



////HEALTH AND SAFETY RELATED TO PRODUCTS USED IN PAINTING, DRAWING AND PRINTMAKING////

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**GETTING TO KNOW ABOUT
HEALTH AND SAFETY RE-
LATED TO PRODUCTS USED
IN PAINTING, DRAWING
AND PRINTMAKING.**

__Dr. EVA FIGUERAS FERRER__

Practicing art is not a high risk activity. This statement, along with the creative, expressive and intangible aims of this activity, as well as the lack of information, promotion of safety awareness and training of the people in charge of art studios, may have pushed the implications of practicing art as regards health, safety and environment into the background. Faced with this prospect, a comprehensive study of the facilities and the activities carried out in art studios becomes necessary. The study concerns experimental activities involving Health and Safety risks for both the artists and the teachers and students, especially those carried out in the studios located in educational institutions.

In order to minimize the risk of accidents and incidents in art studios, as well as the possible detrimental effects on health and the environment, it is essential to implement preventive technical and organizational measures aimed at eliminating risks from the outset. When these cannot be totally eliminated, the necessary protection measures shall be adopted in order to minimize them, always giving priority to those measures involving collective protection against those which are just limited to individual protection by using Personal Protective Equipment (PPE).



[Personal Protective Equipment (PPE) shall always be used. Waxes handling.]

The lack of space and the non-ergonomic design of the studio, faulty facilities, ignorance of the hazardous characteristics of the employed chemical products, the use of intrinsically hazardous working methods and procedures, bad working habits or environmental pollution can be considered risk factors.

In order to prevent and reduce risks, it is necessary to consider the aspects of structural safety, location, design and layout of the studio. It is

also essential to establish a good preventive and corrective maintenance policy which contemplates the periodic inspection of installations, materials and equipment as well as the immediate repair of possible damages. It is no less



[Personal Protective Equipment (PPE) shall always be used. Inking plate engraving.]

important to have information on the hazardous characteristics of chemical products, and to appropriately control and handle waste materials. Finally, it is of fundamental importance to acquire and maintain best working practices, by following Standard Operating Procedures (SOPs), since we understand they describe by means of documents the specific se-

quences of operations and methods to be applied in the studio for specific purposes.

It is important to take into account that, although some chemical products employed in the painting, drawing or printmaking studio do not require a hazard indication, that does not mean that they should be considered innocuous, since they can react with other products they come into contact with. Consequently, whenever a chemical product is handled, be it considered hazardous or not, the following preventive actions shall be taken: if it is the first time a chemical product is being used, the users of chemical products, in this case the artists, the teachers, the studio technicians, the students, etc. need to have detailed information on the hazards and risks arising from its use and establish a plan of action for the use of the products. This plan of action must consider the working method, individual and collective protection, the appropriate storage of the products, the methods of neutralization and spillage collection, waste product management, and individual hygiene and cleaning before, during and after the use of the product.

In order to ensure the safe handling of the products used in the studio it is necessary to be familiar with the sources of information on chemical hazard. Besides the current legislation on the marketing of chemical products regarding classification, packaging and labelling of hazardous substances and mixtures, there are other important sources of information such as the label on the container and the Material Safety Data Sheet of the product (MSDS).

The label is, generally, the first piece of information that the user receives and the one which enables the identification of the product when it is used. According to the GHS (Globally Harmonized System of classification and labelling of chemical products)¹, hazard symbols, warning statements and hazard indications on the label have become internationally standardized and have been assigned to every corresponding hazard category.

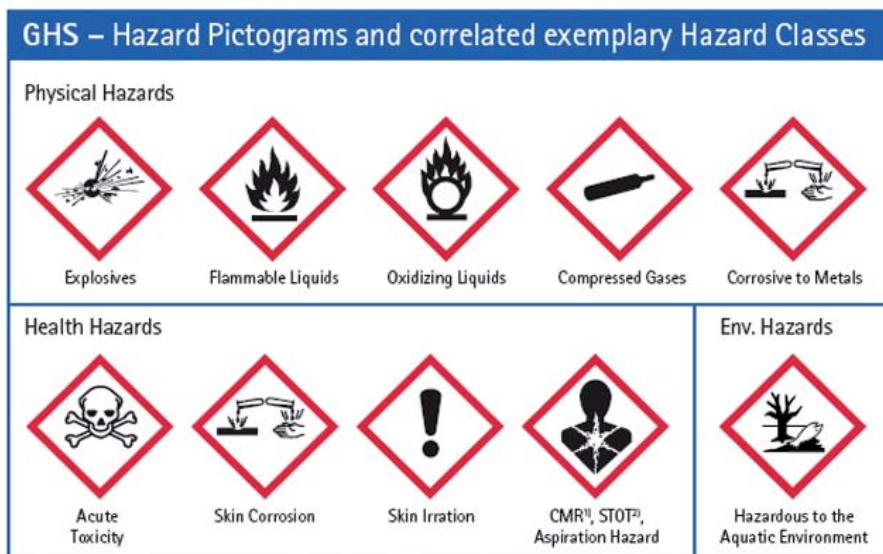
The label of a hazardous chemical product must contain:

- a** Hazard pictograms.
- b** Signal words: "Hazard" or "Caution".
- c** Hazard statements. H Statements: these are statements corresponding to a hazard class and category which specify the nature of the risk regarding the respective hazardous product, including, where appropriate, the degree of hazard.
- d** Precautionary statements. P Statements. They describe recommended measures that should be taken in order to minimise and prevent adverse effects caused by exposure to a hazardous product or the

¹Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending. Regulation (EC) No 1907/2006 (OJ L 353, 31.12.2008, p.1). GHS stands for the "Globally Harmonized System of Classification and Labelling of Chemicals". GHS is a system that defines and classifies the hazards of chemical products, and communicates health and safety information on labels and material safety data sheets (called Safety Data Sheets, or SDSs, in GHS). The goal is that the same set of rules for classifying hazards, and the same format and content for labels and safety data sheets (SDS) will be adopted and used around the world. An international team of hazard communication experts developed GHS.

way this is handled. They can be complemented with precautionary pictograms.

E Manufacturer and supplier identification.



1) carcinogenic, germ cell mutagenic, toxic to reproduction / 2) specific target organ toxicity

Hazard pictograms, signal words and hazard statements must appear together on the label. The competent authority can, if it so decides, either impose a specific format for its presentation as well as for the precautionary information, or leave it to the discretion of the supplier. All the information on the label must stand out from the label background and it will be big enough and sufficiently spaced out to make it easily readable. Each symbol shall take up at least 1/10 of the size of the label and shall never be smaller than 1 cm².

Inside the studio, the containers should be correctly labelled; therefore, unlabelled or unidentified products derived from transfer, generated during a process or deemed to be waste are not acceptable. In order to identify products prepared in the studio and handled internally, it

is possible to use a label model such as the following one, used by way of an example, applying for yellow chrome and lamp black pigments:

  UNIVERSITAT DE BARCELONA   Faculty of Fine Arts Painting Department	
Chrome Yellow Nº CI: PY-34 (77600) PbCrO₄	
H A Z A R D   	H360: May impair fertility or cause harm to the unborn child H332: Harmful if inhaled H302: Harmful if swallowed H373: May cause damage to organs through prolonged or repeated exposure H410: Very toxic to aquatic life with long lasting effects P270: Do not eat, drink or smoke when using this product

The Material Safety Data Sheet (MSDS) is an important source of information which complements the details given on the label and represents an essential working tool, since it effectively and sufficiently informs the professional user about the health, safety and environmental hazards of the product. The MSDS does not only inform about the hazardous properties of the products but also includes essential recommendations for their handling, storage, transport and disposal, as well as the measures that should be taken in different risk situations.

According to the regulations on marketing hazardous chemical products, the person responsible for marketing a substance or mixture classified as hazardous, either bottled or in bulk, must provide the professional user with the MSDS



UNIVERSITAT DE BARCELONA



Faculty of Fine Arts
Drawing Department

Lamp Black
N° CI: PBk-6 (77266)

CAUTION



H351: Suspected of causing cancer.
H335: May cause respiratory irritation.
H333: May be harmful if inhaled.
H320: May cause eye irritation.
H313: May be harmful in contact with skin.
H303: May be harmful if swallowed.
P261: Avoid breathing dust.
P270: Do not eat, drink or smoke when using this product.
P281: Use personal protective equipment as required.

applying to the supplied product, in accordance with the guidelines detailed in Annex II of European Regulation No. 1907/2006, regarding registration, evaluation, authorisation and restriction of chemical substances and mixtures (REACH)².

²Regulation (EC) No. 1907/2006 of the European Parliament and Council, of 18 December, 2006, regarding registration, evaluation, authorisation and restriction of chemicals substances and mixtures (REACH). Official Journal of the European Union, dated 29 May, 2007.

The MSDS shall be written in, at least, the official language of the State and shall include:

- 1_ Identification of the substance or mixture, and of the supplier.
 - _1.1. Identification of the substance or mixture.
 - _1.2. Use of the substance or mixture.
 - _1.3. Identification of the person responsible for marketing the product.
 - _1.4. Emergency phone number of the company which markets the product or the competent consultative body.
- 2_ Hazards Identification.
- 3_ Composition and Information on Ingredients.
- 4_ First Aid Measures.
- 5_ Fire Fighting Measures.
- 6_ Accidental Release Measures.
- 7_ Handling and Storage.
- 8_ Exposure Controls / Personal Protection.
- 9_ Physical and Chemical Properties.
- 10_ Stability and Reactivity.
- 11_ Toxicological Information.
- 12_ Ecological Information.
- 13_ Disposal Considerations.
- 14_ Transport Information.
- 15_ Regulatory Information.
- 16_ Additional Information.



Health	2
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Reactivity	0
Personal Protection	H

Material Safety Data Sheet Acetone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acetone

Catalog Codes: SLA3502, SLA1645, SLA3151, SLA3808

CAS#: 67-64-1

RTECS: AL3150000

TSCA: TSCA 8(b) inventory: Acetone

CI#: Not applicable.

Synonym: 2-propanone; Dimethyl Ketone;
Dimethylformaldehyde; Pyroacetic Acid

Chemical Name: Acetone

Chemical Formula: C₃H₆O

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.
Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Acetone	67-64-1	100

Toxicological Data on Ingredients: Acetone: ORAL (LD50): Acute: 5800 mg/kg [Rat]. 3000 mg/kg [Mouse]. 5340 mg/kg [Rabbit]. VAPOR (LC50): Acute: 50100 mg/m 8 hours [Rat]. 44000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance may be toxic to kidneys, the reproductive system, liver, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 465°C (869°F)

Flash Points: CLOSED CUP: -20°C (-4°F). OPEN CUP: -9°C (15.8°F) (Cleveland).

Flammable Limits: LOWER: 2.6% UPPER: 12.8%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Vapor may travel considerable distance to source of ignition and flash back.

Special Remarks on Explosion Hazards:

Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anhydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide, potassium ter-butoxide, sulfur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thitriazylperchlorate.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

Storage:

Store in a segregated and approved area (flammables area) . Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 500 STEL: 750 (ppm) from ACGIH (TLV) [United States] TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) [United States] TWA: 500 STEL: 1000 [Australia] TWA: 1185 STEL: 2375 (mg/m3) [Australia] TWA: 750 STEL: 1500 (ppm) [United Kingdom (UK)] TWA: 1810 STEL: 3620 (mg/m3) [United Kingdom (UK)] TWA: 1800 STEL: 2400 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Fruity. Mint-like. Fragrant. Ethereal

Taste: Pungent, Sweetish

Molecular Weight: 58.08 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 56.2°C (133.2°F)

Melting Point: -95.35 (-139.6°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.79 (Water = 1)

Vapor Pressure: 24 kPa (@ 20°C)

Vapor Density: 2 (Air = 1)

Volatility: Not available.

Odor Threshold: 62 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.2

Ionicity (In Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 44000 mg/m³ 4 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenicity) based on studies with yeast (*S. cerevisiae*), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behavior) characterized by dizziness, drowsiness, confusion, headache, muscle weakness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting). Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also

affect the Central Nervous System (behavior), characterized by depression, fatigue, excitement, stupor, coma, headache, altered sleep time, ataxia, tremors as well as the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis. Eyes: Eye irritation.

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fathead Minnow]. 0.1 ppm any hours [Water flea].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Acetone UNNA: 1090 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene, Formaldehyde Connecticut hazardous material survey.: Acetone Illinois toxic substances disclosure to employee act: Acetone Illinois chemical safety act: Acetone New York release reporting list: Acetone Rhode Island RTK hazardous substances: Acetone Pennsylvania RTK: Acetone Florida: Acetone Minnesota: Acetone Massachusetts RTK: Acetone Massachusetts spill list: Acetone New Jersey: Acetone New Jersey spill list: Acetone Louisiana spill reporting: Acetone California List of Hazardous Substances (8 CCR 339): Acetone TSCA 8(b) inventory: Acetone TSCA 4(a) final test rules: Acetone TSCA 8(a) IUR: Acetone

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCCL (EEC):

R11- Highly flammable. R36- Irritating to eyes. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information**References:**

-Material safety data sheet issued by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G., The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI, RTECS, HSDB databases. Other MSDSs

Other Special Considerations: Not available.

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Last Updated: 11/01/2010 12:00 PM

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Safety Data Sheet

Material Safety Data Sheets of the chemical products used, either in print or electronic format, must be easily found in the studio, since the information they provide is very detailed and can be effective at a certain point.

The storage of chemical products is another very important aspect regarding health and safety in the studio. Storing means keeping products for their subsequent use, disposal or delivery to a third party. The latter function includes preparations for shipment.



[Material safety data sheets]

The first step for storage will involve the separation of incompatible product families⁴. Therefore, acids are separated from bases, oxidants from flammable products, carcinogenic substances, etc.

In a painting, drawing or printmaking studio, it is advisable to have a warehouse for the chemical products. In the warehouse it is appropriate to physically separate incompatible chemical products, either by means of islands or shelves. The island system consists of using a number of shelves for a specific product family – solvents, for instance – placed in such a way that they are surrounded by aisles the width of which is at least one metre. In this way, a warehouse can be made up of several islands, each of them used for a specific product family, while inert reagents are all grouped on shelves along one of the walls. The shelving system is appropriate when little space is available and there are small quantities of products which can be arranged on shelves along the walls, alternating inert products with incompatible products. Thus, for instance, acids

³In many cases, the companies which market the products provide electronic MSDS, which are available on the Internet.

⁴Chemical Storage: Myths vs. Reality. <http://www.hss.doe.gov/index.html> (Consulted: 2/02/2012).

will be placed vertically on a set of shelves, in such a way that these substances will take up a column. Next to this column, inert substances (such as salts) will be placed, and then, basic substances will be arranged in another column.



[Inadequate storing of chemical products in the studio]

Special care shall be taken with solvents and thinners, which shall be stored in fire-resistant cabinets placed far away from heat sources in order to avoid possible fires. Pigments shall be stored in well-ventilated places, away from heat and moisture sources. A series of measures need to be taken to minimise hazards in the warehouse of the studio. For example, the studio must be well ventilated, dry and protected from direct heat sources. It is advisable to use appropriate health and safety signs on the premises and to maintain emergency exits unblocked. Chemical products must be stored in the conditions detailed in the corresponding MSDS and it is necessary to appropriately label containers of transferred products or prepared mixtures. Accumulation of large quantities of chemical products in the warehouse must be avoided and a record of entries and exits must be kept in order to enable an updated stock inventory.

Waste management is another aspect to be taken into account. Waste generated in the painting, drawing or printmaking studio as a result of using solvents, ink, varnish, sprays, pigments, acids, etc. is classified as ha-

Special care shall be taken with solvents and thinners, which shall be stored in fire-resistant cabinets placed far away from heat sources in order to avoid possible fires. Pigments shall be stored in well-ventilated places, away from heat and moisture sources.

A series of measures need to be taken to minimise hazards in the warehouse of the



[Flammable safety cabinets]

zardous waste, because it can represent a health and environment hazard.

Hazardous waste requires special disposal procedures which are regulated by national and international laws, hence the importance of managing this type of waste appropriately, both on and off the premises. On the premises, correct waste management involves:

1. Identifying the waste with a label which contains information about its nature and its state of matter, hazard pictograms, H and P statements, the identification of the waste generator (studio, department, etc.) and the start and end date⁵ of filling the container. By way of an example, below is shown an internal management label for non-halogenated solvent waste.

RESIDUOS PELIGROSOS	
 UNIVERSITAT DE BARCELONA	Facultad de Bellas Artes Departamento de Pintura Taller de pintura
Disolventes no halogenados	
Fecha inicio llenado:	PELIGRO H226: Líquidos y vapores inflamables H302: Nocivo en caso de ingestión H331: Nocivo si se inhala H402 Nocivo para los organismos acuáticos
Componentes tóxicos:	
  	

⁵The end date of filling the container can be useful as a reference for the maximum legally allowed storage. If waste disposal is established at shorter intervals by the company in charge of managing it, the start date of filling the container can be used as a reference, as is shown in the sample label.

2_ Using the appropriate container for the type of waste that will be stored in it. High density polyethylene (HDPE) cans are resistant to most chemical products. It is recommended that 10–15-litre cans be used, and that they should be filled up to a maximum of 90% of their capacity. Thus, spills and splashes due to an excess of pressure inside the container are avoided.



[The containers should be correctly labelled]



[It is recommended that 10–15-litre cans be used, and that they should be filled up to a maximum of 90% of their capacity.]

3_

Carrying out appropriate selective waste collection. Wastes which can cause chemical reactions due to incompatibility must not be mixed. Some of these are detailed below:

Oxidants with:	flammable substances, carbides, nitrides, hydrides, sulphides, alkyl metals, aluminium, magnesium and zirconium powder
Reducing agents with:	nitrites, halogens, oxides, peroxides, fluorine
Strong acids with:	strong bases
Sulphuric acid with:	sugar, cellulose, perchloric acid, potassium permanganate, chlorates, thiocyanates
Acids with:	sulphides, cyanides

The state of matter of the waste is another factor to be taken into consideration when carrying out selective waste collection: solid and liquid waste must be collected separately. Thus, for instance, in the painting studio, solid waste is generated, such as paper, cloths containing solvents (hydrocarbons, alcohols, ketones), masks or mask filters, gloves, etc., all of which are contaminated with chemical products. This waste shall be disposed of in 30-litre containers identified as "Contaminated material".

Glass bottles and plastic containers which have been in contact with chemical products shall be decontaminated insofar as possible and the identifying label shall be removed. In this way, they will become common waste and they will be subsequently recycled. If decontamination is not possible, they shall be identified as "Contaminated Glass" and "Contaminated Plastic" and they shall be disposed of as hazardous waste. Aerosols shall also be disposed of as hazardous waste.

4_ Storing the waste temporarily. Waste accumulation in the studio is a source of hazard. In order to avoid it, when a container is full (a maximum of 90% of its capacity) it shall be removed from the studio and taken to the place fitted out for the temporary storage of waste. This warehouse must satisfy all the applicable legal requirements. Records must be kept of all the waste entries and dispatch, which shall be planned taking into account the generated volume of waste, as well as current legislation, which prohibits the storage of hazardous waste for periods longer than six months.

After the temporary storage, waste shall be delivered to authorised waste managers who guarantee the correct waste management off the premises.

Despite taking the necessary preventive measures, accidents and incidents in handling chemical products in the studio cannot be entirely avoided. It is essential to establish some action protocols which provide for the organisation of first aid procedures in accordance with the number of people using the studio, the existing risk, and the means of access to the nearest health care centre.

The first aid material will consist of at least one portable first aid kit which contains authorised disinfectants and antiseptics, sterile gauze, cotton wool, bandage, surgical tape, sticking plasters, scissors, forceps and disposable gloves. This material shall be periodically checked and shall be replaced as soon as it expires or it is used up. All the studio users must be trained and informed about the actions to be taken in case of accident and all the following information must be available in a visible place: what measures to take, who to call, telephone numbers, etc. In case of accident the action protocol known as PAS (in Spanish, it stands for: Protect, Alert, Help) must be followed.

When handling chemical products, detrimental health effects occur through skin and eye contact, inhalation and, to a lesser extent, through accidental ingestion (by means of hand-to-mouth contact, contaminated food or drink, etc.). In case of such accidents it is advisable to react fast and follow the established action protocol corresponding to the type of accident.

The seriousness of injuries due to skin contact with chemical products will not depend only on the physical and chemical properties of the product

but also on the duration of contact and the amount of product. The action to be taken in case of such injuries shall be based on removing the chemical product from the skin of the injured by diluting it with water (immediately wash the affected area thoroughly under running water for about 20–30 minutes).

In eye contact with chemical products, time is crucial. It is always essential to react with the utmost urgency in order to reduce the seriousness of the injury by washing the eyes thoroughly with water (for about 20–30 minutes) in the eyewash station; eyes must be kept open to ensure they are thoroughly rinsed under the eyelids. Medical attention must be provided no matter how unimportant the injury might seem.

Intoxication by ingestion of chemical products requires medical attention before taking any action. And, lastly, if intoxication by inhalation of chemical products occurs, the affected person must be immediately moved to a well ventilated place and medical attention must be requested as soon as possible. At first symptom of breathing difficulty, mouth-to-mouth resuscitation must be given.

Spills of chemical products are some of the most frequently occurring incidents in the art studio when handling the said products. If a chemical product splashes or is spilled on the floor or any surface of the work area, quick action must be taken to collect the spilled material, thus preventing its evaporation and possible damage to people and facilities. With a view to taking appropriate action, it is necessary to have good knowledge of the cleanup methods for the different chemical products used in the art studio and the appropriate personal protective equipment (gloves, safety glasses, waterproof apron, etc.). This information can be found in the MSDS.

For the collection of liquid spills, an inert absorbent such as vermiculite or similar material must be used, and spill waste must be neutralized according to the established method. Sawdust shall never be used to absorb flammable products, since it increases flammability. Water can neither be used to clean up this kind of spills. It is important to take into account that the absorbent, once used, becomes hazardous waste; therefore, it must be appropriately disposed of.

The painting, drawing and printmaking studio must be provided with information about the procedures to be followed in emergency cases as well as in evacuation cases, which might occur as a result of handling chemi-

cal products or in other circumstances that might affect the safety of the facilities and the people working on them, or might cause damage to the environment. This information is part of the emergency plan of the building where the art studio is located. If the art studio is located in an educational institution, there are specific regulations regarding the development of emergency plans for this type of buildings. The development of an emergency plan involves a policy of fire protection, evacuation and signalling. It also requires the organization of emergency teams (group of people specially trained and organized for the prevention and action in emergency situations occurring inside the building) and a programme for establishing periodic drills which enable to check the effectiveness of the plan in the long term.

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**HEALTH AND SAFETY
RISKS ASSOCIATED WITH
HANDLING PRODUCTS USED
IN PAINTING, DRAWING
AND PRINTMAKING**

_ _Dr. BIBIANA CRESPO MARTÍN_ _

Every painting, drawing or printmaking studio entails certain risks depending on the hazardous properties of the chemical products used therein and by the way these are handled and stored. This is why, when examining chemical hazards, different types or categories can be established, such as:

- Fire and/or explosion hazard.
- Hazards associated with dangerous chemical reactions which can be detrimental to workers' health and safety.
- Inhalation hazard.
- Skin absorption hazard.
- Skin or eye contact hazard.
- Ingestion hazard.
- Risk of parenteral contamination

The hazard degree of chemical species varies according to their nature and they may contain different substances which can have harmful effects on health. These may become important depending on:

- The amount of material that is handled.
- The degree of purity of the product.
- The environmental conditions the products may be subjected to.
- The frequency of contact with the substance.
- The (short or long) time of contact with the product.
- The physical characteristics of the person who handles the product (total weight, physical condition).



[Warning, prevention and protection measures in order to minimize the health and safety risks associated with handling chemical products.]

As far as health hazards and detrimental effects are concerned, the most direct ways of contamination from chemical substances are those which involve:

1_ Inhalation or diffusion through the respiratory tract: it is the primary way of contamination. Substances in solid state of matter and, more specifically, those in powder form which are in the air are inhaled and easily pass through the lungs into the bloodstream. On the other hand, liquids such as solvents or thinners and acids are highly volatile and generally evaporate fast permeating the surrounding atmosphere. Solvent vapour from the air is inhaled and, just like powder, easily passes through the lungs into the bloodstream. Likewise, vapour of products in gaseous state such as aerosols can cause the irritation of the respiratory system or the eye and nasal membranes, leading in extreme cases to chronic bronchitis and similar illnesses. Also, high concentrations of acid vapours can lead to pulmonary oedema and other lung damage.

2_ Skin and eye contact: many substances pass directly through the skin into the bloodstream. It is worth underlining that the acids used in etching irritate the skin and, when the solutions are concentrated, they may cause serious chemical burns, especially to the eyes.

3_ Ingestion or oral contamination: all the products can be ingested orally through contact with hands, drinks, food and contaminated cigarettes. The ingestion of small amounts of acids may cause damage to the stomach or even death.

Effects caused by brief, short-term, exposure to substances in powder form are usually irritant and of little significance, with the exception of lead, a very dangerous mineral which can cause damage to the digestive tract, the blood, the central nervous system and the kidney, giving rise to colics, shock, anaemia, kidney damage and encephalopathies. Exposure to lead can cause death and its effects might not appear in an immediate way. Medical monitoring is advisable. It is worth stressing that the most serious

effects caused by a single exposure to a high amount or high concentration of a solvent or acid are eye, nose and throat irritation; in contact with skin, they can cause eczema and irritation, since solvents dissolve the very fats of the skin; they can affect the CNS and as a result, cause narcotic effects (drowsiness), and give rise to nausea, vomiting, dizziness and headaches.

On the other hand, the effects caused by frequent exposure for a long period, long-term exposure, can affect lungs and the respiratory system. As mentioned above, lead is very toxic, either by skin contact or by inhalation or ingestion. This mineral passes into the bloodstream and subsequently, into the medulla and bone tissue, the kidneys and the liver. It is eliminated through faeces and urine. It causes damage to soft muscles, arterial blood vessels, nervous tissue and blood. Clinical symptoms are asthenia, dyspepsia, bowel ataxia, diaphoresis, rheumatic pain, vertigo, cephalalgia, shaking, etc. These symptoms can progress to much more serious manifestations such as saturnine encephalopathy, impotence and sterility. Chemical products classified as carcinogenic (which is the case for red lead) and mutagenic, as well as those which can be harmful to reproduction, must be removed and replaced with less hazardous ones. Although they occur in extreme cases, the possible effects and consequences arising from prolonged and repeated exposure to solvents, acids and aerosols should not be ruled out since they can progress to: kidney damage (kidney failure in serious cases); liver damage (symptoms such as loss of appetite, nausea, diarrhoea, vomiting, a bad taste in one's mouth); lung damage: breathing problems, baritosis, fibrosis, pneumoconiosis, pulmonary oedema, asthma; damage to bone marrow: anaemia; skin damage: almost all the aerosols produce reddening, urticaria, dryness, dermatitis or skin burns in contact with the skin; eye damage: conjunctivitis, reddening, blurred vision, serious deep burns, pain; respiratory tract damage: sore throat, rhinitis, pharyngitis, laryngitis; alterations in smell and taste; neurological disorders, effects on the nervous system; abdominal cramps and pain; decrease and differences in phosphate levels; alterations in human reproduction; the action of these compounds as sensitizing factors cannot be ruled out.

The best way to reduce risks related to hazardous chemical substances is to eliminate the need to use them, modifying the process in which

these substances are used for this purpose. If this option is not feasible, the hazardous substance shall be replaced with another one, the use of which involves a lesser health and environmental risk. In case none of the above options is possible to apply, the necessary prevention and protection measures shall be adopted in order to minimize the risks that exposure to the said substances involves. This will be carried out by measures such as:

- The isolation of the process in which contaminants are released;
- The reduction of contaminant release through the improvement of the process;
- The application of technical solutions in order to minimize the concentration of contaminants in the exposure area;
- The use of PPE whenever necessary.



[Various elements of an appropriate Personal Protective Equipment (PPE).]

Safety with regard to handling products used in painting, drawing and printmaking as a work system is widely dealt with in an enormous variety of legal texts, handbooks, offprints, studies, guide books, etc. However, all the existing regulations and information make no sense if the individual attitude, primarily, and the collective one in the studio, secondly, are not adopted as rules of conduct.

For these purposes, we consider it is advisable to specify safety procedures for product handling according to each product's state of matter and, consequently, we have agreed to study them considering the three possible states of matter: solid, liquid, and gas. With the aim of making appropriate specifications,

we provide taxonomy of the products corresponding to each state of matter.

Safety with regard to handling products in solid state used in painting, drawing and printmaking.

Most of the solid products used in painting, drawing and printmaking are in powder form. Therefore, we will generically refer to all of them as powders for the purposes of analysing safety with regard to their handling.

Preventive measures in order to avoid exposure to hazardous substances in powder form that occur in different art studios are:

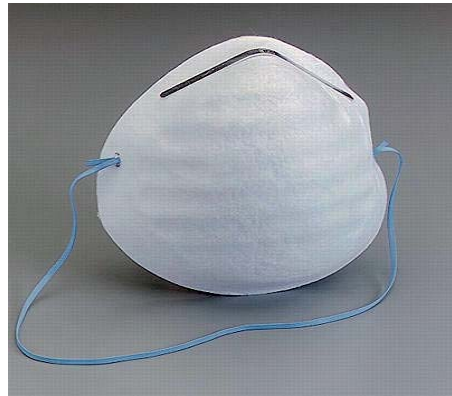
- Appropriately ventilate the premises, either naturally or mechanically.
- Use closed systems in order to minimize the release of contaminants.
- Install ventilation or local exhaust ventilation in the area where contaminants are released.
- Clean and replace ventilation and exhaust ventilation system filters according to the manufacturer's instructions.
- Carry out periodic environmental control.
- Clean tools in well ventilated premises.
- Keep containers tightly closed.
- Use, when necessary, the appropriate PPE, which must bear the EC mark.
- Provide containers with automatic closure lids for the disposal of cloths and other materials containing these products.
- Provide exposed studio users with information on hazards and appropriate training in hazard prevention.

With regard to the main measures for the safe handling of powdered substances, we can list the following:

- Personal Protective Equipment (PPE) shall always be used.
- Eating, drinking and smoking are not allowed in the art studio. Accidental ingestion is possible, since powders and vapours from different sources can contaminate food, tools or cigarettes.
- When powdered substances must be handled, a type P2 or P3 face mask must be used to protect against toxic powder inhalation (P1 type

face masks are not recommendable).

- Eye protection: use adjustable safety glasses.
- Skin protection: use appropriate gloves (nitrile gloves are recommended instead of latex, which shows a high degree of sensitization), clothes and shoes.
- Inhalation of powder of any kind or exposure in places with large amounts of powder shall be avoided.
- Once the activity is finished, the working area must be cleaned with a damp mop or an oil impregnated dust cloth to avoid dust accumulation. Dust circulation must be avoided. Dust must not be swept since it may be stirred up.
- Powdered substances must be kept in closed plastic containers, and a spatula or an appropriate tool must be used to handle them.
- When hazardous products are handled in the art studio, appropriate personal hygiene is necessary. After finishing work, hands, nails, forearms and face must be washed with water and soap.
- People who suffer from allergies and asthma must avoid using powdered products.
- Exposure to pigment powders, such as those based on lead, is particularly hazardous for the unborn baby, so pregnant women must avoid handling lead until childbirth or the end of breastfeeding. During this period it is recommendable to use alternative materials.
- Children must never be exposed to lead, especially in powder form.



[Disposable respiratory protective masks against inhaling toxic powder.]

List of solid products used in painting, drawing and printmaking: _

>PIGMENTS

Some pigments, such as those containing lead, silica dust or asbestos can cause serious pulmonary damage or diseases and may have very detrimental effects if the appropriate hygiene measures and procedures are not employed. When powdered pigments are handled, the hazard generally lies in the inhalation of the small particles of the pigment but also in the skin contact or in the ingestion; it is necessary to be familiar with the chemical properties of each of them in order to be able to proceed with due caution, according to their chemical composition. Some of the pigments which are highly detrimental to health are the following:

- Naples Yellow/Lead Antimonite.
- Lead White/Basic Lead Carbonate.
- Zinc Yellow/Zinc Chromate.
- Chrome Yellow/Lead Chromate.
- Barium Yellow/Barium Chromate.
- Cadmium Yellow/Cadmium Sulphide.
- Cadmium Red/Cadmium Sulphoselenide.
- Aureolin/Potassium Cobalt Nitrate.
- Vermilion/Mercuric Sulphide.
- Cobalt Violet/Cobalt Arsenate or Phosphate.
- Manganese Violet/Manganese Ammonium Pyrophosphate.
- Prussian Blue/Ferric Cyanoferrate.
- Cobalt Blue/Cobalt Oxide-Aluminium Oxide.
- Manganese Blue/Barium Manganate.
- Cobalt Green/Cobalt Oxide
- Zinc Oxide.



[Nitrile gloves for skin protection]



[Latex gloves for skin protection]

>>List of PIGMENTS

- Lead Pigment: Chrome Yellow / Lead White / Naples Yellow
- Zinc and Cobalt Pigments: Zinc Yellow / Zinc White / Cobalt Blue / Cobalt Violet
- Barium and Manganese Pigments: Barium Yellow / Manganese Blue / Manganese Violet / Manganese Black
- Titanium Pigments: Titanium White
- Cadmium Pigments: Cadmium Yellow / Cadmium Red
- Iron Pigments: Ercolano Red / Mars Red / Natural Ochre / Raw umber and Burnt umber / Burnt Sienna / Black Earth / Mars Violet / Mars Black / Prussian Blue
- Chrome Pigments: Chrome Green
- Carbon Pigments: Lamp Black
- Sulfide Pigment: Ultramarine Blue / Ultramarine Violet
- Copper and Phthalocyanine Pigments: Phthalocyanine Blue / Phthalocyanine green
- Toluidine Pigments: Toluidine Red
- Anthraquinone Pigments: Alizarin Crimson
- Naphthol Pigments: Naphthol Yellow
- Quinacridone Pigments: Quinacridone Violet / Quinacridone Red / Quinacridone Magenta

>MINERALS

The main natural pigments used in painting are of mineral or biological origin. Most mineral pigments are dry colorants, usually in fine powder form. The hazard it involves depends on the particle size.

The minerals used in drawing and painting which are not considered pigments are stated below.

>>List of minerals:

- Haematite / Limestone / Graphite / Silver

>Binding AGENTS

These products have specific risk rates and, although those of natural origin are considered non-hazardous, it is advisable to take the usual precautions applying to handling chemical products.

>>List of Binding Agents:

- Vegetable gums and glues: Gum arabic / Cherry gum / Gum tragacanth / Sarcocolla / Starch / Dextrin / Alginate
- Animal glues: Fish glue or isinglass / Rabbit-skin glue / Hide or parchment glue / (semi-solid) Gelatine glue / Casein glue
- Synthetic glues: Methyl cellulose
- Natural resins: Rosin (Colophonia resina) / Dammar resin / Chios mastic gum / Sandarach resin / Shellac resin / Copal resin / Asphalt
- Synthetic resins: Alkyd resins / Acrylic resins / Vinyl resins

>ADDITIVES

The additives here classified in fillers, natural and synthetic waxes, siccatives or retarders, and disinfectants and preservatives are of different nature, so their state of matter may be solid (often in powder form) or liquid.

Likewise, these products can be natural or synthetic, which means their characteristics are different, although it does not make a difference to their degree of hazard.

>>List of Additives

- Fillers: Calcium carbonate / Aluminium Hydroxide / Talcum / Plaster or Chalk / Kaolin / Calcium hydroxide / Quartz sand / Barium sulphate / White asbestos / Magnesium carbonate
- Natural and synthetic waxes: Beeswax / Carnauba wax / Paraffin wax
- Siccatives or retarders: Soap
- Disinfectants and preservatives: Beta-naphthol / Potassium carbonate / Ammonia / Sodium pentachlorophenate

Safety with regard to handling products in liquid state used in painting, drawing and printmaking_

Liquid products used in painting, drawing and printmaking can be classified in two large groups: solvents or thinners, and acids, in the specific case of indirect incision techniques used in printmaking. Nevertheless, we will also list here the binding agents and additives in liquid state of matter.

The physicochemical, toxicological and ecotoxicological characteristics of solvents or thinners, and acids oblige users to take a series of precautions to avoid accidents or incidents in the art studios.

The presence of flammable materials (paper, cardboard, cloths, resins) and sources of combustion (gas or electric fires, the electrical system itself or accumulated static electricity) in the painting, drawing and printmaking studio, make it necessary for the users to maximize precautions when handling and storing regularly used flammable chemical products such as solvents and the products which contain them. Thus, the fire or explosion hazard will be avoided or minimized.



[Proper storage of solvents by chemical species with good visibility of product labeling]

In order to prevent fires and improve safety in the painting, drawing and printmaking studio, the following precautions must be taken:

- The said substances must be available only in the necessary amount for everyday activity. The rest of them must be kept in the warehouse or in safety cabinets.
- In case flammable liquids are decanted, manual or mechanical means must be used.
- Do not smoke in the art studio and do not handle products containing solvents near burners or heaters, etc.
- Do not eat, drink or smoke inside the studio.
- The warehouse for these and other products shall be located in a different building, separated from the working area, and shall be properly ventilated.
- In areas with flammable atmospheres an explosion-proof electrical system is necessary. The electrical system must be checked and kept insulated and protected.
- Fire extinguishing systems must be available as well as detection and alarm mechanisms, and regular maintenance must be provided.
- Emergency exits must be marked and kept clear.
- An emergency plan must be available and studio users must be provided with instructions. Periodic emergency evacuation drills must be carried out.

[Manual pump to
decant flammable li-
quids]



In order to avoid explosions due to the formation of explosive atmospheres of air and organic vapours (of solvents, spray paints, varnishes, etc.) in the art studio, it is necessary to control the concentration of flammable dust, gases and vapours. For this purpose, the following preventive measures must be taken:

- Use solvents and acids in areas with good ventilation, either natural or mechanical, and employ a local exhaust ventilation system to extract the generated vapours.
- Use appropriate PPE, such as gloves, aprons and safety glasses.
- Substitute, insofar as possible, very toxic substances for others of lower toxicity.
- Never use solvents to remove paint or grease from skin. Use water and soap or waterless hand cleaners.
- In case of contamination by inhalation or ingestion, seek immediate medical attention.
- Change contaminated clothes when leaving the studio.
- Exposure to solvents and acids is especially hazardous for the development of the unborn baby, so pregnant women must avoid handling solvents until childbirth or the end of breastfeeding. It is recommendable to use alternative materials during this period. Children must never be exposed to solvents.

List of liquid products used in painting, drawing and printmaking:

>SOLVENTS or THINNERS

Solvents are often found in daily use products and are used in the formulation of a wide variety of art materials and products, such as inks, acrylic paints, varnishes, lacquers, siccatives and fixatives.

Solvents can be harmful if they are not used following the appropriate hygiene measures and procedures. In recent years, new solvents classified as “non-toxic, healthy and natural”, mainly derived from citrus peel, have been



marketed. One of their main constituents is limonene, which is considered natural and biodegradable. Nevertheless, some studies of harmful effects of limonene on animals have proven that it is a highly toxic product. The American Industrial Hygiene Association (AIHA) established that the TLV¹ of limonene is much lower than that of other toxic solvents including turpentine, toluene, ethyl alcohol and N-hexane².

No solvent is innocuous and healthy. All of them, be they natural or synthetic, are potentially hazardous. This depends on the type, manner, and time of contact, and of the amount of substance used. Toxicity and evaporation levels of organic solvents are varied. Many solvents cause skin irritation (acetone, for instance, can cause mild irritation) and others can be absorbed by the skin and cause reactions in the bloodstream. An excessive vapour inhalation can affect the central nervous system and cause drowsiness, thus increasing the risk of accidents apart from other disorders.

Chemical products classified as carcinogenic (which is the case for benzene) and mutagenic, as well as those which can be harmful to reproduction, must be removed and replaced with less hazardous ones.

>>List of solvents

- Aromatic hydrocarbons: Benzene, Toluene, Xylene, Limonene,

¹TLVs are reference values for the concentrations of chemical agents in the air and they represent the conditions which, based on current knowledge, most workers can be exposed to daily, during all their working life, without suffering adverse effects on their health. The Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) can be used as a reference.

There are two categories of TLVs: TLV-TWA and TLV-STEL. TLV-TWA represent the conditions which, based on current knowledge, most workers are considered to be able to be exposed to for 8 hours daily, 40 hours weekly, during all their working life, without suffering adverse effects on their health.

TLV-STEL is the reference value for the EC, limited to a maximum time of 15 minutes.

TLVs are not reliable as absolute criteria, since they depend on the working conditions of each art studio.

²Rossol, Monona, The artist's complete health and safety guide, Allworth Press, New York, 2001, p. 90.



Styrene.

- Aliphatic hydrocarbons: n-pentane, n-hexane, n-heptane and other saturated hydrocarbons (paraffin).
 - Halogenated hydrocarbons: Dichloromethane, Carbon tetrachloride, Trichloroethylene, Perchloroethylene.
 - Ketones: acetone, Butanone, Hexan-2-one, Isophorone.
 - Alcohols: Methyl alcohol, Ethyl alcohol, Butyric alcohol, Isopropyl alcohol and Glycerine.
 - Alicyclic hydrocarbons: Turpentine, Cyclohexane.
- Petroleum-derived solvents: Stoddard solvent, Petrol, Solvent naphtha (mineral turpentine), White spirit.

>>List of thinners

- Oils or essences for oil painting techniques: Linseed oil / Walnut oil / Poppy seed oil / Turpentine / Lavender essence / Clove essence.

>ACIDS

Acids are not combustible but, if they are oxidizing agents (such as nitric acid), they can react in contact with flammable or combustible products, acting as oxygen in the combustion reaction (oxidizing agent).

In case of fire, acids give off toxic irritating gases. In order to prevent fires in the art studio it is essential to handle and store acids and their waste far from flammable substances, organic (such as acetone or acetic acid) and combustible compounds. For this reason, it is recommendable to store acids in appropriate places or cabinets, close to the etching facilities and separated from solvents, which shall be stored in safety cabinets in the printmaking area.

The main rules to follow for handling acids are those established by the standard safety procedures for handling corrosive products:

- In order to avoid splashes and spills when decanting solutions, funnels, beakers and other appropriate pumping methods must be used.
- It is essential to use containers which allow the user to see the process in order to avoid spilling the liquid.

- When handling acids, Personal Protective Equipment (PPE) must always be used.



[Pumping system liquids decant.]

As far as respiratory protection is concerned, it is advisable to consider the levels of exposure in order to decide whether protection is absolutely necessary to use or it is simply a precautionary measure. For example, for handling iron trichloride, the appropriate protection is a P2 type of particle filter. An FFP2 type of filtering face piece or a P2 filter for a face mask can be used. Carbon filters do not filter nitric acid and nitrogen oxides properly.



- .1. Filtering face masks FFP1 type.
- .2. Filtering face mask FFP2 type
- .3. Filtering face mask FFP3 type.

Other protection measures to be taken into consideration are the following:

- Use approved eye protection bearing the EC mark.
- Use viton, butyl or nitrile rubber gloves for hand protection (resistant to diluted and concentrated acids).
- Use cotton laboratory coats to protect street clothing, especially if the latter is made of fibre, since it may adhere to the skin if it comes into contact with certain chemical products; also use neoprene, viton or butyl rubber aprons (do not use PVA or polythene ones), which resist acid splashes.
- Shoes must be comfortable, closed-toe and breathable. They must fasten the foot well and be provided with nonslip soles. Heels will not be higher than 3 centimetres.
- In case of inhalation or ingestion seek emergency medical attention.
- Use ventilation (either natural or mechanical) in the area and, whenever necessary, local exhaust ventilation.
- Hazardous spills must be confined and shall not be absorbed with cloths. An appropriate absorber and neutralizer must be used.
- Generated waste shall be managed as hazardous waste.
- It is obligatory to wash hands after work and change contaminated clothes when leaving the printmaking studio.

A well-equipped printmaking studio should be provided with etching facilities separated from printing facilities and an exhaust ventilation system for the vapours and gases generated during plate corrosion.

Apart from the general preventive measures mentioned with regard to handling acids as corrosive products, the following measures must be taken during the process of corrosion of metal plates:

- Do not handle plates immersed in the acid with your fingers. Use adhesive tape like a big handle or hanger behind the plate in order to handle it from outside the tray or tank which contains the corrosive bath.

- Carefully immerse and take out the plate from the corrosive bath. Wash the plate with water after taking it out of the tray. If iron perchloride is used for etching, immerse the plate in a tray with vinegar to avoid oxidation and remove the etch residues.
- Corrosive baths are different depending on the type of metal to be etched, and every metal plate must be immersed in the appropriate acid bath. It is advisable to adequately indicate the type of metal corresponding to each tray.
- Rinse the plate thoroughly with water and properly dry it before leaving the etching facilities.
- Do not enter the etching facilities with flammable products such as solvents, alcohols, etc.
- Wash hands with water and soap before leaving the etching facilities.
- Do not eat or smoke on the premises.
- When trays and vertical tanks containing acids are not used, they must be covered to avoid gas and vapour release.

>>List of acids

- Acetic acid, Citric acid, Hydrochloric acid, Hydrofluoric acid, Phosphoric acid, Nitric acid, Sulphuric acid, Potassium chlorate, Dutch mordant, Phenol.

>>List of corrosive salts

- Iron Trichloride, Copper sulphate, Sodium persulphate, Sodium chloride.

>>List of binding agents

- Vegetable gums and glues: Latex
- Synthetic glues: White glue (liquid emulsión)

>>List of additives

- Siccatives or retarders: Cobalt siccative / Glicerine / Ethylene glycol

monohexyl ether

- Disinfectants and preservatives: Formaldehyde

Safety with regard to handling products in gaseous state used in painting, drawing and printmaking_

Most gaseous products contain solvents in their chemical composition and for this reason, they are highly flammable and increase fire risk. This risk is especially high for aerosol paints and varnishes (sprays). Aerosol cans are pressurized and contain highly flammable propellants. Most spray varnishes contain a mixture of solvents, such as aromatic and aliphatic hydrocarbons, and petroleum-derived solvents like white spirit and naphtha. Some quick drying aerosol varnishes such as re-touch varnish or Dammar varnish are mainly compounded of alicyclic solvents (turpentine) and alcohols, sometimes accompanied by white spirit. These main solvents which contain products in gaseous state are flammable, highly volatile and can easily cause an air/solvent vapour explosive mixture. For this reason, as we have previously stressed, they can be the source of a fire if they are not stored, handled and disposed of as waste, taking the appropriate preventive measures.

Aerosol cans generally bear the flame and the F+ danger symbols, which indicate the flammability potential and the high risk of fire. All the products which contain solvents, and most particularly aerosols, must be handled according to the safety regulations given in the section of safe handling of substances in liquid state.

As we have already mentioned, and owing to the fact that products in gaseous state used in painting, drawing and printmaking are based on a mixture of different substances, we will not provide a list of these since they have already been specified with reference to the products in solid and liquid state.



EPILOGUE

Nowadays, the prevention of occupational and environmental hazards has become a priority for the organisations which do not only aim to comply with the legislation currently in force regarding safety and environmental issues, but have also undertaken to reduce the number of accidents and incidents occurring in the work area, as well as the environmental impact of their activities.

Art practice is not exempt from occupational and environmental hazards and, therefore, the implementation of all the necessary measures to prevent them must not remain alien to it. Due to the variety of activities, products and processes taking place in the fine art studios, this goal is not easy to attain and involves many diverse actions, ranging from the use of personal protective equipment (safety glasses, gloves, hearing protection, etc.) to improvements to the facilities, including the replacement of products, materials and equipment or the modification of working procedures.

Among the potential risks which may be identified in the fine art studios are those which arise from the (physicochemical, toxicological and environmental) properties of the chemical products used therein. Depending on the hazardous characteristics of these products, their concentration, the way they are used and the manner in which generated waste is managed, art professionals will be directly responsible for the short and long-term effects of said products on health and environment.

This book is intended as a basic reference tool regarding the hazards associated with chemical products used in painting, drawing and printmaking. It focuses on the safe development of activities in fine art studios and studies aspects related to health, safety and the environment, compiles general occupational safety regulations and general information for the prevention of occupational hazards, without forgetting the promotion of prevention culture in training future art professionals.

This publication is the result of the studies conducted by the authors within the Research Groups linked to the Faculty of Fine Arts at the University of Barcelona which they are in charge of: Painting, Drawing and Printmaking versus new Procedures and Materials (2005 SGR 007876) and Integrated Management of Quality, Environment and Safety in Experimental Teaching in Degree Courses at the Faculties of Fine Arts (2008 MQD 00104).

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