

SAFEGUIDE

OCCUPATIONAL HEALTH & SAFETY RISK ASSESSMENT GUIDE

APPLICATION EXAMPLE

OCCUPATION: EXPLOSIVE MATERIALS WORKER

PART A. GENERAL FACTS ABOUT THE OCCUPATION

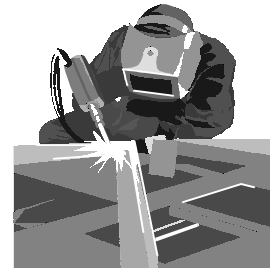
1. THE JOB OF AN EXPLOSIVE MATERIALS WORKER

The explosive materials worker is involved in tasks that concern the production, packaging, transportation and storage of all kinds of products that are described in the current legislation with the term “explosive materials”.

Common tasks performed by an explosive materials worker include: production, packaging, transportation and storage of both the raw material used and the ammunition produced.

The equipment used by an explosive materials worker includes:

1) Mechanical equipment used in either the production of explosive materials (constant functioning reactors, explosive-acid separators, cooling systems, stirring equipment, security systems etc) or in the production of ammunition (e.g. foundry equipment) 2) volume measurement equipment 3) presses 4) transportation means 5) jigs and fixtures 6) hand tools



2. MOST COMMON HAZARDS RELEVANT TO THE JOB OF AN EXPLOSIVE MATERIALS WORKER

- Explosion during the production, transportation and storage of explosive materials.
- Burns due to the use of acids and chemical substances
- Starting a large scale fire
- Causing a large scale accident
- Hazards related with moving machine parts.

3. MOST COMMON WORK RELATED DISEASES AND ILLNESSES RELEVANT TO THE JOB OF AN EXPLOSIVE MATERIALS WORKER

Nitrosis, respiratory tract irritations, cough, dyspnoea, lung swelling.

Poisoning due to the inhalation of fumes (solvents), blood pressure fall, nuisance, strong headaches



4. OTHER GROUPS OF WORKERS THAT ARE SUBJECT TO THE HAZARDS RELATED WITH THE JOB OF AN EXPLOSIVE MATERIALS WORKER



All the staff working in an explosive materials production plant are subject to serious dangers. The production of explosives is an activity that involves high risk level. During the production, transportation and storage of the explosive materials large scale accidents may occur having a strong impact not only to the production plant itself but to the surrounding territory as well.

5. PREVENTIVE MEASURES IN THE JOB OF AN EXPLOSIVE MATERIALS WORKER

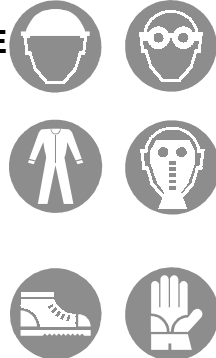


Explosive materials production and elaboration plants are subject to high risk levels, therefore the implementation of sophisticated preventive measures is obligatory.

All the current legislation requirements should be applied as well as the relevant safety rules and the work instructions

6. PERSONAL PROTECTIVE EQUIPEMENT OF AN EXPLOSIVE MATERIALS WORKER

- Protective gloves
- Appropriate spectacles or other eye protection
- Protective footwear
- Working clothes
- Masks or other breathing apparatus where necessary
- Ear-muffs in cases of high noise level
- Hair covering



Some brief guidelines for the selection of the appropriate Personal Protective Equipment are given in APPENDIX 2. In every case the relevant EN Standards should be taken into account.

7. LEGISLTATIVE REQUIREMENTS IN THE JOB OF AN EXPLOSIVE MATERIALS WORKER



A state licence is needed for a worker to do the job of an explosive materials worker.

Nevertheless, the personnel working in explosive materials and ammunition production plants should be suitably trained in both the subject of their work and the protective and preventive measures. The labor conductors, the chief workers and the explosive elaboration machines operators should be particularly trained under the supervision of the production manager at least two months before starting their duties.

The workers should be able bodied, physically and mentally healthy.

Intense care during labor, good reflections, cooperative spirit and a real sense of danger are considered as additional qualifications for the job of an explosive materials worker.

8. NOTES AND REMARKS



9. DESCRIPTION OF THE PARTICULAR WORKPLACE



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PART B. WRITTEN RISK ASSESMENT

WORKPLACE:..... **ASSESSMENT DATE:**.....

1. HAZARDS ASSOCIATED WITH THE RAW MATERIALS USED			
POTENTIAL HAZARDS	LIK.	SEV.	PREVENTIVE/ PROTECTIVE MEASURES
<i>Hazards associated with the raw material supply</i> <ul style="list-style-type: none"> Burns due to the use of strong acids, skin diseases Explosion and/ or fire due to inappropriate storage (non compatible materials), static electricity, large stored quantities or accumulation of explosive material in slots, narrow gaps etc 			<ul style="list-style-type: none"> Use the appropriate PPE (rubber apron, protective gloves and spectacles) In case of contact with the skin, wash acid with adequate amount of water Solution should be prepared by adding acid to water and never the other way round Raw material quality control (purity and size measurements) The workplace should be kept extremely tidy and clean Slots, narrow gaps or similar places where the explosive material may accumulate should be carefully controlled, cleaned and filled up Grounding check The requirements of the relevant legislation should always be met Careful personnel selection
<i>Hazards associated with the temporary storage of the raw materials used</i> <ul style="list-style-type: none"> Nitrosis, respiratory tract irritations, cough, dyspnoea, lung swelling Explosion due to accumulation of explosive material even in small particals (dust) Fire due to flammable solvents, cleaning agents Explosion due to vapors from liquids or metals that are used in 			<ul style="list-style-type: none"> The workplace should be kept tidy and properly ventilated Use the appropriate PPE (rubber apron, protective gloves and spectacles) Solution should be prepared by adding acid to water and never the other way round Raw material quality control (purity) Raw materials should be stored in appropriate vessels in small quantities Flammable materials should always be kept in firmly closed vessels and away from explosive materials and heat sources
<i>Other potential hazards associated with the raw materials used</i>			<i>Preventive and protective measures that are proposed</i>

2. HAZARDS ASSOCIATED WITH THE CURRENT PRODUCTION PROCEDURE

POTENTIAL HAZARDS	LIK.	SEV.	PREVENTIVE/ PROTECTIVE MEASURES
<p><i>Tools, Machinery, Fixtures etc in use.</i></p> <ul style="list-style-type: none"> • Explosion caused by friction, impact or pressure raise • Explosion and/ or fire from the accumulation of explosive material in slots, narrow gaps etc in the equipment used • Explosion due to the accumulation of static electricity • Explosion caused by working near flammable materials • Explosion during sift, granulation, and separation in smaller quantities of the explosive material • Explosion due to nitrosis reactor security system failure • Explosion due to the side products of the neutralisation • Injuries due to falling objects 			<ul style="list-style-type: none"> • The machinery used should be of anti explosive type. It should be certified from the manufacturer and have clearly stated operation, repair and maintenance instructions • All apparatuses and tools should be of anti explosive type • Moving machine parts should be rigidly fastened with the appropriate fastening means • All machine parts should be reachable in order to be easily cleaned • Water protection and lubrication materials should not affect in a hazardous manner the explosive material • Static electricity control systems • The workplace should be kept extremely tidy and clean. Dust should not be removed with the use of compressed air, dirty cloths or wire brushes. Plentiful of water should be used instead. • Slots, narrow gaps or similar places where the explosive material may accumulate should be carefully controlled, cleaned and filled up. Special care should be taken for high abrasion or hollow machine parts • Careful use of cleaning cloths and cleaning material. They should be littered in special vessels and destroyed by authorized personnel • Always elaborate and handle small quantities • Use the safety cabin, plentiful of water and remote control where possible • In case of failure every operation should be immediately stopped. Immediate emptying of the reactor and the separator at the water tank • Careful handling of the explosives' washing products. Appropriate sewage • The workplace should be kept tidy. • Use the appropriate PPE
<p><i>Hazards associated with the work method used</i></p> <p>.....</p>			<p>.....</p>
<p><i>Hazards associated with repair and maintenance works</i></p> <ul style="list-style-type: none"> • Repair and mainainance of the mechanical equipment • Explosion hazard 			<ul style="list-style-type: none"> • Repair and maintenance works should not take place inside the production plants or laboratories • Repair and maintenance works should only be done by authorized personnel and under the surveillance of the production manager or the safety engineer • Repair and maintenance works should be recorded in the relevant book of each unit • Before starting any maintenance or repair work explosive materials should be taken away from both the machinery and the surrounding places (walls, floor, workbench) • The steam boiler should be frequently maintained in order to archive the best combustion conditions • Electrical installations and lightning rods should be frequently checked by authorized personnel, especially before put into operation, after maintenance or modification and after lightning stroke
<p><i>Other potential hazards associated with the current production procedure</i></p>			<p><i>Preventive and protective measures that are proposed</i></p>

3. HAZARDS ASSOCIATED WITH THE WORKING ENVIRONMENT			
POTENTIAL HAZARDS	LIK.	SEV.	PREVENTIVE/ PROTECTIVE MEASURES
<i>Physical Hazards</i> <ul style="list-style-type: none"> High temperature Humidity Low temperature Noise 			<ul style="list-style-type: none"> Temperature control, thermometers Natural or artificial ventilation. Air conditioning Elimination of heat sources where possible Humidity control. In storage installations the humidity should be controlled according to the needs of the explosive material Hot water or steam circulation should be used for heating purposes. Electrical or other type of stoves should be avoided Heaters' temperature should be controlled and never exceed 120 C. Relevant equipment should be well maintained and lubricated Use ear muffs Noise screens, noise isolation
<i>Chemical Hazards</i> <ul style="list-style-type: none"> Burns due to acid spills Fire or explosion caused by the mixture of metallic dust vapors with the atmospheric air in the appropriate percentage Explosion caused by careless handling of the smokeless powder 			<ul style="list-style-type: none"> Use the appropriate PPE (rubber apron, protective gloves and spectacles) when working with hazardous substances such sulfuric acid, nitric acid, sodium hydroxide etc. Be careful when working with chloric and nitric salts. Constant cleaning and ventilation of the workplace Constant humidity control of the explosive material
<i>Electricity</i> <ul style="list-style-type: none"> Fire caused by electrocution Fire due to sparks created from electrostatic charges 			<ul style="list-style-type: none"> Safe power supply system. Water protected electrical installations of anti explosive type preferably with internal cables. Underground power supply system Electric motors should not be installed near the machines but in a separate space and the motion should be appropriately transmitted to the machines All electrical material used should comply with the special rules for electrical material in explosive environment Use of lightning rods in the storehouses and in nitrois plants Use of appropriately grounded equipment Use plentiful of water for the removal of dust and static electricity charges Static electricity discharging systems

3. HAZARDS ASSOCIATED WITH THE WORKING ENVIRONMENT (continue)

POTENTIAL HAZARDS	LIK.	SEV.	PREVENTIVE/ PROTECTIVE MEASURES
<i>Job site</i> <ul style="list-style-type: none"> Insecure building installation Insufficient emergency exits Lack of medical material 			<ul style="list-style-type: none"> Production plants should be build far from residence areas and should comply with all the legislative safety requirements Buildings should be far from each other in order to avoid the hazardous circumstances to be transmitted Premises should be guarded twenty four hours long Premises should be fenced and have sufficient exits according to the amount of personnel In places with especially high risk level appropriate emergency exit should exist for the personnel to be able in case of emergency to empty the space quickly Emergency exits and lanes should always be kept open and easily reached The surrounding space should be free of trees and bushes Water tanks should be near band of workers that are handling explosive materials mixtures Water fire fighting system covering all the buildings Outside of high risk level sites there should be placed a red box containing extra fire fighting tube Appropriate and easily reachable fire fighting means should be available in every site, especially in the high risk level ones (fire extinguisher, vessels containing dry sand and digging tools) First aid kit and medical material should be readily available At least one member of the personnel per job site should have knowledge in providing first aid
<i>Other potential hazards associated with the working environment</i>			<i>Preventive and protective measures that are proposed</i>

4. HAZARDS ASSOCIATED WITH THE FINAL PRODUCT AND SUBPRODUCTS

POTENTIAL HAZARDS	LIK.	SEV.	PREVENTIVE/ PROTECTIVE MEASURES
<p><i>Hazards associated with the taking away of the final product and subproducts</i></p> <ul style="list-style-type: none"> • Explosion and/ or fire due to accumulation of explosive material debris • Explosion caused by friction, impact or pressure during the transportation of the explosive materials 			<ul style="list-style-type: none"> • Explosive materials that are scattered on the floor during the production should be immediately removed from the workplace • The appropriate measures should be taken for the complete and safe disposal of the explosive material debris • Debris should not be buried in the ground • Transportation should be done with extreme care. Use anti explosive type vehicles • Vehicles should be appropriately certified and clear maintenance instructions should be provided by the manufacturer
<p><i>Hazards associated with the temporary storage of the final product and subproducts</i></p> <ul style="list-style-type: none"> • Explosion and/ or fire due to accumulation of explosive material debris • Explosion and/ or fire caused by temporary storage of the produced explosive materials 			<ul style="list-style-type: none"> • Explosive materials should be stored in small quantities (never exceed the maximum allowed quantity as defined in the relevant legislation) • No other work activities are permitted in store houses • Explosive materials should be stored in appropriate vessels of anti explosive type that are not reacting with the explosive materials • Explosive materials should not be stored together with the ignition means • Explosive materials, half-finished and final products (ammunition) should be stored separately • Between-phases products should be kept in appropriate store houses until used in the relevant production phase • Final products should be immediately transported to store houses • The produced explosive materials should not be stored together with flammable materials, solvents, paints, metal dusts, clothes, garbage or other neutral material • The appropriate measures should be taken for the complete and safe disposal of the explosive material debris. In no case should debris be buried in the ground • Appropriate grounding installations, lightening rods and fire fighting means should be available • The workplace should be kept extremely tidy and clean • Appropriate protection from rodents • Use of appropriate materials for packaging (boxes, vessels, barrels) • The floor should be kept in good condition and should be made from material that does not produce sparks, is not slippery and is conductive.
<p><i>Other potential hazards associated with the final product and subproducts:</i></p>			<p><i>Preventive and protective measures that are proposed</i></p>

5. OTHER TYPES OF HAZARD

POTENTIAL HAZARDS	LIK.	SEV.	PREVENTIVE/ PROTECTIVE MEASURES
<i>Hazards associated with the poor organization of work</i> <ul style="list-style-type: none"> • Lack of working instructions tables • Poor work schedule organization 			<ul style="list-style-type: none"> • Clear and explicit working instructions provided in tables that are put in easily seen places • Appropriate work schedule • Clearly defined tasks and duties
<i>Hazards associated with psychological factors</i> <ul style="list-style-type: none"> • Time pressure • Poor cooperation with co-workers and supervisors • Recent serious accident that effects personnel psychologically in a negative way 			<ul style="list-style-type: none"> • Conditions that promote good cooperation and promote good relationships
<i>Hazards associated with the particular requirements of the work and the particularities of the specific workplace</i> <ul style="list-style-type: none"> • Inappropriate assignment and/ or use of the personal protective equipment • Use of inappropriate working clothes or/ and personal stuff • Carelessness, negligence, ignorance of non specialized personnel or visitors 			<ul style="list-style-type: none"> • Personal protective equipment and working clothes should comply with the relevant EN standards and should be kept clean, not exceed their life limit and be properly maintained • Smoking at the high risk level sites of the production plant is prohibited. Buildings should have the relevant signs • Personnel should not carry ignition mechanisms, non-water proof lamps, heated objects, self-ignited material and metal or other parts apart from the ones given to them for the completion of their tasks • The entrance in high risk sites should be prohibited to unauthorized persons unless permission is given by the safety engineer • Irrelevant persons or groups of workers doing a specified job in the production plant, should be previously rendered aware of all possible hazards and take the preventive measures • In times when the production plant is not in operation only the guarding personnel should be allowed and it should be locked

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PART C. POTENTIAL HAZARDS AND PERSONAL PROTECTIVE EQUIPMENT



		PART OF THE BODY AT RISK													
		HEAD					UPPER LIMBS	LOWER LIMBS	GENERAL						
		SKULL	EARS	EYES	FACE	RESPIRATORY TRACT	HANDS	ARMS	FEET	LEGS	SKIN	ABDOMEN	WHOLE BODY	OTHER IDENTIFIED PART OF THE BODY AT RISK	
POSSIBLE HAZARDS															
MECHANICAL	FALLS FROM HEIGHTS														
	BURNS – CUTS								X	X					
	IMPACT – CRUSHING – ENTANGLEMENT														
	VIBRATION														
	SLIPS														
ELECTRICAL															
THERMAL	HEAT-FLAMES												X		
	COLD														
RADIATION	NON IONISING														
	IONISING														
NOISE															
CHEMICAL	GASES-VAPOURS														
	FUMES														
	MISTS														
	IMMERSION														
	SPLASHES														
GASES-VAPOURS						X							X		
BIOLOGICAL	HARMFUL BACTERIA														
	HARMFUL VIRUS														
	FUNGI														
PROPOSED PERSONAL PROTECTIVE EQUIPMENT		HELMET	EARMUFFS	GOGGLES	FACE PROTECT.	RESPIRATORY DEV.	GLOVES	PROTECTIVE CLOTHING	FOOTWEAR	PROTECTIVE CLOTHING	ORINTMENTS	PROTECTIVE CLOTHING	PROTECTIVE CLOTHING, PROTECTIVE EQUIPMENT AGAINST FALLS FROM A HEIGHT ETC	PROPER PROTECTIVE EQUIPMENT	

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PART D. LEGISLATION - STANDARDS - REFERENCES

1. RELEVANT GREEK LEGISLATION



1. Ν. 1568/1985 “Υγιεινή και ασφάλεια των εργαζομένων”
2. Π. Δ. 17/96 “Μέτρα για τη βελτίωση της ασφάλειας και της υγείας των εργαζομένων κατά την εργασία σε συμμόρφωση με τις οδηγίες 89/391/ΕΟΚ και 91/383/ΕΟΚ”
3. Π. Δ. 16/96 “Ελάχιστες προδιαγραφές ασφάλειας και υγείας στους χώρους εργασίας σε συμμόρφωση με την οδηγία 89/645/ΕΟΚ”
4. Π. Δ. 395/1994 “Ελάχιστες προδιαγραφές ασφάλειας και υγείας για τη χρήση από τους εργαζόμενους εξοπλισμού ατομικής προστασίας κατά την εργασία σε συμμόρφωση προς την οδηγία του Συμβουλίου 89/656/ΕΟΚ”
5. Π. Δ. 105/1995 “Ελάχιστες προδιαγραφές για την σήμανση ασφάλειας ή/ και υγείας στην εργασία σε συμμόρφωση με την οδηγία 92/58/ΕΟΚ”
6. Π.Δ. 377/1993 “Προσαρμογή της Ελληνικής Νομοθεσίας στις Οδηγίες 89/392/ΕΟΚ και 91/368/ΕΟΚ του Συμβουλίου των Ευρωπαϊκών Κοινοτήτων σχετικά με τις μηχανές.”
7. Π.Δ. 395/1994 “Ελάχιστες προδιαγραφές ασφάλειας και υγείας για τη χρησιμοποίηση εξοπλισμού εργασίας από τους εργαζόμενους κατά την εργασία τους σε συμμόρφωση με την οδηγία 89/655/ΕΟΚ.”
8. Ν.Δ. 35/1968 “Περί των όρων ιδρύσεως και λειτουργίας εργαστηρίων, εργοστασίων και αποθηκών εκρηκτικών υλών”
9. ΚΥΑ 3329/1989 “Κανονισμοί για την παραγωγή, αποθήκευση και διάθεση σε κατανάλωση εκρηκτικών υλών.”

For more information and a further relevant investigation the following www address is proposed:
www.elinyae.gr

2. EUROPEAN EN STANDARDS RELEVANT TO THE PROPOSED PERSONAL PROTECTIVE EQUIPMENT (P.P.E.)



EN 420	General requirements for gloves
ENV 340	Protective clothing: General Requirements
EN 379 –95	Industrial safety helmets
EN 812-99	Industrial bump caps
EN 345 –95	Specification for safety footwear for professional use
EN 346-93	Specification for safety footwear for professional use

For more information and a further relevant investigation the following www addresses are proposed:
www.elot.gr, www.idec.gr/ppe, www.cenorm.be .

3. SPECIALISED BIBLIOGRAPHICAL REFERENCES



- Μεθοδολογικός οδηγός για την εκτίμηση και πρόληψη του επαγγελματικού κινδύνου, Σ. Δρίβας, Κ. Ζορμπά, Θ. Κουκουλάκη, Β' έκδοση, ΕΛΙΝΥΑΕ, Αθήνα 1998
- Επιδημιολογία και πρόληψη επαγγελματικών νόσων, Α. Λίνου, Αθήνα 1989
- Croner's Risk Assessment, Croner Publications Ltd., Surrey 1995
- BS 8800 : 1996 "Occupational health and safety management systems"
- Safety and health in the use of chemicals at work, C.M.A. Bakar, D. Gold, ILO, Geneva 1993
- Encyclopaedia of Occupational Health and Safety, ILO.