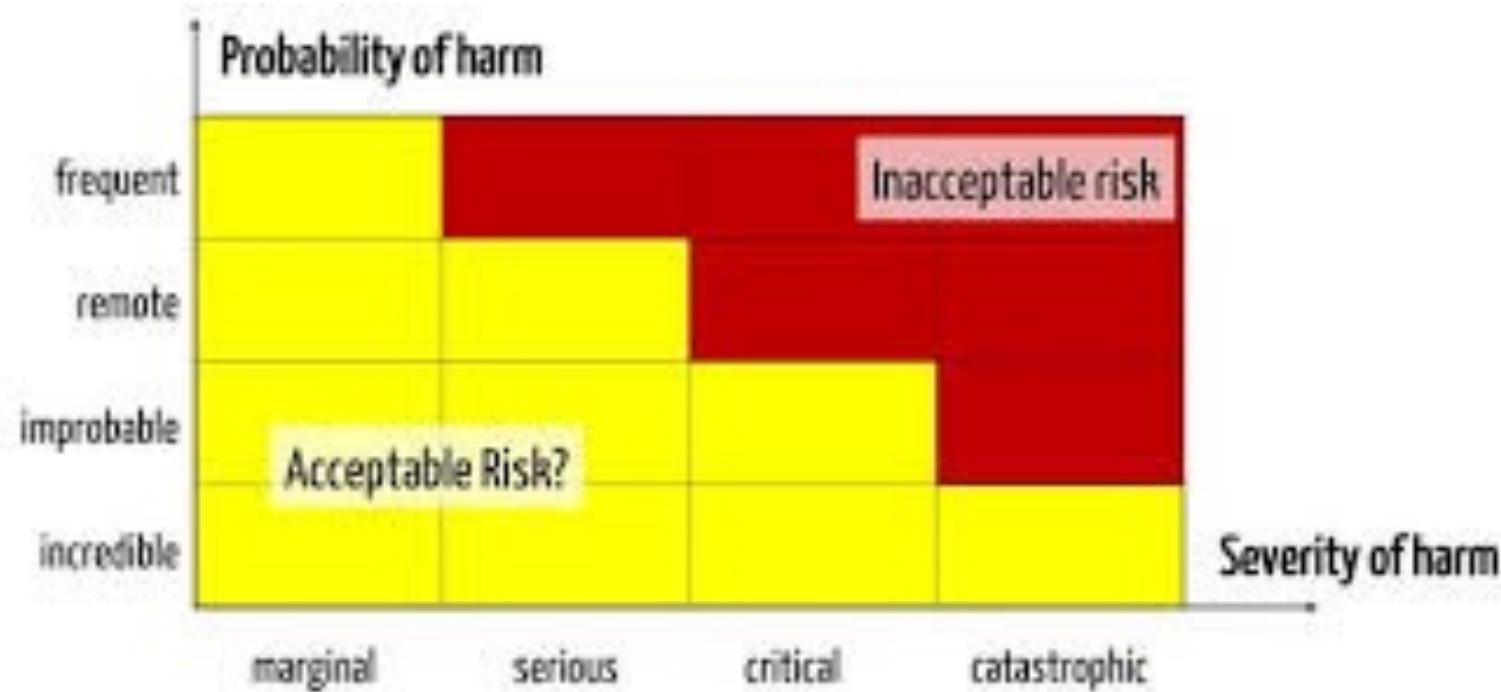


Step 5: Review your assessment and update if necessary.

Acceptable Risk:



acceptable risk is a **risk** that has been reduced to a level that can be tolerated by the organization having regard to its legal obligations and its own **OSH** policy



RISK ASSESSMENT

HAZARD	RISK	Probability	Severity	Present Risk Assessment (probability x severity)	Present measure	Measures to be taken	New Probabiliy	New Severity	New Risk Assessment (probability x severity)
Working with Asbestos	Serious lung diseases if fibres released into air and inhaled.	Very high (5)	Very high (5)	Very high (25)	No	1) Elimination 2) Substitution 3) Engineering methods 4) Administrative methods 5) PPE	Low (2)	Very high (5)	Low (10)
Flammable gases	Fire, Smoke inhalation, Burns	High (4)	Very high (5)	Very high (20)	No	Correct Storage, caution signs, tranings, PPE	Low (2)	Very high (5)	Low (10)
Manuel handling	Suffering from back pain	High (4)	High (4)	Very high (16)	No	Use lift truck, porters trolley etc., training	Very Low (1)	High (4)	Very Low (4)
Noise	Hearing damages	Very high (5)	Very high (5)	Very high (25)	No	Caution signs	High (4)	Very high (5)	Very high (20)
Noise	Hearing damages	Very high (5)	Very high (5)	Very high (25)	No	Using Ear plugs when it exceeds 85 dB	Low (2)	Moderate (3)	Very Low (6)

Must be done again



Table. An example for a risk assessment

RISK ASSESSMENT

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Must be done again



Table. An example for a risk assessment

Recommended references:

- https://www.google.com.tr/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwjgqufxgP_WAhXBCpoKHdbiC9kQtwIIMDA_B&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3Da-YkLaFvmo8&usg=AOvVaw06eb5XbQtYH1DdorOUAyig
- <https://www.youtube.com/watch?v=xwsmMue2q18>
- https://www.google.com.tr/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwipjcvVg_WAhVJKpoKHbvEBwAQyCkIJzAA&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DHD1e3uc_eQE&usg=AOvVaw1oc9wxLNRlclglgu1NtYny
- [https://www.researchgate.net/publication/327795051 Occupational Health Risk Assessment in the Electronics Industry in China Based on the Occupational Classification Method and EPA Model](https://www.researchgate.net/publication/327795051_Occupational_Health_Risk_Assessment_in_the_Electronics_Industry_in_China_Based_on_the_Occupational_Classification_Method_and_EPA_Model)
- <https://www.examples.com/business/job-risk-assessment-examples.html>
- [https://www.academia.edu/573832/Classification and Analysis of Risks in Software Engineering](https://www.academia.edu/573832/Classification_and_Analysis_of_Risks_in_Software_Engineering)
- [https://www.researchgate.net/publication/6533726 Risk Assessment - Hospital View in Selecting Medical Technology](https://www.researchgate.net/publication/6533726_Risk_Assessment_-_Hospital_View_in_Selecting_Medical_Technology)
- [https://www.researchgate.net/publication/275642286 Workplace Hazards Risks Control](https://www.researchgate.net/publication/275642286_Workplace_Hazards_Risks_Control)
- [https://www.westernsydney.edu.au/_data/assets/pdf_file/0020/12917/12917 Hazard Identification, Risk Assessment and control Procedure.pdf](https://www.westernsydney.edu.au/_data/assets/pdf_file/0020/12917/12917_Hazard_Identification,_Risk_Assessment_and_control_Procedure.pdf)
- <https://ailevecalisma.gov.tr/medias/4577/kitap10.pdf>
- [https://www.researchgate.net/publication/290654558 Occupational Risks of Health Professionals in Turkey as an Emerging Economy](https://www.researchgate.net/publication/290654558_Occupational_Risks_of_Health_Professionals_in_Turkey_as_an_Emerging_Economy)
- [https://www.researchgate.net/publication/336836371 Effects of Occupational Health and Safety Training Conducted in the Workplaces on Safety Behaviour in Turkey An Evaluation in the Private Security Sector](https://www.researchgate.net/publication/336836371_Effects_of_Occupational_Health_and_Safety_Training_Conducted_in_the_Workplaces_on_Safety_Behaviour_in_Turkey_An_Evaluation_in_the_Private_Security_Sector)
- http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=92011
- [https://www.academia.edu/34854688/OCCUPATIONAL HEALTH AND SAFETY ACT No 6331 TURKEY](https://www.academia.edu/34854688/OCCUPATIONAL_HEALTH_AND_SAFETY_ACT_No_6331_TURKEY)
- <https://www.worksafe.vic.gov.au/resources/controlling-ohs-hazards-and-risks-handbook-workplaces>
- www.worksafe.wa.gov.au
- www.safetyline.wa.gov.au



**“Don’t worry. We can clean up after we
get back from the safety meeting.” ? ?**

OCCUPATIONAL HEALTH & SAFETY



Dr. Elif AKISKA

The main purposes of OHS are;

** to assure safe and healthful working conditions for employees

(çalışanların sağlığını korumak)

**to prevent work accidents and occupational diseases.

(iş kazalarını ve meslek hastalıklarını önlemek)

**to provide security and continuity in production.

(ürümde güvenliği ve devamlılığı sağlamak)

**to provide a healthy and safe working environment

(Sağlıklı ve güvenli çalışma ortamı oluşturmak)

As a result, quality and efficiency increase



1) Identify the hazards.



2) Identify the risks.

3) Decide on precautions

4) Record your findings and implement them

5) Review and update

HAZARD	RISK	Probability	Severity	Present Risk Assessment (probability x severity)	Present measure	Measures to be taken	New Probability	New Severity	New Risk Assessment (probability x severity)
Working with Asbestos	Serious lung diseases if fibres released into air and inhaled.	Very high (5)	Very high (5)	Very high (25)	No	1) Elimination 2) Substitution 3) Engineering methods 4) Administrative methods 5) PPE	Low (2)	Very high (5)	Low (10)
Flammable gases	Fire, Smoke inhalation, Burns	High (4)	Very high (5)	Very high (20)	No	Correct Storage, caution signs, trainings, PPE	Low (2)	Very high (5)	Low (10)
Manuel handling	Suffering from back pain	High (4)	High (4)	Very high (16)	No	Use lift truck, porters trolley etc., training	Very Low (1)	High (4)	Very Low (4)
Noise	Hearing damages	Very high (5)	Very high (5)	Very high (25)	No	Caution signs	High (4)	Very high (5)	Very high (20)
Noise	Hearing damages	Very high (5)	Very high (5)	Very high (25)	No	Using Ear plugs when it exceeds 85 dB	Low (2)	Moderate (3)	Very Low (6)

Who must do the Risk Assessment?

- 1) Employer
- 2) OHS Expert
- 3) Workplace doctor
- 4) Working agent
- 5) Authorized staff



They all must sign the Risk Assessment

feel B.T.
S.J. feel W. feel
feel Magi Bony

So,

Occupational Health and Safety:

Improves a company's occupational health and safety standards.

Ensures good business,

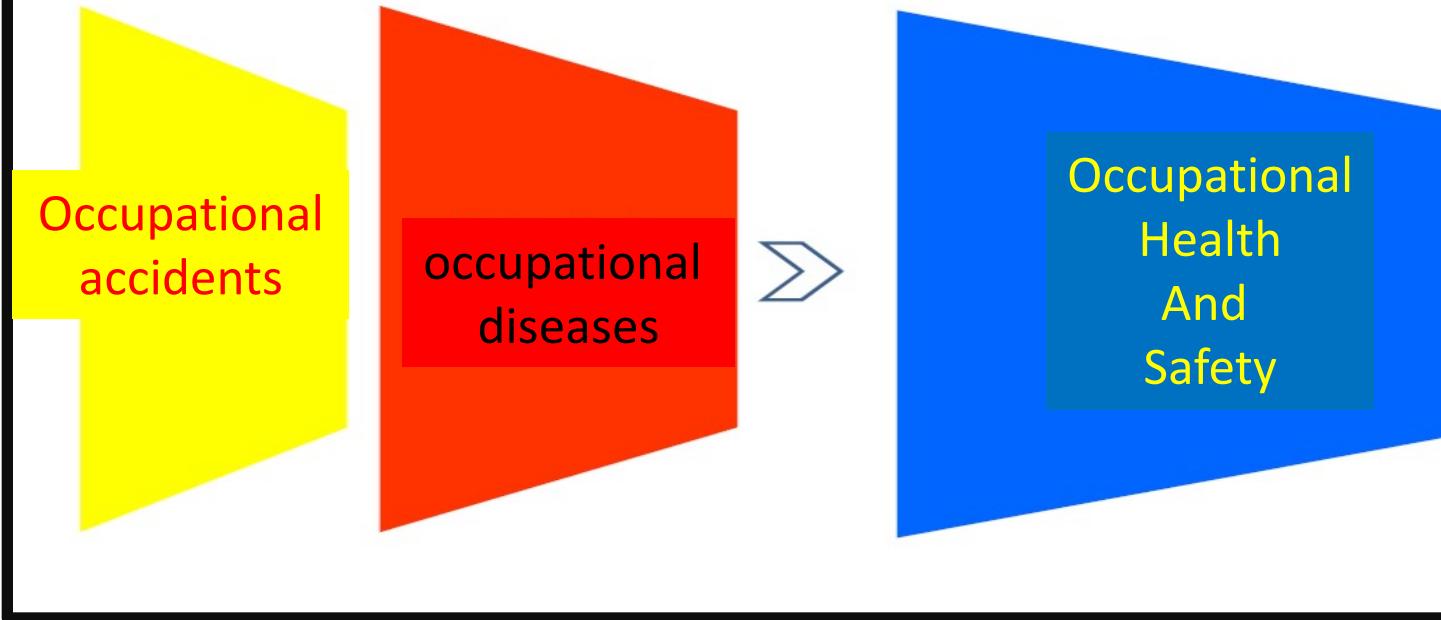
Protects the physical and mental health of the employee, a better brand image, and higher employee morale etc.



These studies are; **systematic and scientific studies** that are carried out in order to protect themselves from conditions that may harm health at workplaces.

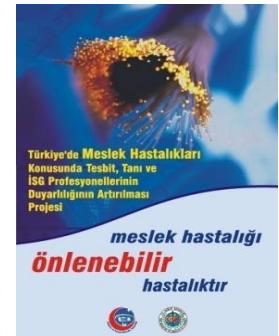


Because of



is required..

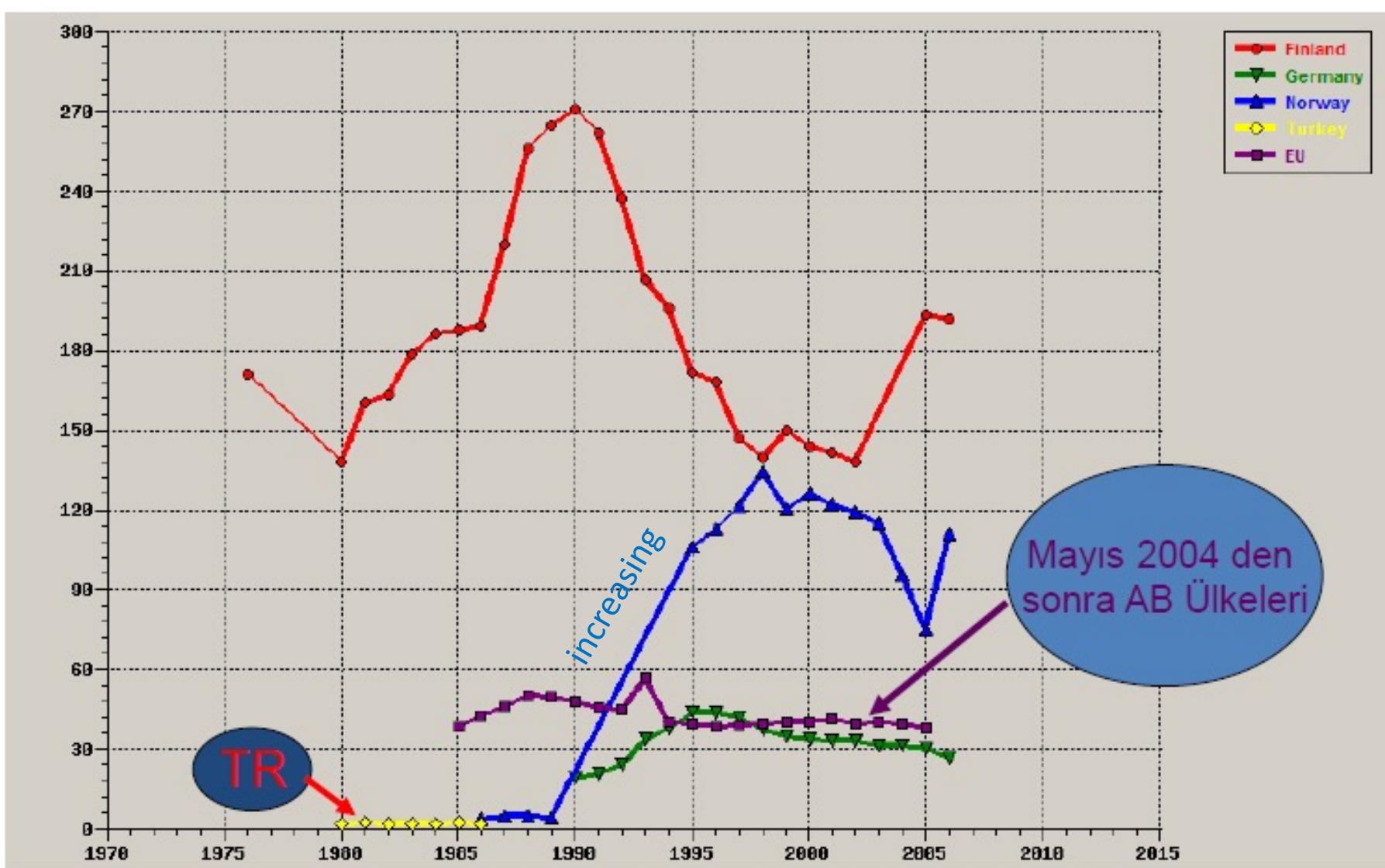
Occupational diseases can be avoided completely = 100 %.



98% of Work accidents can be avoided. 

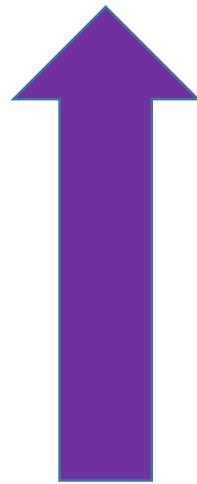
2009

Lets have a look at Occupational Disease Statics in world



According to these data;
Turkey has no data about
occupational diseases.

?



Development in
OHS

Occupational accidents

Occupational diseases

SAFETY F1RST

Safety is my
responsibility.



Labor laws from past to present



**DEVELOPMENT OF CONCEPT AND RULES OF
OCCUPATIONAL HEALTH AND SAFETY
IN WORLD AND TURKEY**

Historical Development of OHS in the World

- **Before the industrial revolution:**



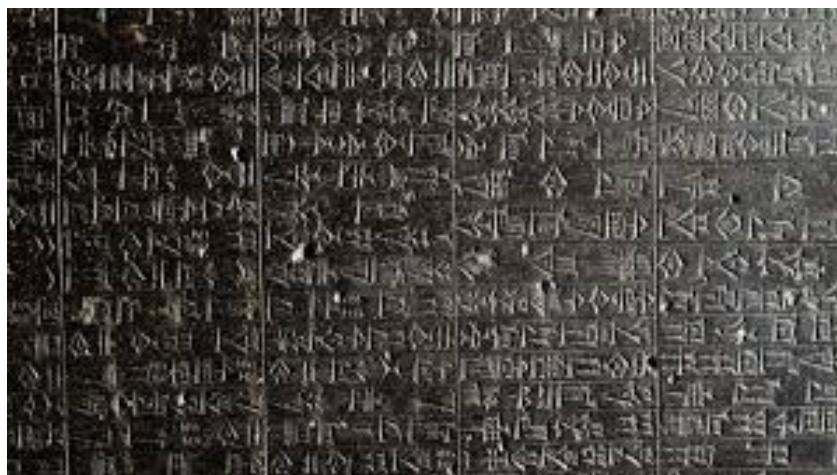
- Production techniques and forms have also changed throughout the production process, *beginning with the first human*.
- The development of **stone and soil**, the development of **mining** techniques, the possession of **fire**, the increasing use of **steam** power, and the development of **work tools and production tools** have been significant influences.
- Studies to solve the problems brought about by the developments in the working life have been fundamental elements in the development of worker health and work safety.
- For this reason, the history of establishing a relationship between work and health depends on ancient times.



Hammurabi Law (The first Law)

first law in the area of Occupational Health and Safety.

- In the B.C. 2000s, **Hammurabi**, the founder of the Babylonian Empire (1819-1950 BC) prepared **Hammurabi Laws**. This law included Health and Safety provisions on OHS.



*Bu kanun İş Sağlığı ve Güvenliği kapsamındaki **ilk kanun** kabul edilir.*

Historical Development of OHS in the World

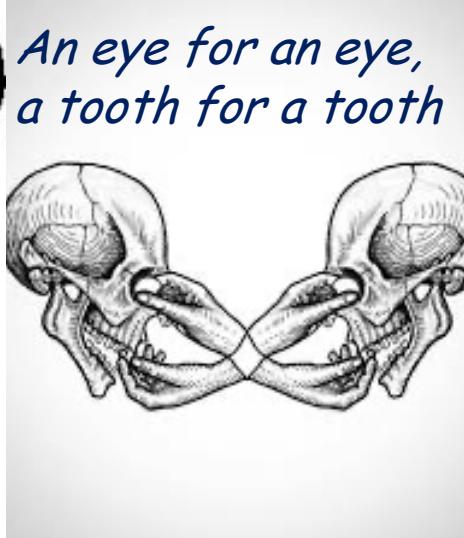
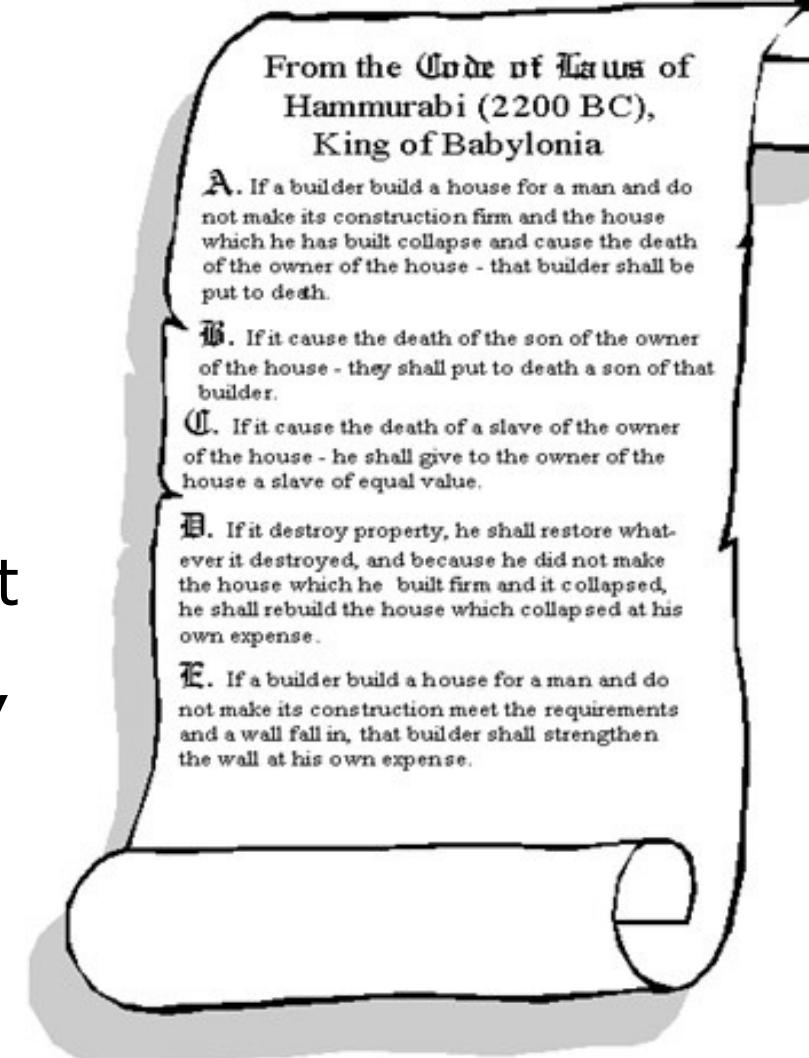
- According to Hammurabi Laws:

- If a builder built a house for someone, and did not construct it properly, and the house which he built collapsed and killed its owner, then that builder would be put to death'

[Law 229]

- 'If it killed the son of the owner, the son of that builder would be put to death' **[Law 230]**

- 'If it killed a slave of the owner, then he would pay for a slave to the owner of the house' **[Law 231]**



*An eye for an eye,
a tooth for a tooth*

In ancient times, most of the manual labor was performed by slaves.
Slaves were unfortunately considered to be valuable capital assets.

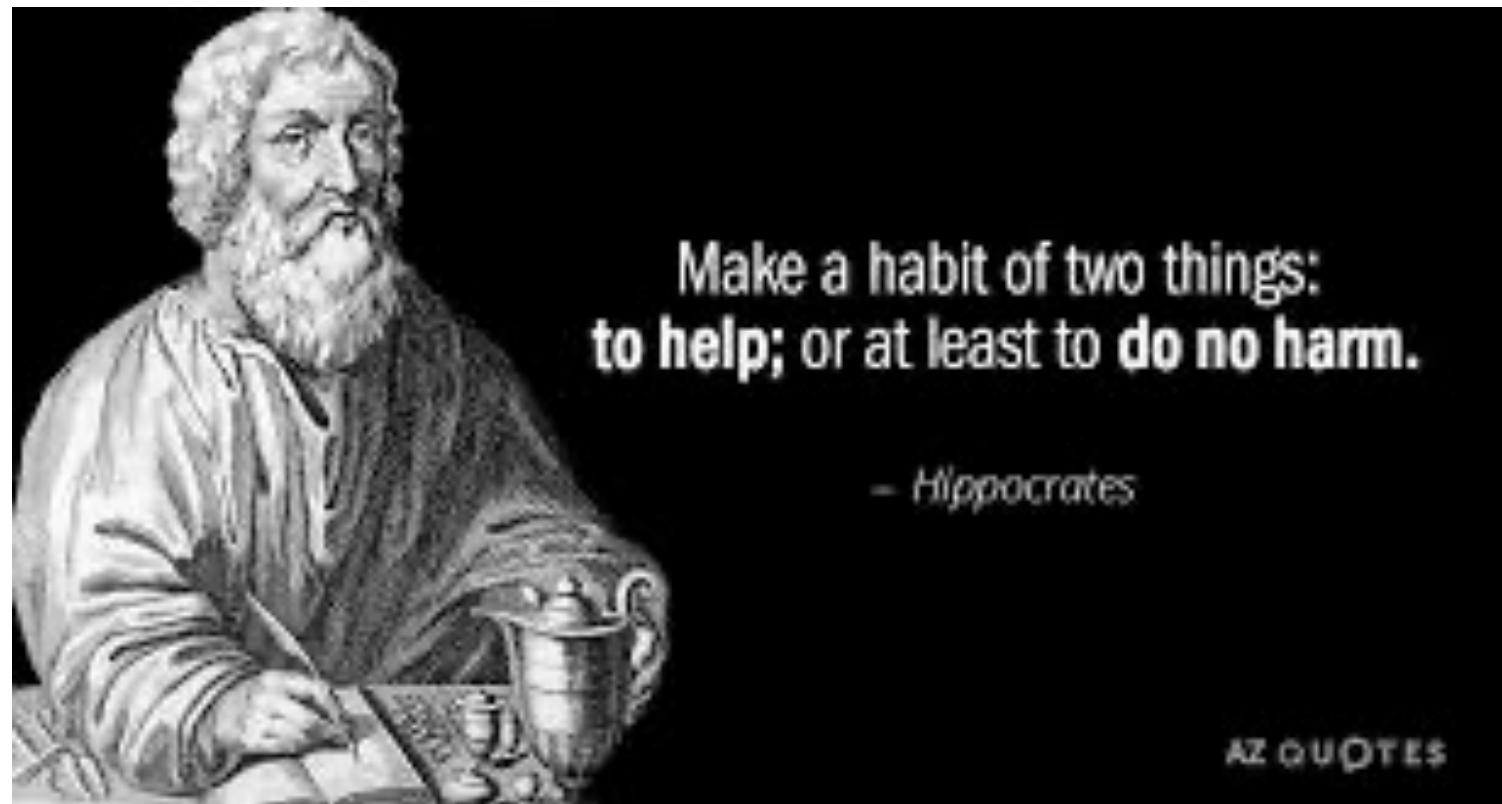
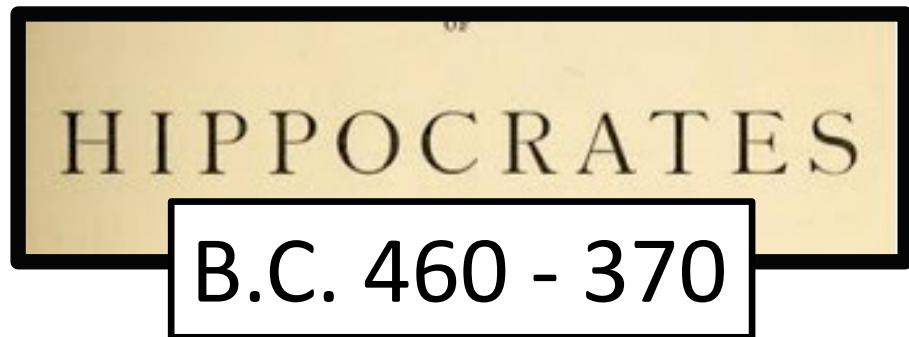


Working in mining regions was so dangerous.
So it was considered suitable **for only slaves**. 

- **Pliney the Elder (AD 23-79)**: wrote a book
about the diseases of slaves.

He recorded the danger of breathing of fumes
and vapors to the miners.





He mentioned the harmful effects of
Lead (Pb) element
for the first time

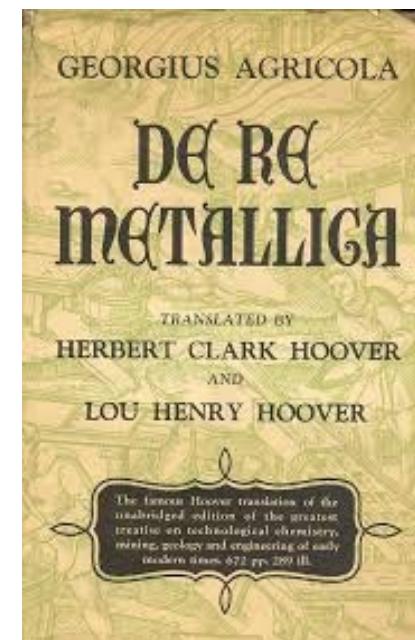


- **Georgeius Agricola (1494-1555):**, the first known mineralogy scientist, published a book in 1530 “**De Re Metallica**” (based on *the Nature of Metals*)

It is about the state of the art of mining, refining, and smelting metals.



The book was an important chemistry text in the history of chemistry.



Question. Who wrote the «De Re Metallica» book?
Answer: Agricola

Bernardino Ramazini: father of OHS

(1633-1714- ITALIAN)



Bernardino Ramazzini, padre della Medicina del Lavoro

He wrote a book: «De Morbis Artificum Diatriba»



He focused on the worker's health problems in a systematic way.

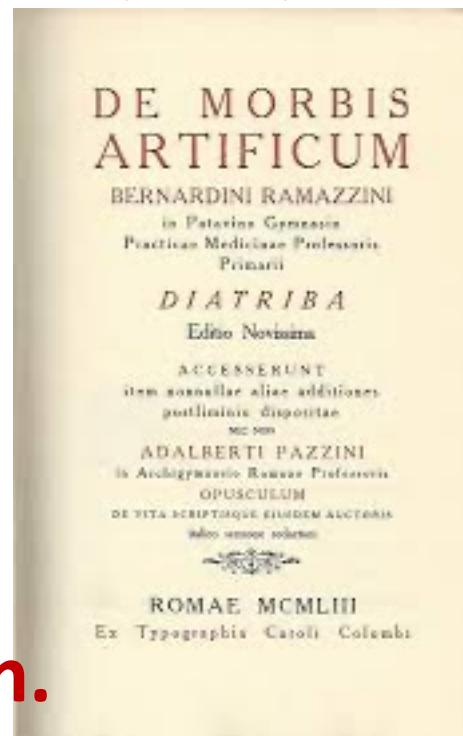
He described diseases associated with various occupations.

He described metal poisoning in miners.

He tried to build-up a relationship between disease and job tasks.



★ «what is your occupation?» question was asked by him.



The period of *industrial revolution*

There are other laws to regulate the working hours and to make arrangements for who can work in mining operations and how many hours they can work.

1802: 'Health and Moral Acts of Apprentices
In England 

Fisrt law regulating the workin hours

No children & women , 58 hours/week

Some limitations to working hours in mining operations.

1833: Factory Regulations for Machine Guarding

- Can't employ children younger than 10
- Younger than 18 can not be employed more than 12 hours

• **1847:** Employment Age regulated

- Max 10 hours working

1867: the law enacted for child workers.

Tanzimat Period:

1865: Dilaverpaşa Regulations (DİLAVERPAŞA NİZAMNAMESİ)

during II. Mahmut period.

The first legal regulation on
OHS in Turkey!!

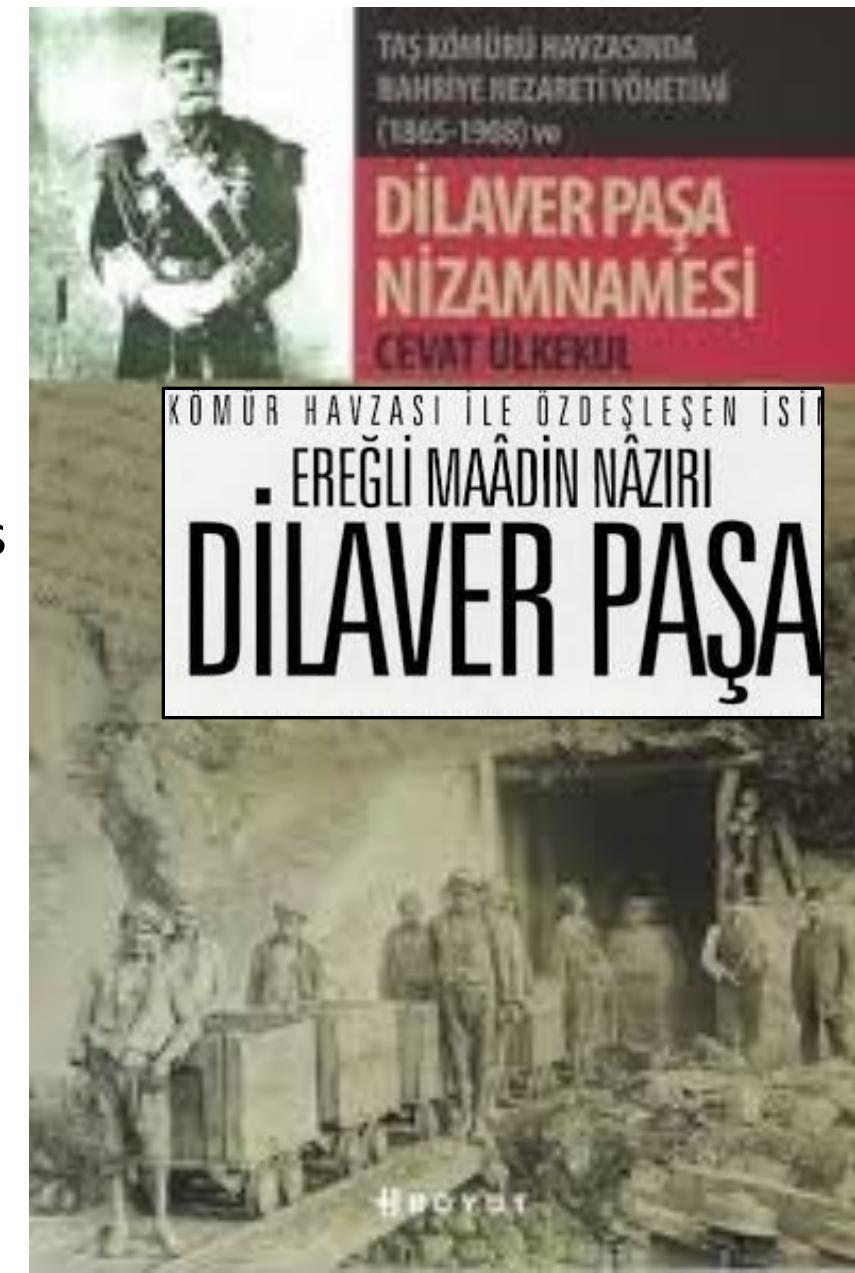




- According to Dilaverpaşa Nizamnamesi;
- 1) Coal** employers should provide accomodation for workers
- 2) working hours were determined as maximum 10 hours.
- 3) A physician should work in the mine



An obligatory !



There are other laws to make regulations for workers

1869 : Maadin Nizamnamesi : is the second regulation after Dilaverpaşa Nizamnamesi.

But it was not applied to work life and realized.

1871: Ameleperver Cemiyeti

1895: Osmanlı Amele Yardımlaşma Cemiyeti

- *Tersane-i Amiriye ve Mensip İşçilerin Emeklilikleri Hakkında Tüzük,*
 - *Hicaz Demir Yolu Memur ve Hizmetlerine Hastalık Kaza Hallerinde Yardım Tüzüğü,*
 - *Askeri Fabrikalar Tüzüğü (daha çok sosyal yardım amaçlı hükümler içermiştir)*

Republic Period

1924: Hafta tatili hakkında kanun

1926: Borçlar Kanunu

1930: Belediyeler Yasası

DURING THE REPUBLIC PERIOD



First Labor law: → LAW NO 3008 in 1937

LAW NO 931 in 1967

LAW NO 1475 in 1971

LAW NO 4857 in 2003



LAW



First OHS LAW: 30 June 2012

(ilk iş sağlığı ve güvenliği kanunu)



<http://iskanunu.com/portal/wp-content/uploads/2012/07/6331-sayili-is-sagligi-guvenligi-kanunu.pdf>

<https://www.lawsturkey.com/law/occupational-health-and-safety-law>

OHS Law No 6331



5- sections *(Bölüm)*

39- Articles *(Madde)*

8- Temporary Articles *(Geçici Madde)*

36- Regulations *(yönetmelik)*

5- Communiqué *(Tebliğ)*

Özetle;

1937 yılı



**3008
Sayılı**



İş yerinde sağlığın korunması ile ilgili yasa ilk kez 3008 sayılı İŞ KANUNU ile çıktı!

1967 yılı



**931
Sayılı**

1971 yılı



**1475
Sayılı**

2003 yılı



**4857
Sayılı**

2012 yılı



**6331
Sayılı**

**1. İŞ SAĞLIĞI
KANUNUDUR**

Recommended Literature:

- [https://www.researchgate.net/publication/286003416 Hippocrates the father of clinical medicine and Asclepiades the father of molecular medicine](https://www.researchgate.net/publication/286003416_Hippocrates_the_father_of_clinical_medicine_and_Asclepiades_the_father_of_molecular_medicine)
- [https://www.researchgate.net/publication/11817798 Bernardino Ramazzini The Father of Occupational Medicine](https://www.researchgate.net/publication/11817798_Bernardino_Ramazzini_The_Father_of_Occupational_Medicine)
- [https://www.researchgate.net/publication/339000991 PHYSICIAN HUMANITIES OCCUPATIONAL HEALTH AND SAFETY IN THE WORLD](https://www.researchgate.net/publication/339000991_PHYSICIAN_HUMANITIES_OCCUPATIONAL_HEALTH_AND_SAFETY_IN_THE_WORLD)
- <https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture-notes/env-occupational-health-students/ln-occ-health-safety-final.pdf>
- [https://www.bclaws.ca/civix/document/id/crbc/crbc/296 97 multi](https://www.bclaws.ca/civix/document/id/crbc/crbc/296_97_multi)
- [https://www.researchgate.net/publication/264826329 Osmanli Imparatorlugu'nun Son Doneminden Cok Partili Doneme Madencilik Politikaları 1861-1948 Mining Policies from Ottoman's Last Era to Multi-Party Period](https://www.researchgate.net/publication/264826329_Osmanli_Imparatorlugu'nun_Son_Doneminden_Cok_Partili_Doneme_Madencilik_Politikaları_1861-1948_Mining_Policies_from_Ottoman's_Last_Era_to_Multi-Party_Period)
- <http://www.oicvet.org/oshnet/files/journal1-isgum.pdf>
- <https://www.lawsturkey.com/law/occupational-health-and-safety-law>
- [https://www.researchgate.net/publication/311987345 Assessment of Occupational Safety and Health Law in Turkish Industrial Relations](https://www.researchgate.net/publication/311987345_Assessment_of_Occupational_Safety_and_Health_Law_in_Turkish_Industrial_Relations)
- [https://www.researchgate.net/publication/311987345 Assessment of Occupational Safety and Health Law in Turkish Industrial Relations](https://www.researchgate.net/publication/311987345_Assessment_of_Occupational_Safety_and_Health_Law_in_Turkish_Industrial_Relations)
- TGNA (2012), Ordinal Number: 277, Draft on Occupational Health and Safety Law and commission reports, <http://www.tbmm.gov.tr/sirasayi/donem24/yil01/ss277.pdf> (Turkish Version- Access 11th July 2013).
- https://www.google.com.tr/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwjjqufxgP_WAhXBCpoKHdbiC9kQtwIIMDAB&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3Da-YkLaFvmo8&usg=AOvVaw06eb5XbQtYH1DdorOUAyig
- https://www.google.com.tr/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwipjcvVg_WAhVJKpoKHbvEBwAQyCkIJzAA&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DHD1e3uc_eQE&usg=AOvVaw1oc9wxLNRIclglgu1NtYny
- https://www.healthmanagement.co.uk/sites/default/files/paragraph/image/Health-Management_brief-history-occupational-health.pdf
- <http://www.lawsturkey.com/law/labor-act-law-of-turkey-4857>
- <https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/64083/77276/%20F75317864/TUR64083%20English.pdf>
- http://www.cakmak.av.tr/articles/Pharmaceuticals_Healthcare/Law%20on%20Occupational%20Health%20and%20Safety.pdf

OCCUPATIONAL HEALTH & SAFETY



Dr. Elif AKISKA



Labor Laws in Turkey



First Labor law: → LAW NO 3008 in 1937

LAW NO 931 in 1967

LAW NO 1475 in 1971

LAW NO 4857 in 2003

this is the labor law that we are responsible for.

LAW

OHS Law No 6331

Law on Occupational Health and Safety

30 June 2012



5- sections *(Bölüm)*

39- Articles *(Madde)*

8- Temporary Articles *(Geçici Madde)*

36- Regulations *(yönetmelik)*

5- Communiqué *(Tebliğ)*



OHS Law No. 6331

Objective of this law is,

to regulate duties, authority, responsibility, rights and obligations of employers and workers,

to ensure occupational health and safety at workplaces,

to improve existing health and safety conditions.



According to this law:

- ALL EMPLOYEES ARE PROTECTED WITHOUT PUBLIC AND PRIVATE SECTOR DISCRIMINATION...

Including:



Without the number limit,



Officer, employee, employer, apprentice, intern, all employees,

All public and private sector jobs and workplaces,

All businesses including agriculture etc.

Exceptions:



Turkish Armed forces, police officers, disaster response teams,

home services, self-employed workers



According to OHS Law No.6331;

Occupational health and safety services are prepared;

To carry out studies for the prevention and protection of occupational risks;
Occupational safety specialists, workplace physicians and other health personnel are assigned among the employees by their employers.



law no. 6331

Before



- Worker healthy and safety
- (işçi sağlığı ve güvenliği)



After



Occupational health and safety
(iş sağlığı ve güvenliği)



- reactive approach
- Post-accident
- (Reaktif yaklaşımlar)



proactive approach
Pre-accident
(Proaktif yaklaşımlar)

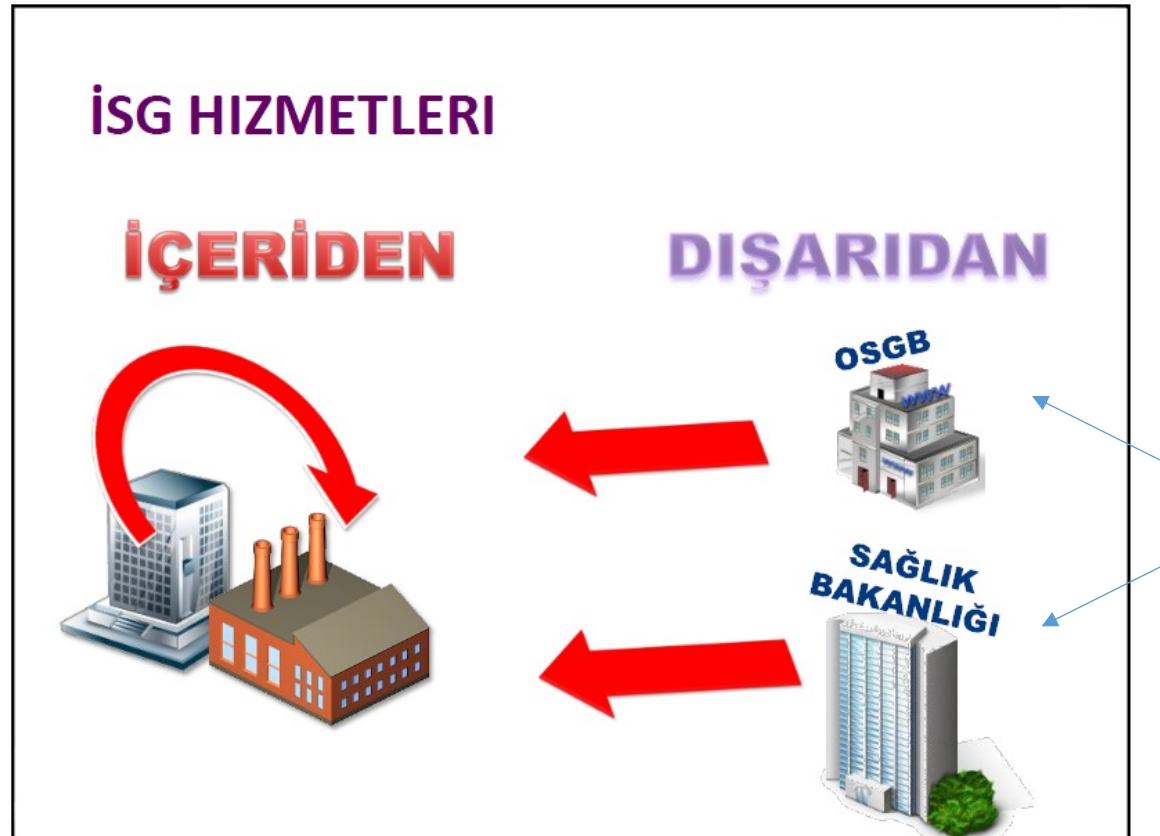


- personal protection methods
- (kişisel korunma yöntemleri)



Bulk protection methods
(toplu korunma yöntemleri)

If there is no employee who has a OHS certificate; where the employer can find a specialist from?



- Outside of work place such as OSGB and Ministry of Health

OSGB: Ortak Sağlık Güvenlik Birimi
Public Health and Safety Unit

OSGB: Public Health and Safety Unit

- The unit authorized by the Ministry, which has the necessary equipment and personnel to provide occupational health and safety services to the workplaces.



**işyerlerine iş
sağlığı ve güvenliği
hizmetlerini sunmak
üzere kurulan gerekli
donanım ve
personelle sahip olan
Bakanlıkça
yetkilendirilen birim**

Today, the law says;

- If the number of employees in a workplace is between 1-9
 - And
- If the workplace is accepted as «hazardous» or «much hazardous»
- So;
- OHS services will be supplied by the government to that workplace.



Evolution Before and After

	2012 Haziran	2014 Şubat	Değişim %
number of occupational safety specialists	8.665	89.719	1035
number of workplace physicians	8.446	21.073	250
Number of Public Health and Safety Unit	195	1.270	651
İş Güvenliği Uzmanlığı Sözleşmesi	1.754	99.793	5689
İşyeri Hekimliği Sözleşmesi	8.936	96.825	1084
Number of Educational Institutions	49	239	488
Number of Trainers	913	3878	425

If you are an OHS Specialist; you must:

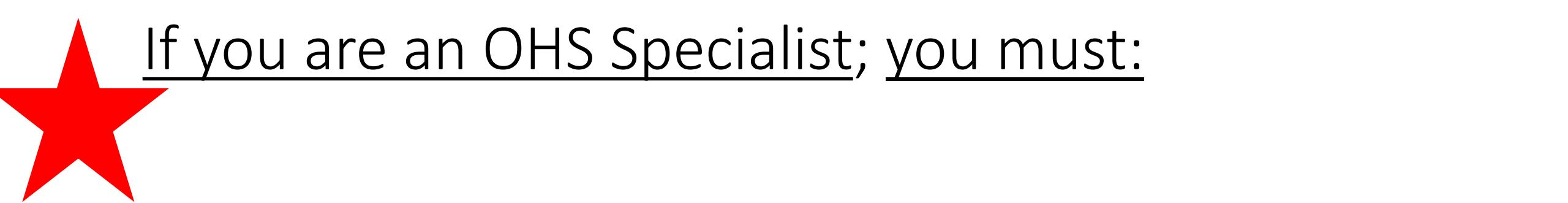
1) Identify hazards

(Ex. Mosquitos in workplace are hazards)



2) Identify risks

(Ex. allergy or taking germs into your body)



If you are an OHS Specialist; you must:

3) Determine precautions: for this;

ELIMINATED

1) eliminate hazard at source (remove the all hazard) Kill all of them?



2) replace hazardous substance with non-hazardous substance (Substitution,

Replace mosquitos with other insects



3) take engineering precautions (controls)

draining swamp

4) take administrative precautions

Caution signs



5) Use personal security equipments

Like mosquito net



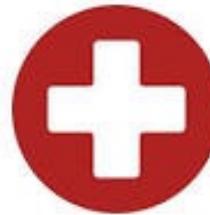
If you are an OHS Specialist; you must:



- 4) Educate the employees



- 5) Prepare the first aid and fire fighting plans



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- 6) Check properly these studies



© depositphotos



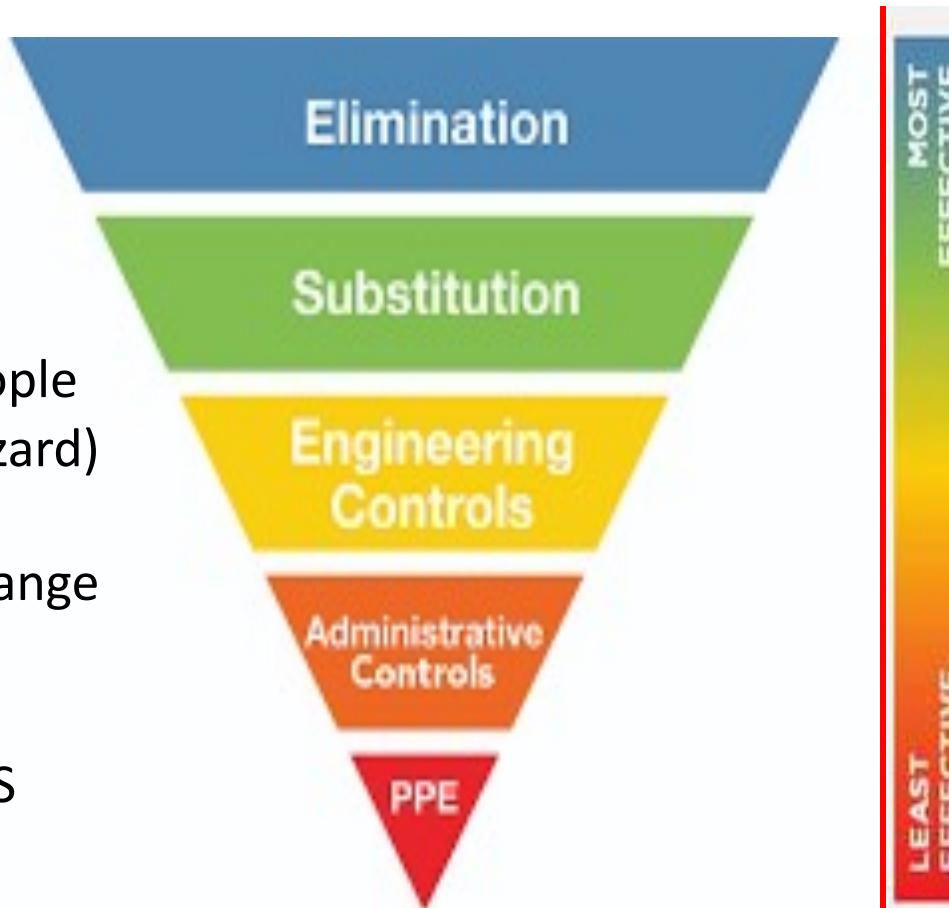
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HIERARCHY of CONTROLS

The risk is reduced by taking the following measures according to the results of the risk assessment and in order of priority:

- ELIMINATION (remove the hazard)
- SUBSTITUTION (replace the hazard)
- ENGINEERING CONTROLS (Isolate people
From the hazard)
- ADMINISTRATIVE CONTROLS (Change
behavior)
- PERSONAL PROTECTION EQUIPMENTS



According to the Law No: 6331

Workplaces are classified as;



- 1) Less Hazardous (Az tehlikeli)
- 2) Hazardous (Tehlikeli)
- 3) Much Hazardous (Çok tehlikeli)



Examples of Less Hazardous Workplaces



Examples of hazardous workplaces



Wood manufacturing factories



Manuel mine extraction



Oil transport via pipeline



Welding



Sugar refineries



Porcelain manufacturing



Clay-sand-gravel pits



Match production



Cologne and cosmetics



plastic raw material manufacturing

Examples of Much Hazardous Workplaces



Building sites



coal mining operation



Underground construction



Chemistry labs



Firefighting



Radiation rays



EXPLOSIVE



LPG filling operations



Chimney cleaning

***Commuique of LIST OF HAZARD CLASSES
REGARDING OCCUPATIONAL HEALTH AND SAFETY***

Nace Code	Work Definiton	Hazard Class
02.40.07	Diğer ormancılık hizmet faaliyetleri (ormancılık envanterleri, orman işletmesi, orman idaresi danışmanlık hizmetleri, orman (bakımı, verimi, vb.) ile ilgili araştırma geliştirme, vb.)	Az Tehlikeli
03.11.01	Deniz ve kıyı sularında yapılan balıkçılık (gırgır balıkçılığı, dalyancılık dahil)	Tehlikeli
03.11.02	Deniz kabuklarının (midye, istakoz vb.), yumuşakçaların, diğer deniz canlıları ve ürünlerinin toplanması (sedef, doğal inci, sünger, mercan, deniz yosunu, vb.)	Çok Tehlikeli
03.12.01	Tatlı sularda (ırmağın, göl) yapılan balıkçılık (alabalık, sazan, yayın vb.)	Tehlikeli
03.21.01	Denizde yapılan balık yetiştiriciliği (çipura, karagöz, kefal vb. yetiştiriciliği ile kültür balığı, balık yumurtası ve yavrusu dahil)	Tehlikeli
03.21.02	Denizde yapılan diğer su ürünleri yetiştiriciliği (midye, istiridye, istakoz, karides, eklembacaklılar, kabuklular, deniz yosunları vb.) (balık hariç)	Tehlikeli
03.22.01	Tatlı sularda yapılan balık yetiştiriciliği (süs balığı, kültür balığı, balık yumurtası ve yavrusu dahil)	Tehlikeli
03.22.02	Tatlısu ürünleri yetiştiriciliği (yumuşakçalar, kabuklular, kurbağalar vb.) (balık hariç)	Tehlikeli
05.10.01	Taş kömürü madenciliği	Çok Tehlikeli
05.20.01	Linyit madenciliği	Çok Tehlikeli

<https://www.resmigazete.gov.tr/eskiler/2017/02/20170227M1-1-1.pdf>

http://www.ttb.org.tr/mevzuat/index.php?option=com_content&view=article&id=939:-salii-ve-guevenli-hzmetler-yoonetmel&Itemid=33

a new career for engineers

- Occupational Healt and Safety Specialist

- A class
 - B class
 - C class

- OHS Trainer



In very hazardous workplaces;

Only and only If you have Class (A) OHS certificate, you can work as an OHS specialist in vey hazardous wokplaces.



In hazardous workplaces;

If you have Class (B) OHS certificate, you can work as an OHS specialist in hazardous wokplaces. But also, if you have Class (A) certificate you can work too.

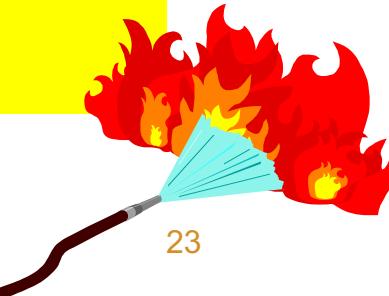


In less hazardous workplaces;

If you have Class (C) OHS certificate, you can work as an OHS specialist in less hazardous wokplaces. Also, if you have Class (B) and (A) cetificate you can work too

To whom (C) Class OHS Certificate is given?

Engineers, architects or technical staffs who have participated in (C) class OHS trainings and who are successful in the (C) class OHS exam by OSYM.



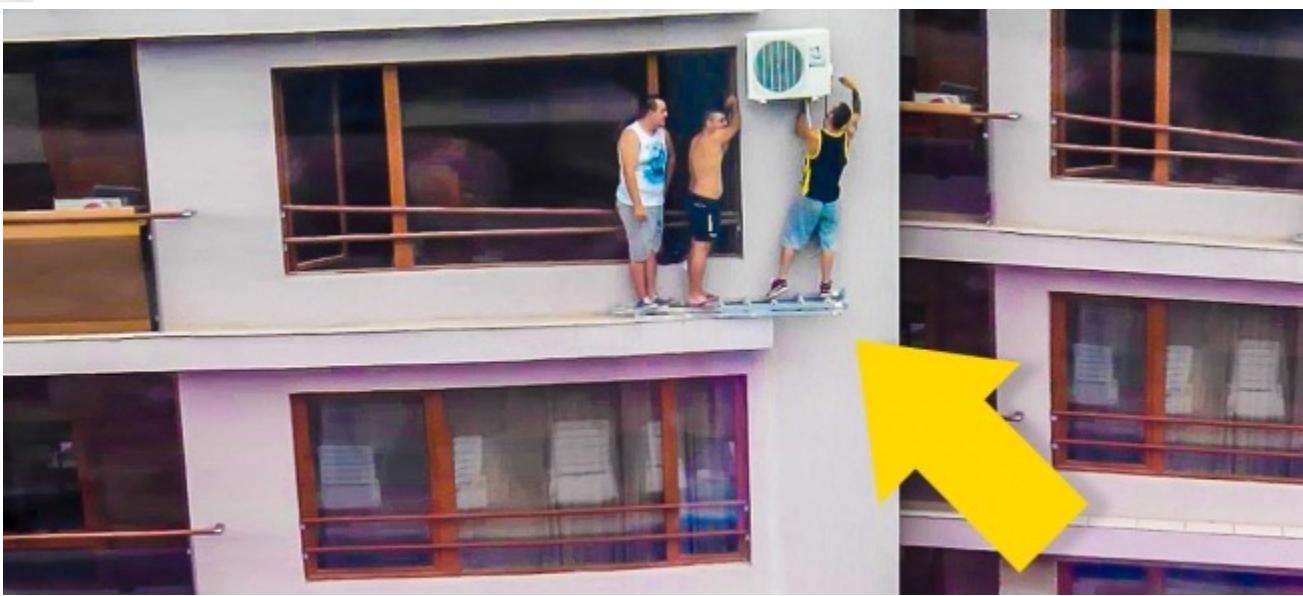
To whom (B) Class OHS Certificate is given?

Engineers, architects or technical staffs who have worked for at least **three years** with (C) class OHS certificate and who have participated in (B) class OHS trainings and succeeded in the (B) class OHS exam by ÖSYM.

To whom (A) Class OHS Certificate is given?

An engineer, architect or technician who has worked for **at least four years** with a (B) class OHS certificate and who has attended the (A) class OHS trainings and also succeeded in the (A) class occupational safety exam by ÖSYM.





the major accident
starts with
the minor negligence



- ***For more information:***
- http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=92011
- <https://www.osha.gov/Publications/OSHA3844.pdf>
- https://www.researchgate.net/publication/277018333_Occupational_Safety_Experts_in_the_Law_No_6331_Qualifacations_Assignments_and_Authorizations
- <https://www.lawsturkey.com/law/occupational-health-and-safety-law>
- <https://dergipark.org.tr/tr/download/article-file/397251>
- http://www.ttb.org.tr/mevzuat/index.php?option=com_content&view=article&id=709:-sai-ve-genle-k-tehle-siniflari-ltestebl&catid=3:tebligenelge&Itemid=35
- <https://www.ailevecalisma.gov.tr/medias/4577/kitap10.pdf>
- <https://istanbulvizyonosgb.com/blog/isyeri-tehlike-sinifi-neye-gore-belirlenir/>



OCCUPATIONAL HEALTH AND SAFETY

CHEMICAL RISK FACTORS



LEGISLATION ON CHEMICAL RISK AGENTS IN OUR COUNTRY

(ÜLKEMİZDE KİMYASAL RİSK ETMENLERİ KONUSUNDAKİ
MEVZUAT)

1. Kimyasal Maddelerle Çalışmalarda Sağlık Ve Güvenlik Önlemleri Hakkında Yönetmelik

Çalışma ve Sosyal Güvenlik Bakanlığı

Resmi Gazete: 28733 – 12.08.2013

2. Kanserojen Ve Mutajen Maddelerle Çalışmalarda Sağlık Ve Güvenlik Önlemleri Hakkında Yönetmelik

Çalışma ve Sosyal Güvenlik Bakanlığı

Resmi Gazete: 28730 - 06.08.2013

3. Asbestle Çalışmalarda Sağlık Ve Güvenlik Önlemleri Hakkında Yönetmelik

Çalışma ve Sosyal Güvenlik Bakanlığı

Resmi Gazete: 28539- 25.01.2013

**4. Çalışanların Patlayıcı Ortamların Tehlikelerinden Korunması
Hkk. Yön.**

Çalışma ve Sosyal Güvenlik Bakanlığı

Resmi Gazete: **28633 30 Nisan 2013**

**5. Parlayıcı, Patlayıcı, Tehlikeli Ve Zararlı Maddelerle Çalışılan
İşyerlerinde Ve İşlerde Alınacak Tedbirler Hakkında Tüzük**

Çalışma ve Sosyal Güvenlik Bakanlığı

Resmi Gazete: 24.12.1973/14752

**6. Asbest sökümu ile ilgili eğitim programlarına ilişkin
Çalışma ve Sosyal Güvenlik Bakanlığı**

Çalışma ve Sosyal Güvenlik Bakanlığı

Resmi Gazete: 28692 – 29.06.2013

**7. Muhtemel Patlayıcı Ortamda Kullanılan Teçhizat Ve
Koruyucu Sistemler İle İlgili Yönetmelik**

Sanayi ve Ticaret Bakanlığı

Resmi Gazete: 26392 30.12.2006

8. Tehlikeli Atıkların Kontrolü Yönetmeliği

Çevre ve Orman Bakanlığı

Resmi Gazete Tarih Ve Sayısı :27 Ağustos 1995/ 22387

**9. Tehlikeli Maddelerin ve Müstahzarların Sınıflandırılması,
Ambalajlanması ve Etiketlenmesi Hakkında Yönetmelik**

Resmi Gazete Tarih ve Sayı: 26/12/2008/ 27092 (mükerrer)

**10. Tehlikeli Maddeler Ve Müstahzarlara İlişkin Güvenlik Bilgi
Formlarının Hazırlanması Ve Dağıtılması Hakkında
Yönetmelik**

Resmi Gazete Tarih ve Sayı: 26/12/2008 / 27092 (mükerrer)

**11. Bazı Tehlikeli Maddelerin, Müstahzarların Ve Eşyaların
Üretimine, Piyasaya Arzına Ve Kullanımına İlişkin
Kısıtlamalar Hakkında Yönetmelik**

Resmi Gazete Tarih ve Sayı: 26/12/2008 / 27092 (mükerrer)

12. Binaların Yangından Korunması Hakkında Yönetmelik

Resmi Gazete Tarih Ve Sayı: 19/12/2007 / 26735 değişiklik
09/09/ 2009 / 27344

-Chemicals are a part of life.

-While the production was 1 million tons 50 years ago, today at least 400 million tons of chemicals are produced every year in the world.

- At least 80.000-100.000 different types of chemicals are used in the world.

-Approximately 5,000-7,000 chemicals are known to be harmful, and 3000 of them are carcinogenic.

-Chemicals are used in all areas: mining, welding, machinery and factory, office, home etc.

- The main way to work safely with chemicals is to provide the necessary safe working environments by knowing the effects of these substances.

-There should be labels and warning information about the contents of the chemicals used.

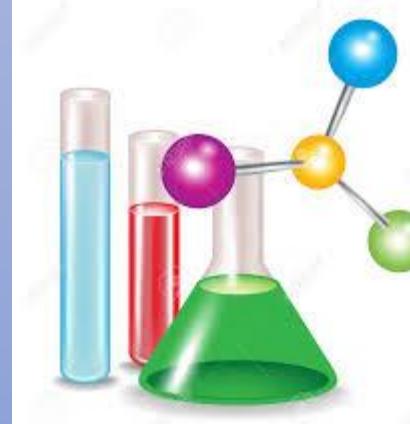


Chemical hazards are
the most serious risk for
workers' health today.



DEFINITIONS

A **chemical substance** is a form of matter having constant chemical composition and characteristic properties.



pharmaceutical preparation : is mix or solutions of at least two or more substances.

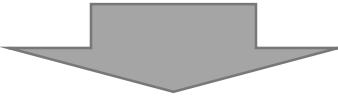


have you ever been to a pharmacy?
sometimes the pharmacist mixes a few drugs and makes a new drug. That is the name of the Pharmaceutical preparation.



- * **A chemical substance** can be simple substances, chemical compounds.
- * It occurs naturally
- * *It can be produced,*
- * *It can occur during any process,*
- * *It can be produced as waste*
- * *It can be occurred accidentally*

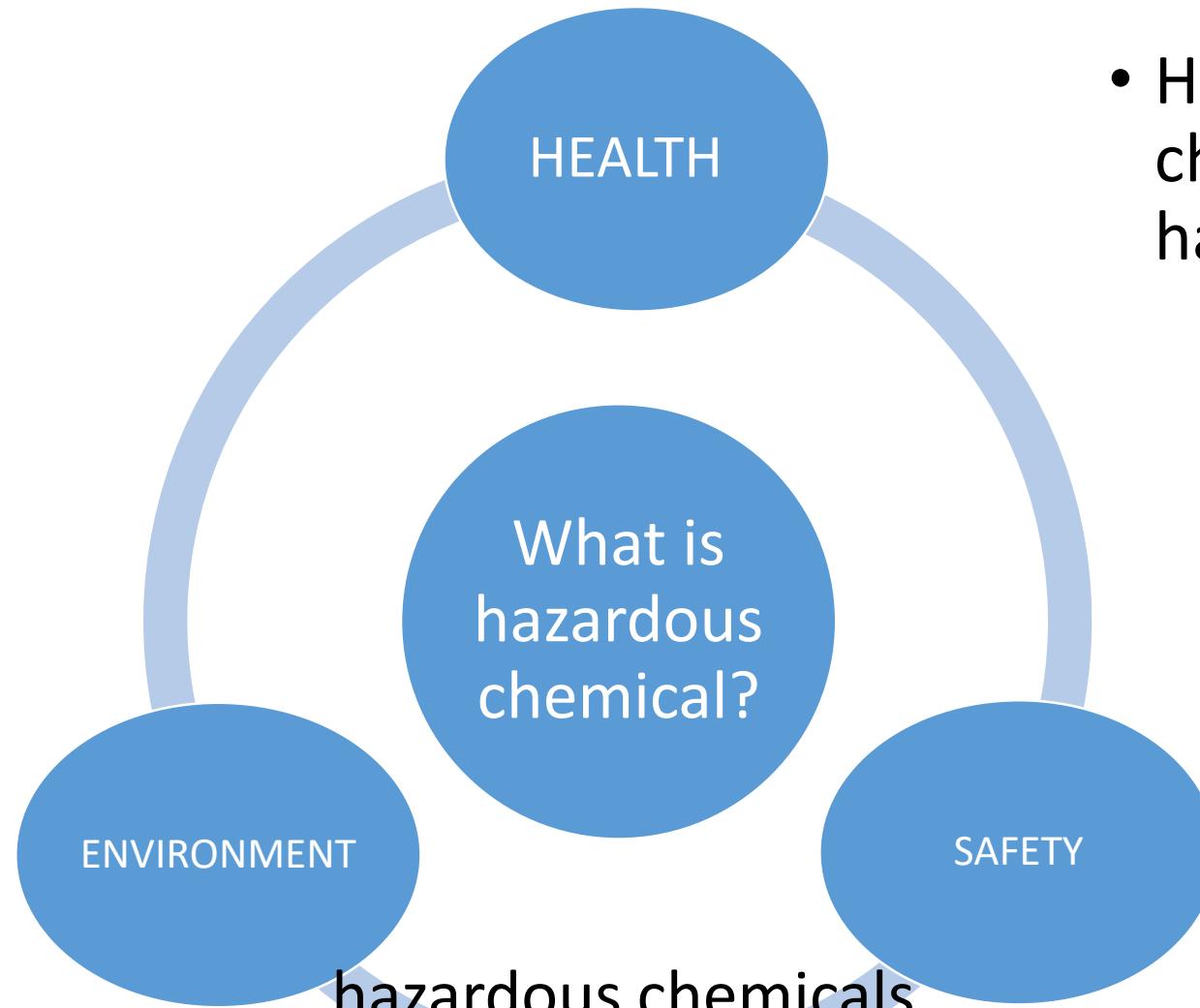
Hazardous Chemical Substances



Any toxic, harmful, corrosive, irritating or asphyxiant substance with

- a) a prescribed exposure limit.
- b) Or which have a detrimental effect on health.





hazardous chemicals
they may create
ecotoxic risks, fire
risks and other
physical risks.

- Hazardous chemicals can harm or damage.

People who may be exposed to Hazardous Chemical Substances shall obey lawfull instructions regarding:

- Prevention of HCS release
- Use of personal protective equipment (PPE)
- Biological tests
- Cleaning up and disposal od HCS containin materials
- Housekeeping, personal hygiene
- Application of information & training





THE FACTORS WHICH DETERMINE THE DAMAGES OF CHEMICALS



1-Physical and
chemical
properties

2-how exposed,
how much
exposed?

3- Characteristics
of the exposed
person

4- Environmental
properties

(Exposure Limit Definitions)

MAC Limit: (Müsaade edilen azami konsantrasyon):

★ maximum permissible concentration of a chemical substance in the workplace air which generally does not have known adverse effects on the health of employees.

TLV: (Ortalama Esik değer- Threshold Limit Value):

Çalışanlara zararlı etki göstermeden çalışılabilecek **ortalama** konsantrasyon.

TWA

TLV-TWA (zaman ağırlıklı ortalama- Time Weighted Average) : eight-hour time-weighted average (TWA).

This is the maximum amount or concentration of a chemical that a worker may be exposed for 8 hours.

STEL

TLV-STEL (ShortTerm Exposure Level) : time-weighted average concentration of a substance over a 15-minute period thought not to be injurious to health.

ASBESTOS

★ Permissible Exposure Limit (PEL)
for asbestos is **0.1 fiber per cubic centimeter** of air as an eight-hour time-weighted average (TWA). ★

Sınır Değer

İşveren, işçilerin maruz kaldığı havadaki asbest konsantrasyonunun, sekiz saatlik zaman ağırlıklı ortalama (twa) değerinin $0,1 \text{ lif}/\text{cm}^3$ 'ü geçmemesini sağlayacaktır.



What is the limit value that should not be exceeded in terms of chemical environment factors?

- a) MAC
- b) STEL
- c) TWA
- d) MSDS

What is the limit value that should not be exceeded in terms of chemical environment factors?

- a) MAC
- b) STEL
- c) TWA
- d) MSDS

Which of the following is a substitution study for protection from hazards?

- a) local ventilation to a welding bench
- b) use of safety belts in scaffolding
- c) use of gloves to protect against the effects of a chemical
- d) replacing a harmful chemical with a less harmful chemical

Which of the following is a substitution study for protection from hazards?

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Let's remember the «control hierarchy»

- 
- 1) Elimination ★
 - 2) Substitution ★
 - 3) Engineering Controls ★
 - 4) Administrative Controls ★
 - 5) Personal Protection Equipment ★

According to 6331 ISG law, what does STEL mean?

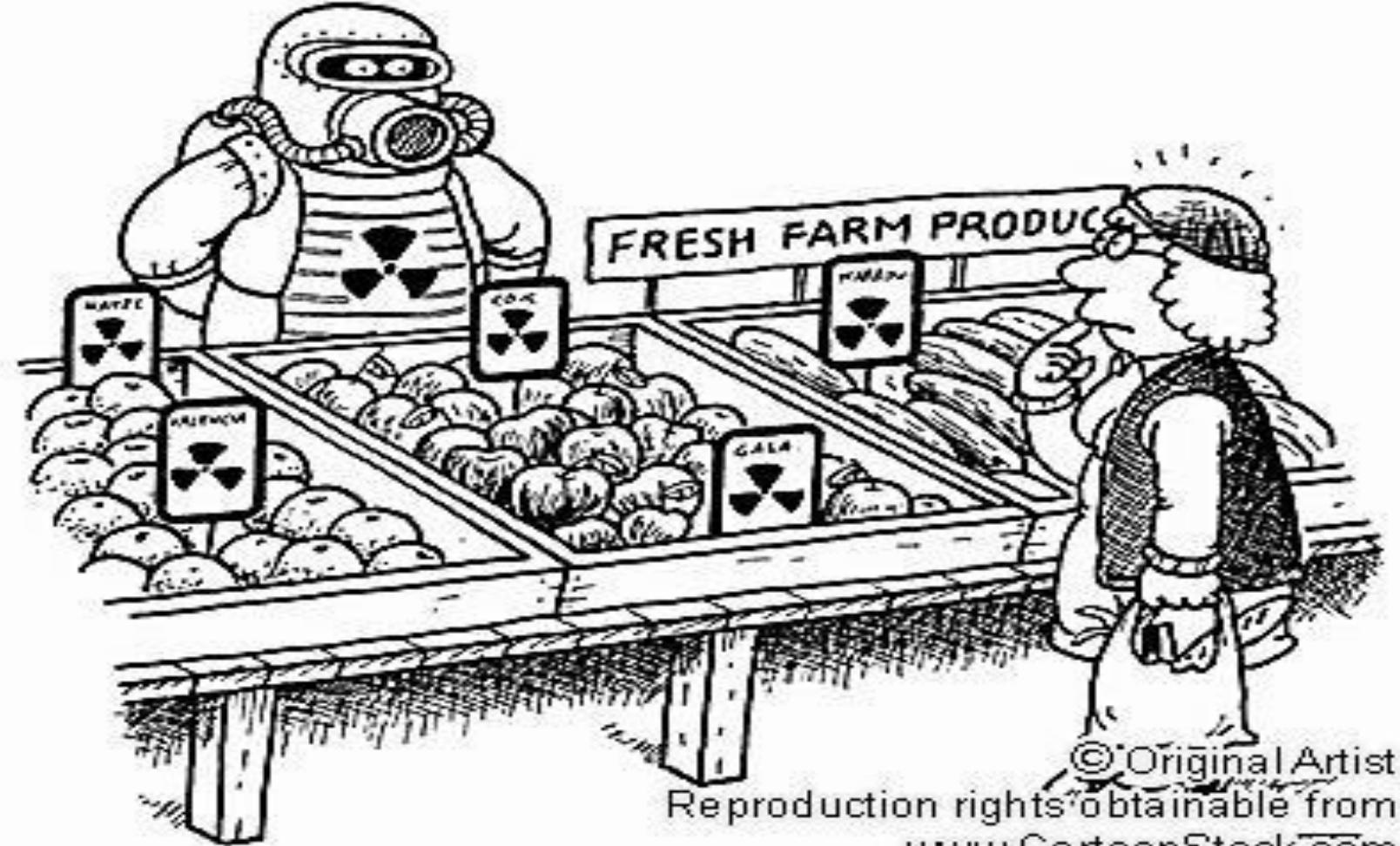
- a) Material Safety Data Sheets (MSDS)
- b) International Marine Organization
- c) Maximum weight that can be lifted by hand
- d) Concentration of a substance over a 15-minute period.

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- c) Maximum weight that can be lifted by hand
- d) Concentration of a substance over a 15-minute period.

ROUTES OF INTAKE

The route of entry of a chemical into the body

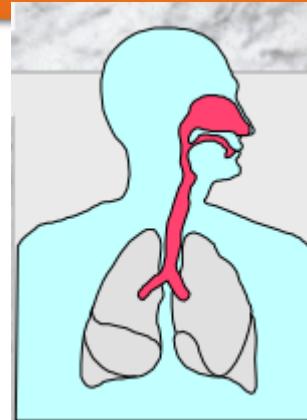


ROUTES OF INTAKE CHEMICALS TO THE BODY

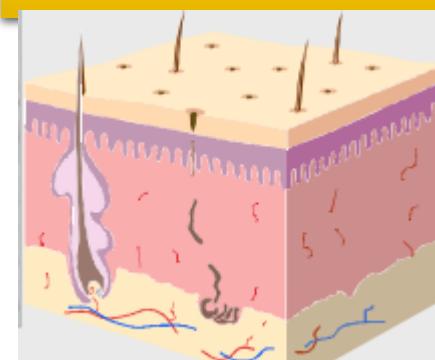


Chemicals harm the health by entering the body in three ways.

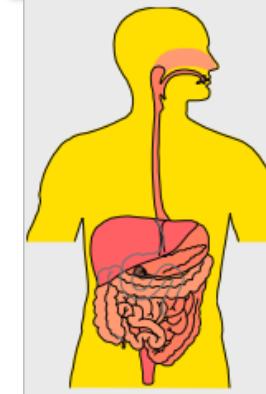
**INHALATION
(breathing)**



**SKIN
ABSORPTION**



**INGESTION
(swallowing)**



ROUTES OF INTAKE CHEMICALS TO THE BODY

INHALATION

Breathing in dusts, gases and vapours is the **most common** route of entry.



Inhalation may result in:
Bronchitis; asthma;
cancers, etc.



ABSORPTION

Absorption through the skin (or eye) is another route of entry for toxic substances.



Effects include:
Burning of the skin/eye;
Irritation of the skin (dermatitis); sensitising effects (contact dermatitis); skin cancer;

INGESTION

Swallowing substances is the least common route of entry for toxic substances. However, they can pass through the digestive system, and affect the gastro-intestinal organs of the body:
Chemicals may be swallowed accidentally if food or hands are contaminated.



The workplace should keep records of assessment for 40 years.



Should keep «medical surveillance records» for 40 years.



If the activity of that workplace ceases, then records must be delivered to the provincial directorate of social security institution (*SGK İl müdürlükleri*)



Which of the following is wrong with regard to the entry of chemical agents into the body?

- a) Through inhalation
- b) Through absorption through the skin
- c) Through digestion
- d) By thermal radiation

Which of the following is wrong with regard to the entry of chemical agents into the body?

- a) Through inhalation
- b) Through absorption through the skin
- c) Through digestion
- d) By thermal radiation



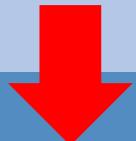
Classification of Chemicals

Hazardous chemicals can be examined under three main headings as stated in the European Union legislation:

**Health
hazard
group**

Physical hazard group

**Environmental
Hazard
group**



**Employee
damage himself**



damage to the environment



CLASSIFICATION ACCORDING TO THE REGULATION ON HEALTH AND SAFETY PRECAUTIONS IN «WORKING WITH CHEMICAL SUBSTANCES»

KİMYASAL MADDELERLE ÇALIŞMALarda SAĞLIK VE GÜVENLİK ÖNLEMLERİ HAKKINDA YÖNETMELİK'E GÖRE SINIFLANDIRMA



1. Explosives (E),



2. Oxidizing gases (O),



3. Flammable gases



4. Highly Flammable gases (F),

5. Extremely flammable gases (F+)

6. Toxic (T),

7. Very toxic

8. Harmful (Xn),

9. Corrosive (C),

10. Irritant(Xi),

11. Allergic,

12. Cancinogenic, (T)

13. mutagen,

14. Toxic for fertility

15. Environmental hazard (N)



Chemical hazard symbols

Some of the chemical hazard symbols are shown here.
The chemical containers must be labelled by these
symbols with respect to its content.



Explosive



Corrosive



Harmful
or irritant



Flammable



Oxidising
agent



Toxic



Environmental
hazard



FLAMMABLE
GAS
2
Flammable
gas



NON-FLAMMABLE
GAS
2
Nonflammable
gas



Chemical hazard symbols shown with black symbols on orange sheets

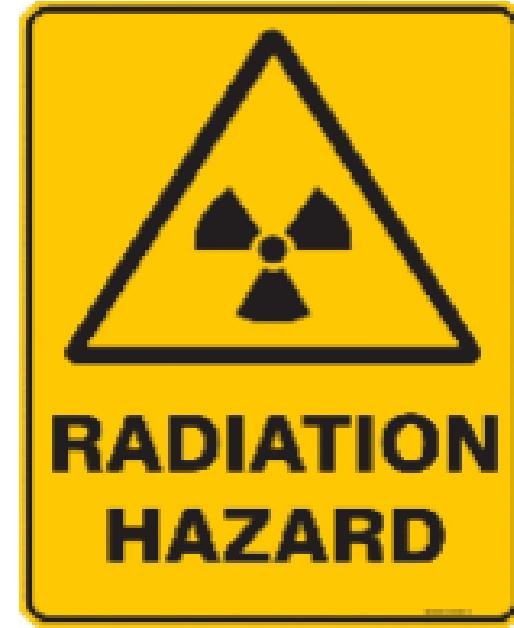


-For full list, you can visit <http://chemistry.about.com/od/healthsafety/ig/Laboratory-Safety-Signs/>

- These symbols are internationally agreed.
- The door of storage room or chemical cabinets must be labelled with respect to its contents.



Biological and radiation hazard symbols are shown here. They are shown black symbols on yellow sheets



Explosives (E)



An **explosive** (or **explosive** material) is a reactive substance that contains a great amount of potential energy that can produce an **explosion** if released suddenly, usually accompanied by the production of light, heat, sound, and pressure.



Oxidizing (O)



If a substance oxidizes, it combines with oxygen and loses hydrogen to form another substance



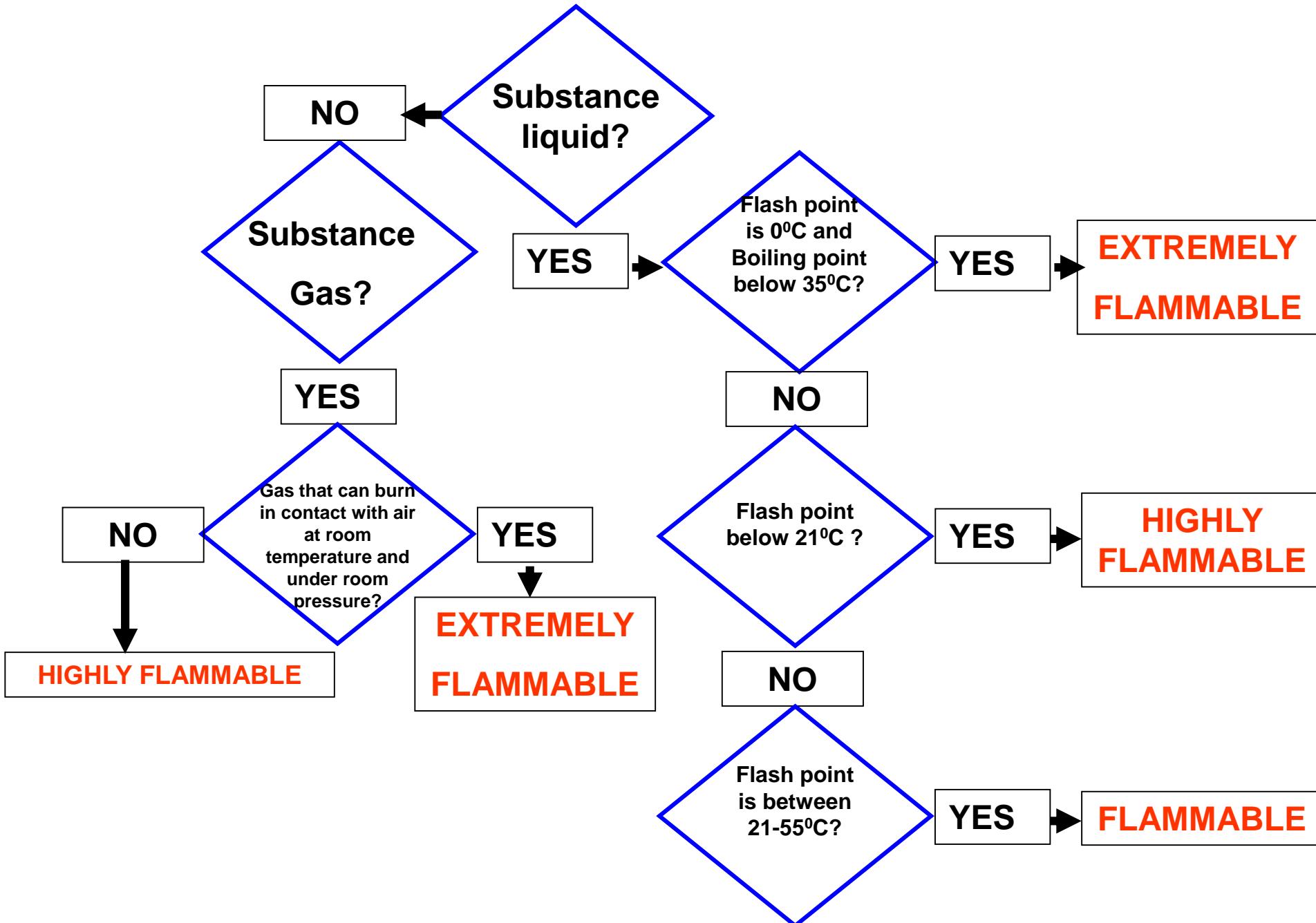
What is the difference between flammable, highly flammable and extremely flammable gases?



- Extremely flammable: Flash point below < 0 C, Boiling point is 35 C
- Highly flammable: Flash point below < 21 C
- Flammable: Flash point is between < 21-55 C



Algorithm Of Flammable, Highly Flammable And Exteremly Flammable Substances



Toxic (T)



Poisonous. Containing or being poisonous material especially when capable of causing death or serious debilitation



VERY toxic (T+)



Very poisonous.



Harmful (Xn)



Xn: Nocif
(zararlı)

Substances that cause acute or chronic damage or death on human health when inhaled, taken by mouth, absorbed through the skin



Corrosive (C)



C: Corrosive
(Aşındırıcı)

In contact with living tissue, they can cause tissue destruction.

Irritant (Xi)



Xi: irritant
(Tahriş edici)

It is not **corrosive**, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.,



Chemicals are classified as;

Solids (Powders)

Liquids (Acids)

Gases

- The most common acids are;

- *hydrochloric acid,*
- *sulfuric acid,*
- *nitric acid,*
- *chromic acid,*
- *acetic acid and*
- *hydrofluoric acid,*



sodium hydroxide burn



spilled acid burn



© FRED PHOTOLIBRARY

A small HF acid burns and its results



damaged gloves



2 hours later



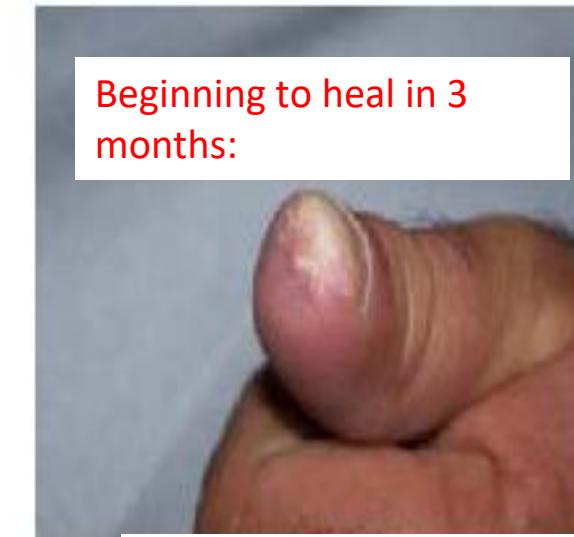
1 day later



3 days later



12 days later



3 s later

Beginning to heal in 3 months:

Carcinogenic, Mutagen, Toxic Substances for fertility

They are substances that cause or accelerate cancer formation when inhaled, taken orally, when penetrated into the skin..

They are substances that cause genetic deformations when inhaled, taken orally, when penetrated into the skin.

They are substances that cause fertility deformation when inhaled, taken orally, when penetrated into the skin.

Category 1 (T)

Substances known to be carcinogenic.



Category 2 (T)

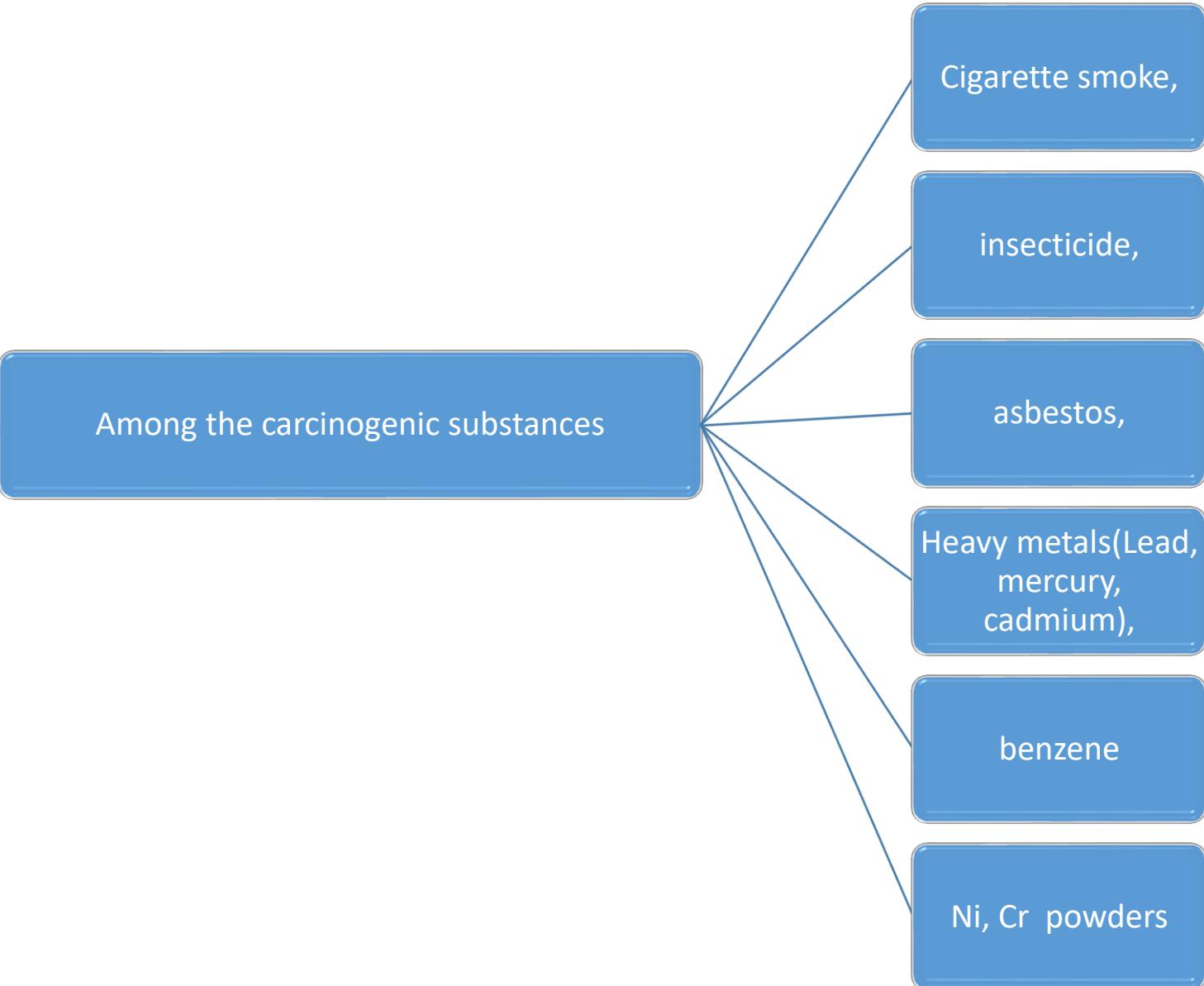
can be considered as carcinogenic.



Category 3 (Xn)

Potential Carcinogenic Effects with insufficient Data







OCCUPATIONAL HEALTH AND SAFETY

POWDERS

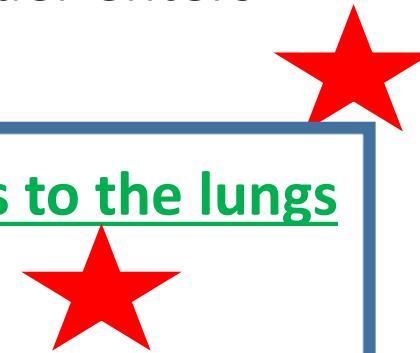
These are the particles with a grain size of 0.5 - 150 microns and suspended in air.

✓ If the grain size of powder is 0-0.5 micron : this powder enters the lungs and goes out.



✓ If the grain size of powder is 0,5-5 micron : it enters to the lungs and stays there.

Asbestos-silica: pneumoconiosis



(FIBROGENESIS –Asbestos POWDER)

Examples/ Asbestos, arsenic, Silica powder, Ni, Cr powders

✓ If the grain size of powder is >5 micron: it doesn't reach the lungs.

ASBESTOS

★ Permissible Exposure Limit (PEL)
for asbestos is **0.1 fiber per cubic centimeter** of air as an eight-hour time-weighted average (TWA). ★

Sınır Değer

İşveren, işçilerin maruz kaldığı havadaki asbest konsantrasyonunun, sekiz saatlik zaman ağırlıklı ortalama (twa) değerinin $0,1 \text{ lif}/\text{cm}^3$ 'ü geçmemesini sağlayacaktır.



Radioactive Powders

U, Th

The ionized rays emitted by them cause damage-deformation in the tissues of the human body.



Allergic Powders

varies from person to person

Flower powder etc..

Inert powders

Coal, iron, Mg component powders, limestone, marble etc.

These powders accumulate in the body, but they do not have any fibrogenic-toxic effects.

LEAD powders

It enters the human body through breathing and digestion.

«Medical surveillance» is carried out in the following cases:

- If the lead level in the blood of any employee is more than 40 µg Pb / 100 ml blood.



(1 mg: 1000 µg)

- If the lead level in the blood of any employee is more than 70 µg Pb / 100 ml blood, this is the biological limitation!

Stop working with LEAD.

Biological limitation of Pb is: 70 µg Pb/100 ml



GASES

CO₂

Non-combustible
Boğucu



Simple
Asphyxiant



Non-poisonous



Akçigere
gitmez

CO

Combustible
Explosive



Chemical
Asphyxiant



POISINOUS
Circulate in the blood,
blocking the oxygen-
carrying blood.

100 ppm: Headache
500 ppm: Severe headache, fainting
2000 ppm: Unconsciousness, pulse
weakness, and death

CH₄ (Methane)

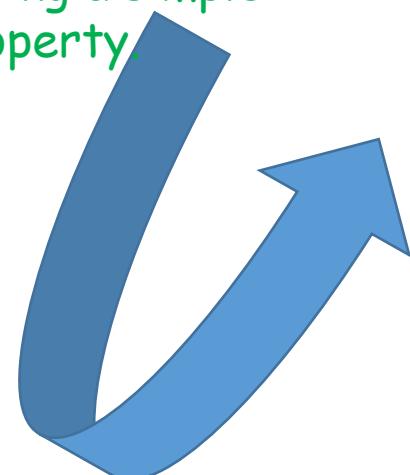
Combustible
Explosive



Simple
Asphyxiant



Methane reduces the
oxygen concentration in
the air, creating a simple
asphyxiant property.



C_1H_4

Methane

C_2H_6

Ethane

C_3H_8

Propane

C_4H_{10}

Butane

Create
Natural gas

Create
LPG

lighter
than air

heavier
than air



All OF Them



Simple asphyxiant,
Combustible,
Explosive

LPG : Liquified petroleum gas

If there is a gas-leak here, it accumulates on the ground because it is heavier than air.

So;

The floor should be ventilated.



Similarly,

LNG : Liquified natural gas

If there is a gas-leak here, it accumulates on the ceiling,
because it is lighter than air.

So;

The ceiling should be ventilated.



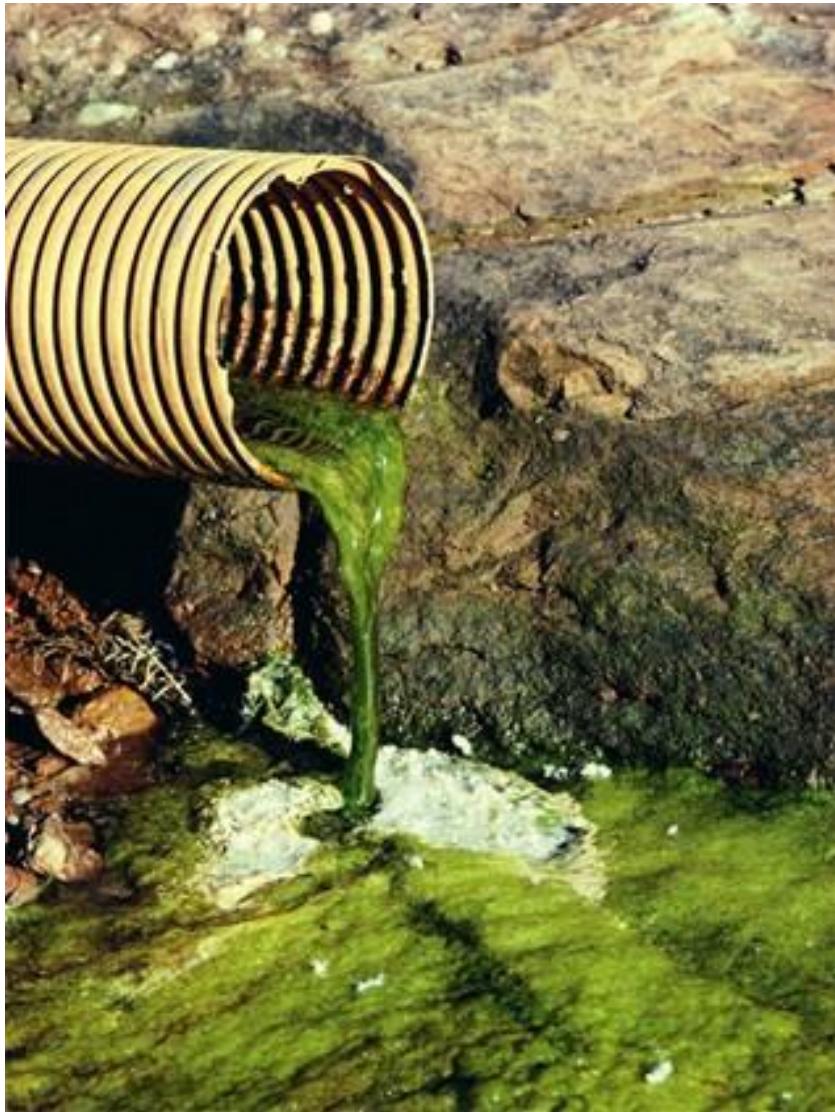
The effects of chemicals on our health

- Respiratory irritation;
- Allergic reactions
- Central Nervous System Destruction

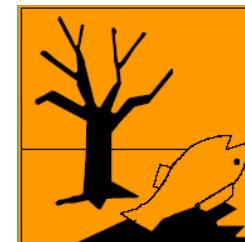
★**Pneumoconiosis:** Silica and Asbestos Powders, ★

- Cancer
- Fertility Diseases

Environmental Hazard (N) :

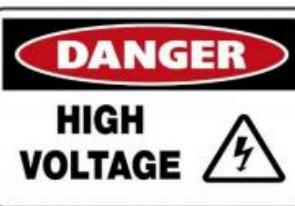


potential to threaten the surrounding natural **environment** / or adversely affect people's health, including pollution and natural disasters.



Hazardous to the ozone layer

Some examples of Safety Symbols and Signs



Safety symbols and signs help you by saying how you have to behave in a laboratory for a safe operation. Some examples of these signs are given here.



Material
Safety
Data
Sheets

Material Safety Data Sheet (MSDS)

It is a **technical document** which provides detailed and comprehensive information for each hazardous chemical related to:

- health effects of exposure to the product
- hazard evaluation related to the product's handling, storage or use
- measure to protect workers at risk of exposure
- emergency procedures.



Material Safety Data Sheet (MSDS)

Who are responsible for?

- 1) Suppliers
- 2) Employer
- 3) Worker
- 4) Delivery person

Delivery of MSDS



Distribution can be;

- as written text,
- must be free.



Delivery time;

- On the first delivery (at the latest),



In case of updating ; Considering the update date, to the user who was given the hazardous chemical until 12 months ago, you have to delivery the new MSDS within 3 months at the latest.



Minimum information that must be included in MSDS:

Identification of material and company (producer)

Composition / Information of Ingredients

Hazards

Firefighting measures

First aid measures

Precautions against accidental scattering

Transport, use, storage measures

Exposure controls / Personal protection

Physical and chemical properties

Stability and reactivity

Toxicological information

Ecological measures

Information about disposal

Transport measures

Legislation informations

ABOUT MSDS

These are the rules while preparing a MSDS

Language	Information	Abbreviations
<ul style="list-style-type: none">The language used in MSDSs should be clear, simple, understandable and short.Warnings such as "Should be kept in any environment" are not acceptableMSDSs can be prepared in the native language or translated to other languages.	<ul style="list-style-type: none">If the information is not available, it should be stated as "Information is not available"	<ul style="list-style-type: none">If an abbreviation is used, it should be stated what the abbreviation means in the notes section.

Page numbers

- All pages of the MSDS should be numbered and the total number of pages must be specified on each page.
- Example: Page 1/8

Published Date

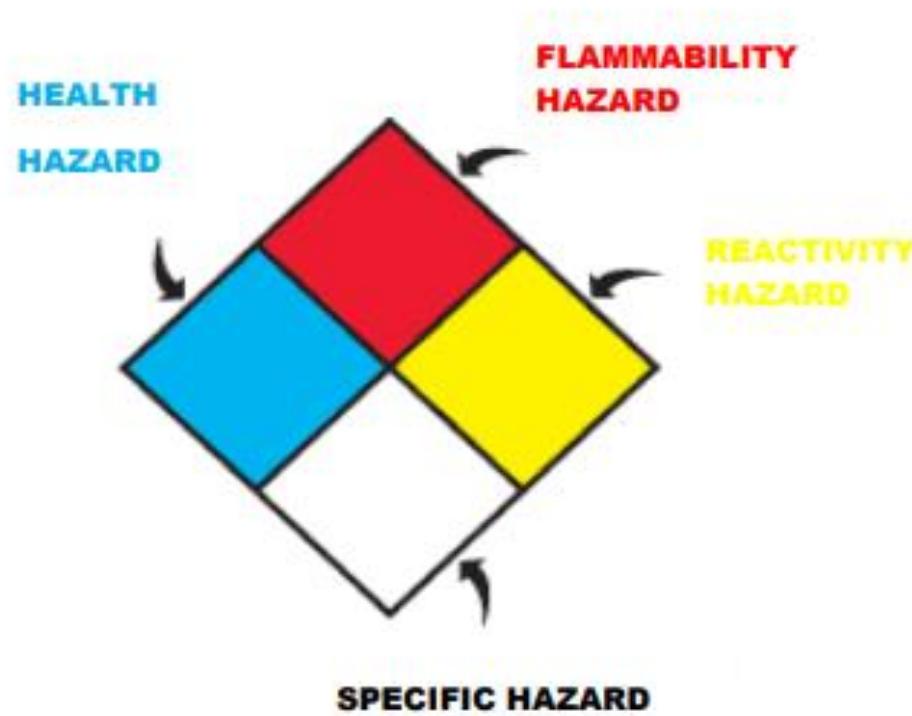
- The date when the MSDS was published must be specified.

Measure Units

- SI units should be used wherever possible.

And,

NFPA (National Fire Protection Agency of the United States) is abbreviated in the MSDS sheets and is also placed on the chemical bottles.

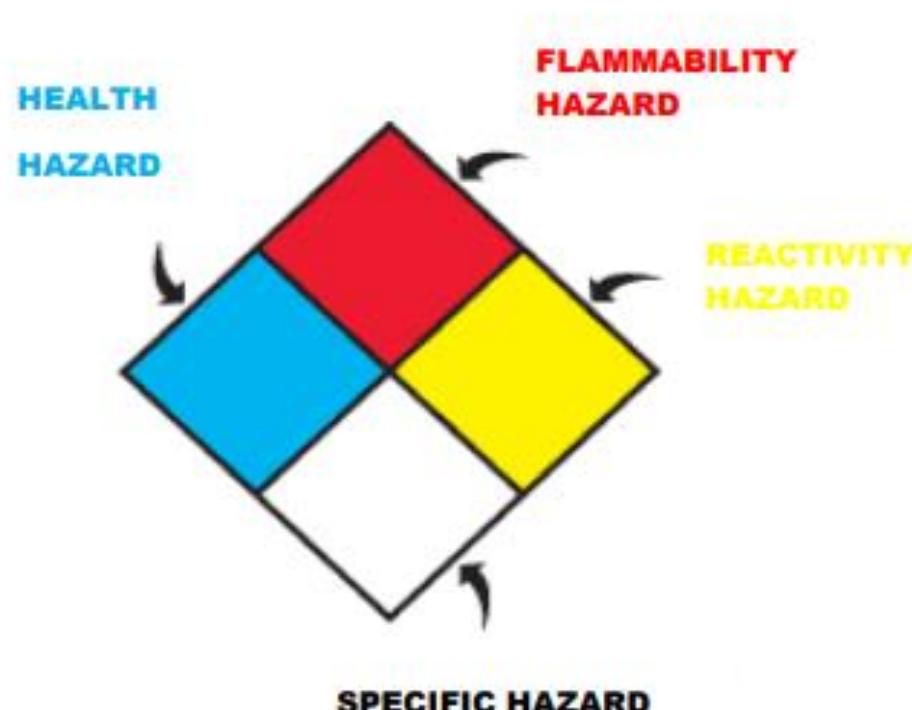


The NFPA Diamond

Among several standards to label chemicals, one very common labelling standard is NFPA diamond (National Fire Protection Agency of the United States).

NFPA diamond contains four major categories:

Health, Flammability, Reactivity and Specific Hazards.



NFPA Diamond symbol & the meaning of each color

The 4 major categories are rated from 0 (very low) to 4 (extreme) in each category. Each number represents the level of the hazard.

HEALTH HAZARD	FLAMMABILITY HAZARD
<p>The classification of hazard on health is assigned as follows:</p> <p>4-EXTREME-Highly Toxic- May be fatal on short-term exposure.</p> <p>3-SERIOUS-Toxic-Full protective suit and breathing apparatus should be worn.</p> <p>2-MODERATE- Breathing apparatus and face mask should be worn.</p> <p>1-SLIGHT- Breathing apparatus should be worn.</p> <p>0-MINIMAL-No precautions necessary.</p>	<p>Susceptibility to burning is criteria for assigning degrees.</p> <p>4-EXTREME-Extremely flammable gas or liquid. Flash point below 22.8 °C (73°F).</p> <p>3-SERIOUS-Flammable. Flash point: 22.8 °C (73°F) to 37.8 °C (100°F).</p> <p>2-MODERATE-Combustible. Requires moderate heating to ignite. Flash point below 93.3 °C (200°F).</p> <p>1-SLIGHT-Slightly combustible. Requires strong heating to ignite.</p> <p>0-MINIMAL-Will not burn under normal conditions.</p>
SPECIFIC HAZARD	REACTIVITY HAZARD
<p>It indicates the classification of hazardous materials</p> <p>OXIDIZING-(OX) - Any substance that gives up oxygen easily</p> <p>ACIDIC-(ACID)- pH < 7</p> <p>ALKALINE-(ALK)- Any base that dissolves in water</p> <p>CORROSIVE-(COR)- Any substance with pH ≤ 2.5 or pH ≥ 12.5</p> <p>WATER REACTIVE-(W) -Any substance that may react with water</p> <p>RADIOACTIVE-(α)- Any substance that produces radiation</p>	<p>Susceptibility of materials to release energy is criteria for assigning degrees.</p> <p>4-EXTREME-Explosive at room temperature.</p> <p>3-SERIOUS-May detonate if shocked or heated under confinement or mixed with water.</p> <p>2-MODERATE- Unstable. May react with water.</p> <p>1-SLIGHT- May react if heated or mixed with water.</p> <p>0-MINIMAL-Normally stable. Does not react with water.</p>

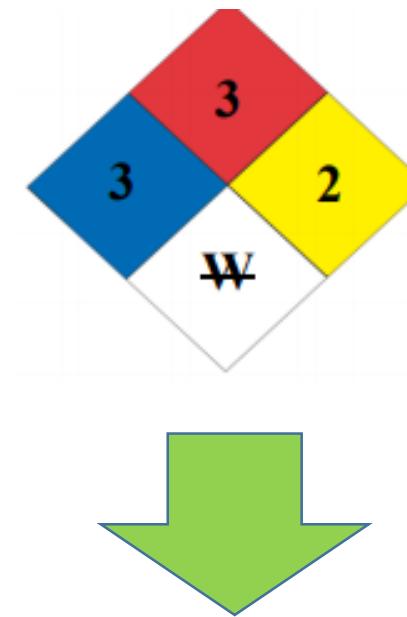


Which color represents
Which hazard?

an EXAMPLE

NFPA Diamond Symbol for Na

HEALTH HAZARD	FLAMMABILITY HAZARD
The classification of hazard on health is assigned as follows: 4-EXTREME -Highly Toxic- May be fatal on short-term exposure. 3-SERIOUS -Toxic-Full protective suit and breathing apparatus should be worn. 2-MODERATE - Breathing apparatus and face mask should be worn. 1-SLIGHT - Breathing apparatus should be worn. 0-MINIMAL -No precautions necessary.	Susceptibility to burning is criteria for assigning degrees. 4-EXTREME -Extremely flammable gas or liquid. Flash point below 22.8 °C (73°F). 3-SERIOUS -Flammable. Flash point: 22.8 °C (73°F) to 37.8 °C (100°F). 2-MODERATE -Combustible. Requires moderate heating to ignite. Flash point below 93.3 °C (200°F). 1-SLIGHT -Slightly combustible. Requires strong heating to ignite. 0-MINIMAL -Will not burn under normal conditions.
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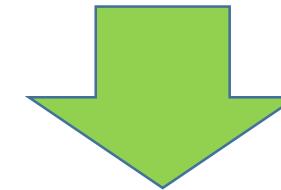
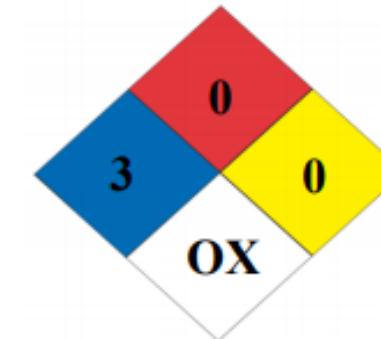


Na is a **flammable**, **toxic** and **unstable** material. Moreover, it is a **element**.

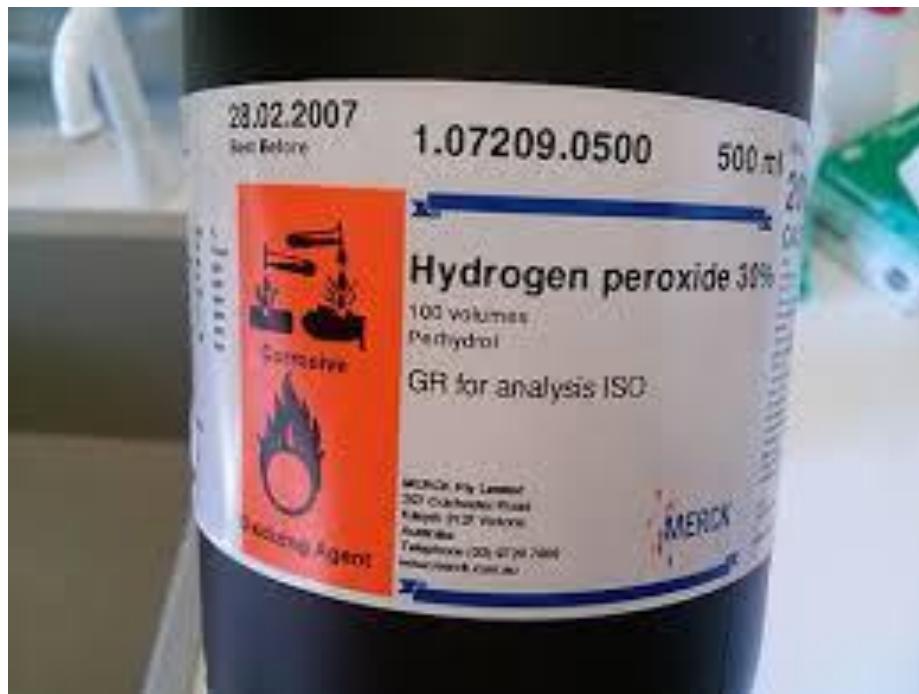
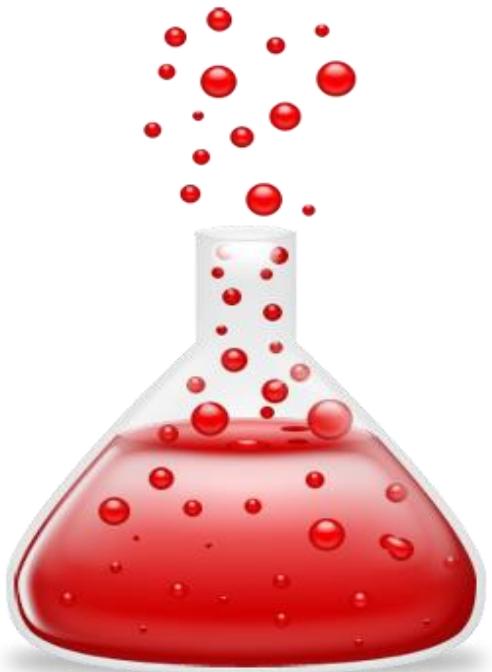
another EXAMPLE

NFPA Diamond Symbol for Bromine (Br)

HEALTH HAZARD	FLAMMABILITY HAZARD
<p>The classification of hazard on health is assigned as follows:</p> <p>4-EXTREME-Highly Toxic- May be fatal on short-term exposure.</p> <p>3-SERIOUS-Toxic-Full protective suit and breathing apparatus should be worn.</p> <p>2-MODERATE- Breathing apparatus and face mask should be worn.</p> <p>1-SLIGHT- Breathing apparatus should be worn.</p> <p>0-MINIMAL-No precautions necessary.</p>	<p>Susceptibility to burning is criteria for assigning degrees.</p> <p>4-EXTREME-Extremely flammable gas or liquid. Flash point below 22.8 °C (73°F).</p> <p>3-SERIOUS-Flammable. Flash point: 22.8 °C (73°F) to 37.8 °C (100°F).</p> <p>2-MODERATE-Combustible. Requires moderate heating to ignite. Flash point below 93.3 °C (200°F).</p> <p>1-SLIGHT-Slightly combustible. Requires strong heating to ignite.</p> <p>0-MINIMAL-Will not burn under normal conditions.</p>
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Bromine **will not** burn under normal conditions and it is **toxic** and **stable** material. Moreover, it is an **agent**



Labelling of Chemical Bottles

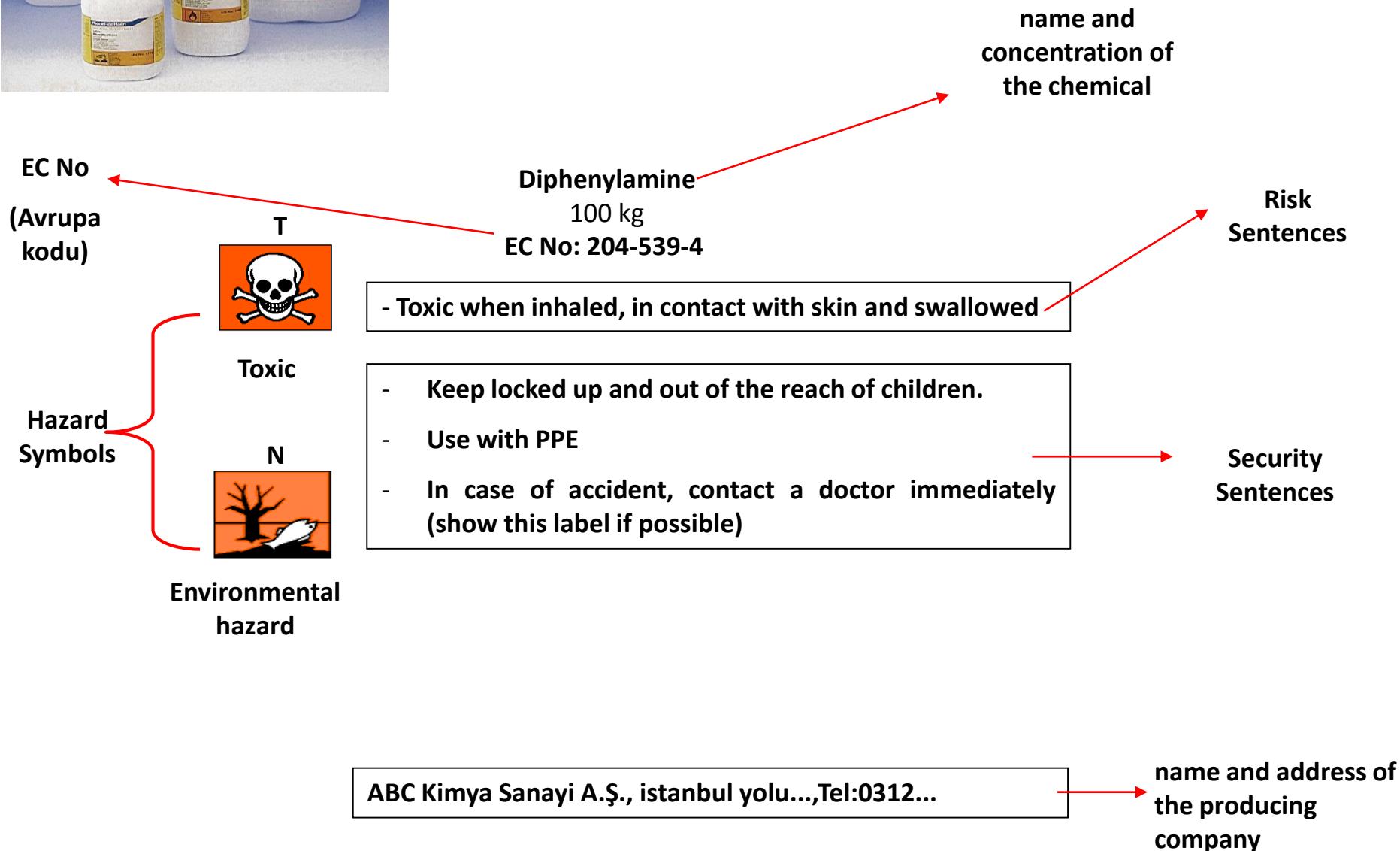
The label should include

- The name of the chemical(s) with the concentration/composition of each ingredient.
 - Date of preparation/packaging.
 - Information on potential hazards and precautions to take
 - Expiration dates and shelf lives.
 - Label language should be in Turkish





LABELLING

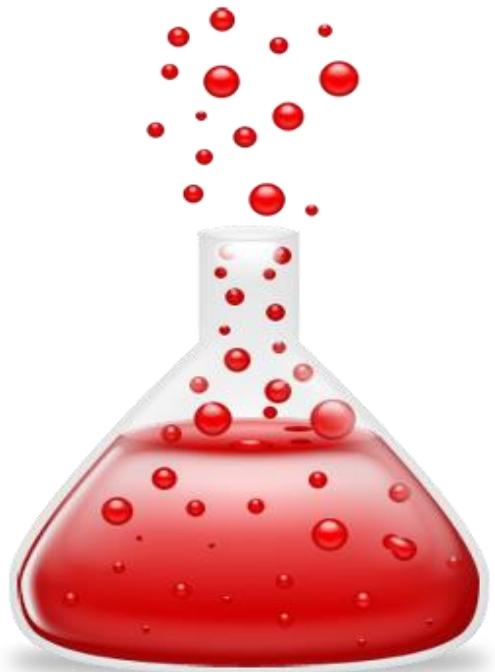


LABEL SIZE

Bottle	Etiket Boyutu (mm)
X < 3 liters (<i>less than</i>)	Min. 52 x 74 (a8 paper size)
3 liters > X < 50 liters	Min. 74 x 105 (a7 paper size)
50 litre > X < 500 litre	Min. 105 x 148 (a6 paper size)
X > 500 liters	Min. 148 x 210 (a5 paper size)







In laboratories, there are various types of chemicals used and stored. These chemicals can be classified according to their physical and chemical properties.

Storage and Handling of Chemicals

Storage must be in:

- closed metal containers inside a storage cabinet
- safety cans, or an inside storage room
- an inside storage room



Metal Containers for
Corrosive materials



Metal Containers for
Flammable materials

	+	-	0	-	-	-	-	-
	-	+	+	-	-	-	-	-
	0	+	+	-	0	0	+	+
	-	-	-	+	-	-	-	-
	-	-	0	-	+	-	-	-
	-	-	0	-	-	+	-	-
	-	-	+	-	-	-	+	+
	-	-	+	-	-	-	+	+

⊕ can be stored together

⊖ can not be stored together

0 can be stored together by taking special precautions

References

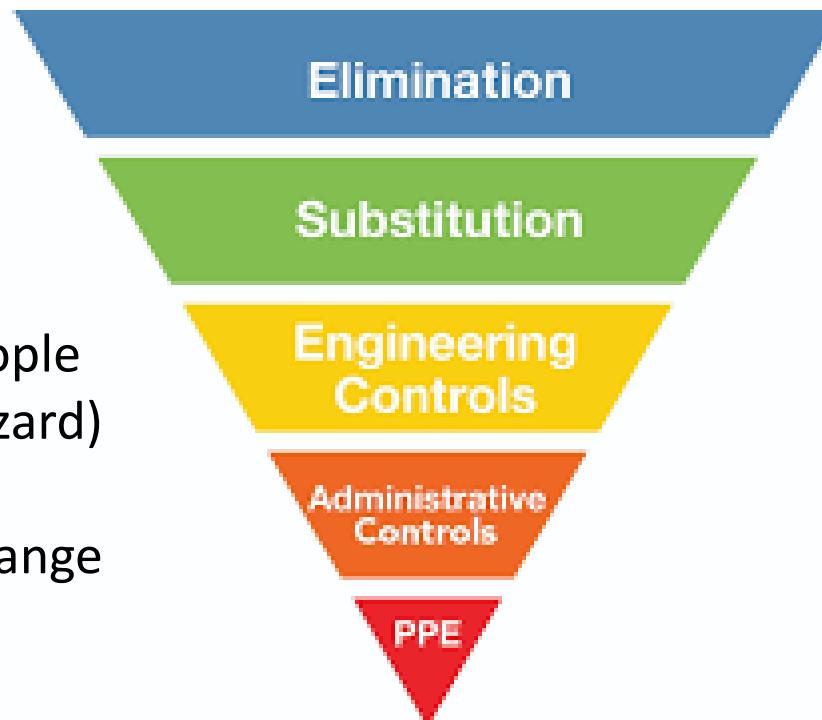
- [1] UCLA Laboratory Safety Manual. (2011). Office of Environment and Safety.
- [2] Handbook of Occupational Hazards and Controls for Pharmacy Workers. (pp. 0–57) (2011).
Government of Alberta.
- [3] M. Rausand. (2005). Hazard Checklist (pp. 1–10). Department of Production and Quality Engineering.
Norwegian University of Science and Technology.
- [4] How to identify hazards requiring risk management? (2006). The Victorian WorkCover Authority.
- [5] Study Materials for the Certificate of Fitness Examination for Supervising Chemical Laboratories (C-14).
(1999). New York City Fire Department.
- [6] Prudent practices in the laboratory. [Electronic resource]: handling and disposal of chemicals. (1995).
Washington, D.C.: National Academy Press.
- [7] Compressed Gas Cylinders. UCLA Environment Health and Safety
- [8] Hazardous waste disposal guide. (2015). Northwestern University Office for Research Safety
- [9] Safety in academic chemistry laboratories Volume 1. (2003). Washington, DC: American Chemical
Society.
- [10] Safety in academic chemistry laboratories Volume 2. (2003). Washington, DC: American Chemical
Society.

For more information, suggested readings are; Furr, A.K. (2000). CRC handbook of laboratory safety. Boca Raton: CRC Press. Hall, S.K. (1994). Chemical safety in the laboratory. Boca Raton: Lewis Publishers.
Do not forget to look at the MSDS's of chemicals.

Control Hierarchy :

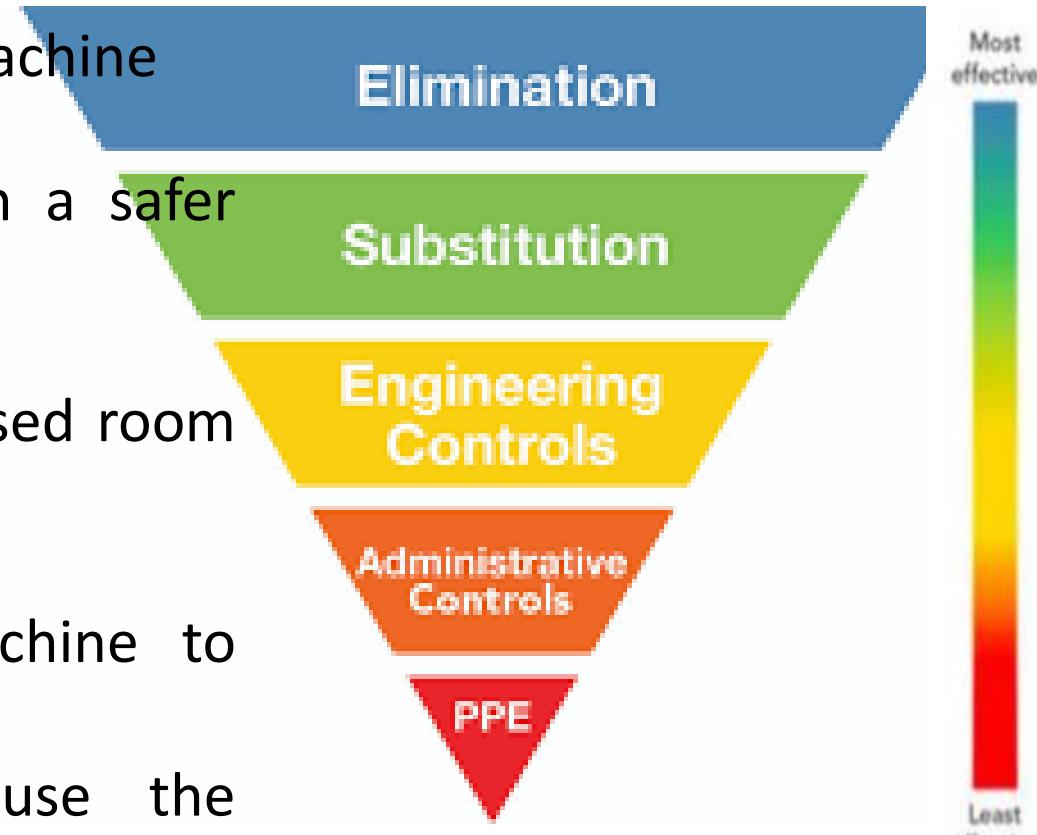
The risk is reduced by taking the following measures according to the results of the risk assessment and **in order of priority**;

- ELIMINATION (remove the hazard)
- SUBSTITUTION (replace the hazard)
- ENGINEERING CONTROLS (Isolate people From the hazard)
- ADMINISTRATIVE CONTROLS (Change behavior)
- PERSONAL PROTECTION EQUIPMENTS



Example; for a machine

- Get rid of the dangerous machine
- Replace the machine with a safer version.
- Keep the machine in a closed room and operate it remotely.
- Attach guard to the machine to protect users &
Train workers how to use the machine safely.
- wear gloves and safety eyewear when using the machine.



How often should you perform risk assessments?

Workplaces are classified as;

- 1) Less Hazardous..... **Every 6 years**
- 2) Hazardous**Every 4 years**
- 3) Very Hazardous.....**Every 2 years**

Further information:

<https://www.hse.gov.uk/pubns/raindex.htm>

FIREE



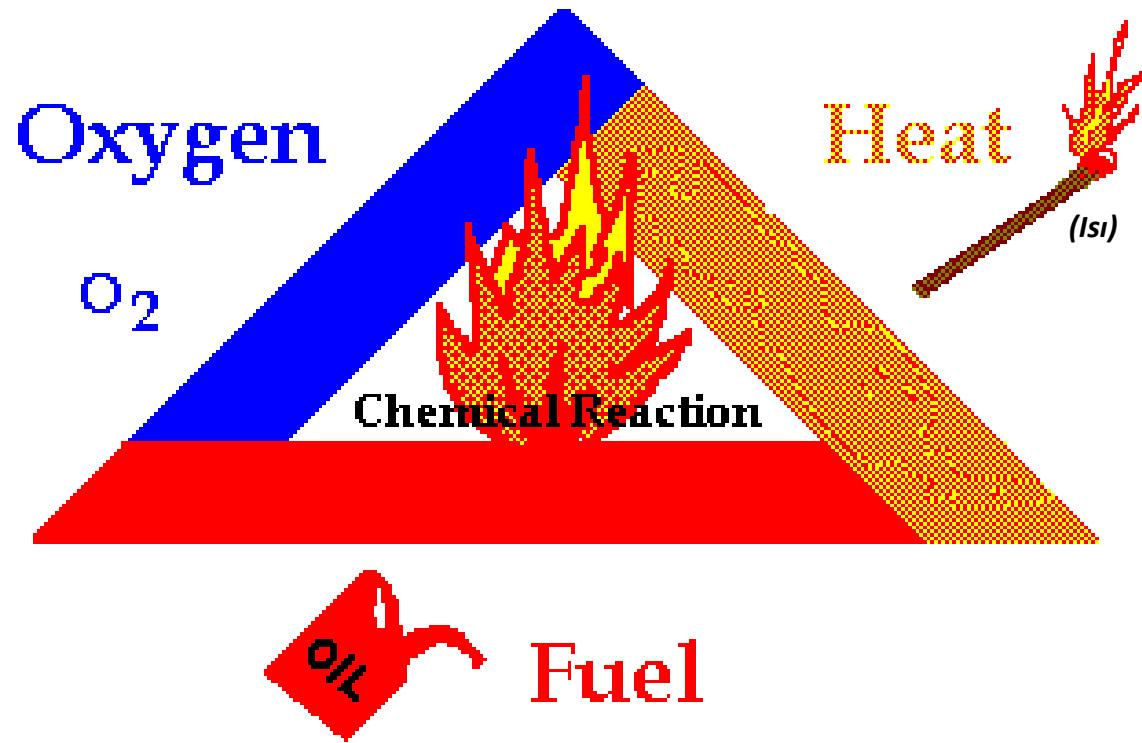
What is Fire ?

Combustion is a chemical reaction.

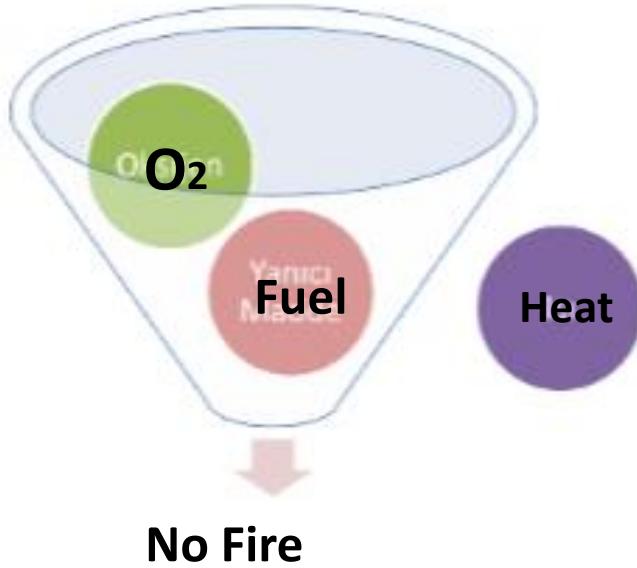
A heat source that heats the combustible material up to the ignition temperature in a sufficient oxygen environment triggers the combustion and **heat energy** is also released as a result of this **exothermic** chain reaction.



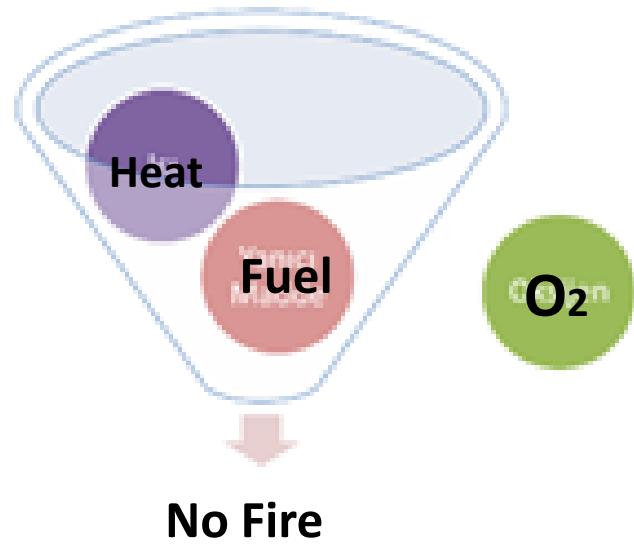
Fire Triangle



Oxygen - Heat - Fuel

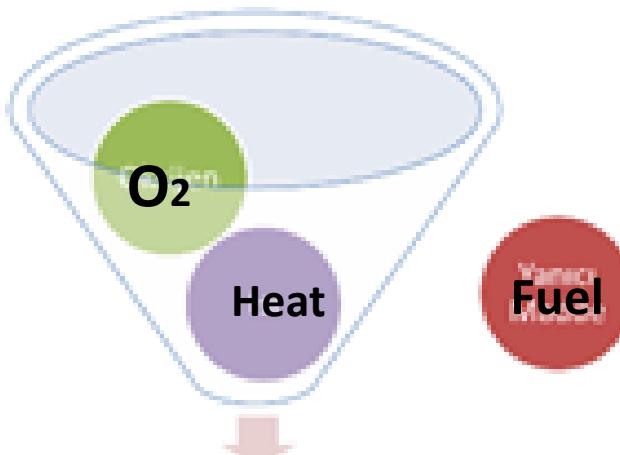


No Fire

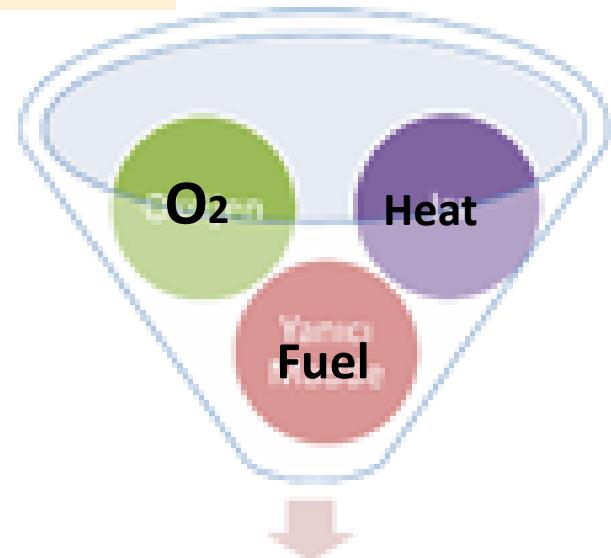


No Fire

All three elements are needed to start a fire. To extinguish a fire, one side must be removed.



No Fire



Fire !



Fire is the rapid oxidation of a material in the exothermic chemical process of combustion, releasing heat, light, and various reaction products.

COMMON CAUSES OF FIRE

A — Failure to take fire protection measures,

B — Ignorance,

Incorrect placement of stove / heating systems, placing easily flammable liquids in the attic and roof, etc.) Stove chimneys should be cleaned twice a year, while heating chimneys once a year.

C — Negligence and carelessness,

Cigarette butts that are thrown out without deflating, iron that is forgotten in the socket, etc...)

D — Accidents, Faulty electrical equipment

(Fallings, impact etc..)

E — Splash,

(intentional fires, terror attacks etc..)

COMMON CAUSES OF FIRE

F — Sabotage, arson

G — Natural Disasters

(lightning, earthquake etc..)

H — Flammable and combustible materials,

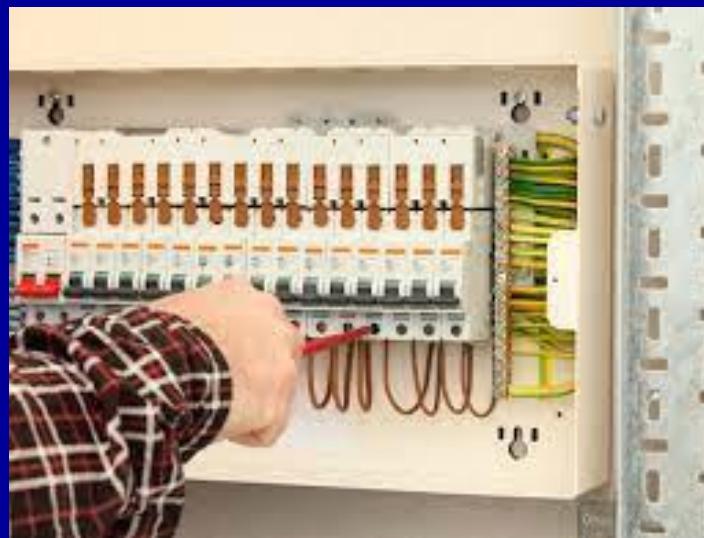
I — Lack of staff training,

J — Lack of resources and equipment in place

1. Failure to take fire protection measures :

The main factors that cause fire are not choosing the right materials against burning and not taking protective measures properly:

- Insufficient installation and fuse systems related to the electrical system or overloading the installation,



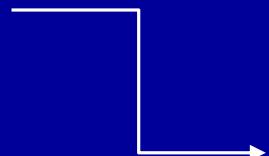
- Roof beams and chimney relations are not properly arranged in buildings, chimneys are not plastered with sufficient care.



- Failure to take necessary precautions when using Liquid Petroleum Gas,



- Failure to periodic cleaning and maintenance of the chimneys, lack of fire partition walls, etc.



2- Ignorance

It is necessary to know how to take precautions against fire.

- Not knowing the properties of the materials and materials used that may cause fire,
 - Not learning how to take fire precautions,
-
- * Not knowing the factors that will cause spark in places such as fuel tanks,
 - * Lack of knowledge of the legislation on the storage and use of hazardous chemicals, etc...

Storage of Chemical Materials:

	Flammable	Explosive	Toxic	Radioactive	Oxidizing	Harmful
Flammable						
Explosive						
Toxic						
Radioactive						
Oxidizing						
Harmful						

Legend:

- can be stored together
- can be stored together with special precautions
- Can not be stored together

3- Negligence and carelessness



LPG **SAFETY TIP
OF THE DAY**

AFTER USE

- ✓ Turn "off" the regulator knob and then the stove knob before retiring to bed.
- ✓ Always keep the regulator knob in 'off' position when the cylinder is not in use

ISSUED IN PUBLIC INTEREST BY INDIAN OIL



4- Accidents, Faulty electrical equipment



5- Splash



6- Sabotage, arson



7- Natural Disasters



Geological disasters



Meteorological disasters



Hydrological disasters



Space disasters

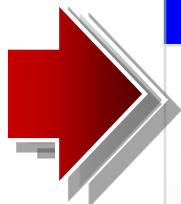
Average Fire Statistics in Turkey



Cigarette / Oakum (Tow)	5836	% 42
Electrical contact	3262	% 23
Chimney	1121	% 8
LPG	752	% 5,20
Arson	524	% 3,50
Splashing	445	% 3
Electrical devices	398	% 2,60
Fuel	154	% 1
Children	407	% 2,60
Others	1930	% 14

Combustion

- Combustion

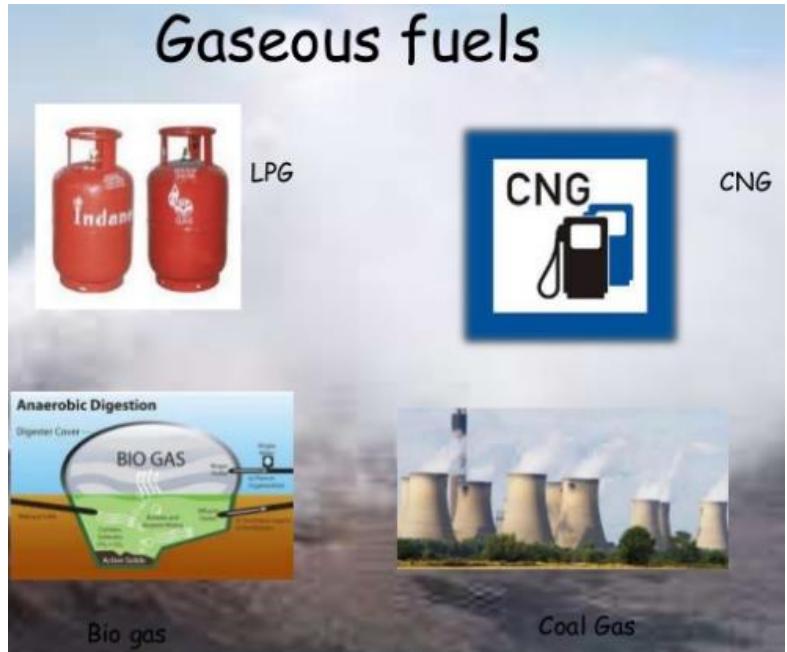


- The chain exothermic (giving heat) chemical reaction that occurs as a result of the combination of the substance with free oxygen in the air at certain rates under heat is called COMBUSTION.

- The substance that undergoes combustion is called as COMBUSTIBLE. It is called a FUEL.

▪ Fuels exist in three states:

- a) Solid,
- b) Liquid,
- c) Gaseous :



A chemical process in which a substance reacts with oxygen to give out heat is called Combustion.

Types of Combustion

- Slow combustion
- Spontaneous combustion
- Rapid combustion
- Flashing and explosion



Increasing severity

Slow Combustion (Oxidation)



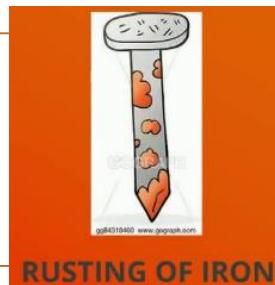
Slow Combustion

- The type of combustion which takes place at a slow rate at low temperatures is called '**Slow Combustion.**'
- Example:-
 - Respiration
 - Rusting of Iron.



~~heat and light exposure~~ ☹

oxidation-rust. ☺



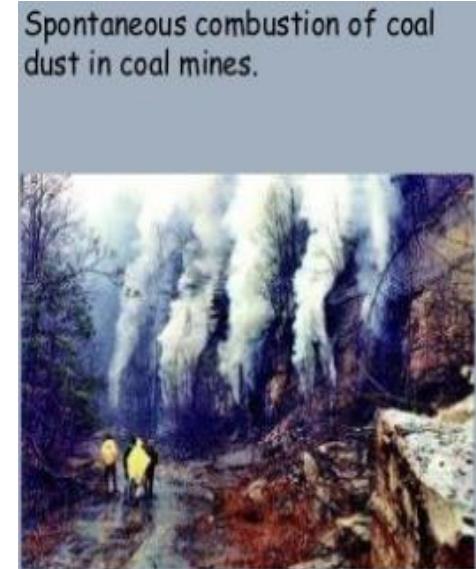
Spontaneous combustion

The type of combustion in which a material suddenly bursts into flames, without the application of any apparent cause is called '**Spontaneous Combustion**'

- Haystacks- because of heat from produced by bacterial fermentation.
- Linseed Oil- can oxidize leading to a build up of heat.
- Coal- may spontaneously ignite when exposed to oxygen.
- Pyrite- oxidizes and causes spontaneous ignition in old mine tailings.
- Pistachio- when stored with lots of other pistachios, self heat can cause combustion.
- Cow Poo- extreme heat is the cause of spontaneous combustion.
- Cotton/Linen- being stored so the heat cannot escape. Once ignition temperature is reached, combustion occurs when oxygen is present.



Forest Fires caused by spontaneous combustion.



Rapid Combustion

- Combustion in which a substance burns rapidly and produces heat and flame is known as rapid combustion, such as combustion of natural gas, LPG, petrol etc.
 - This is usually attained by introducing external heat.
 - Substances which undergo rapid combustion have lower ignition temperature

For example, Burning of LPG

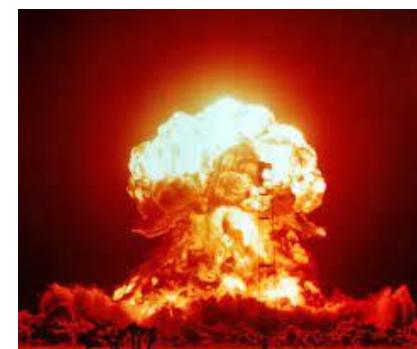
FLASHING and EXPLOSION

FLASHING

- Flash fires are sudden, intense fires caused by ignition of flammable substances in air.

EXPLOSION is a sudden reaction that takes place with the evolution of **heat, light, and sound** with the help of **pressure**.

For example, firecrackers and bombs are the substances which show explosion.



- **An explosion** is a very fast chemical reaction that can form high heat energy in a short time (1/700-1/1000 second)

Rapid combustion



Spontaneous combustion



Explosion

