

Construction Hazards and Risks Control

Lecture Title: – Hazardous Substances and Chemical Risk Management

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**Undergraduate Diploma in
Occupational Health and Safety**

What is an SDS?

- A Safety Data Sheet (formerly called Material Safety Data Sheet) is a detailed informational document prepared by the manufacturer or importer of a hazardous chemical. It describes the physical and chemical properties of the product.



What do you Understand by Physical Property?

- State of Matter: Describes whether a substance is solid, liquid, or gas at a given temperature and pressure.
- Boiling Point: The temperature at which a liquid changes to a gas (boils). It indicates the volatility of a substance.
- Melting Point: The temperature at which a solid turns into a liquid (melts). This property is useful for identifying substances and assessing purity.



Hydrochloric Acid Solution, 1%

MSDS # 337.00

Section 1: Product and Company Identification**Hydrochloric Acid Solution, 1%**

Synonyms/General Names: Muriatic Acid; Hydrochloric Acid Solution, 0.1M, 0.5M, 0.5%

Product Use: For educational use only

Manufacturer: Columbus Chemical Industries, Inc., Columbus, WI 53925.

24 Hour Emergency Information Telephone Numbers

CHEMTREC (USA): 800-424-9300

CANUTEC (Canada): 613-424-6666

Scholar Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.ScholarChemistry.com

Section 2: Hazards Identification

Clear colorless liquid; pungent odor.

HMIS (0 to 4)

Health	1
Fire Hazard	0
Reactivity	0

WARNING! Corrosive to body tissue and slightly toxic by ingestion.

Target organs: Respiratory system, eyes, skin, lungs.

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Section 3: Composition / Information on Ingredients

Hydrochloric Acid, 37% (7647-01-0), 1-2%.

Water (7732-18-5), 98-99%.

Section 4: First Aid Measures

Always seek professional medical attention after first aid measures are provided.

Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.

Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.

Ingestion: Call Poison Control immediately. **Do not induce vomiting.** Rinse mouth with cold water. Give victim 1-2 cups of water or milk to drink.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: Fire Fighting Measures

Noncombustible solution. When heated to decomposition, emits acrid fumes.

Protective equipment and precautions for firefighters: Use foam or dry chemical to extinguish fire.

Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Cool container with water spray. Material is not sensitive to mechanical impact or static discharge.

**Section 6: Accidental Release Measures**

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all ignition sources and ventilate area. Contain spill with sand or absorbent material and place material in a sealed bag or container for disposal. Wash spill area after pickup is complete. See Section 13 for disposal information.

Section 7: Handling and Storage

White

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.

Storage: Store in Corrosive Area [White Storage] with other corrosive items. Store in a dedicated corrosive cabinet. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Use NIOSH-approved respirator with an acid/organic cartridge. Exposure guidelines Hydrochloric Acid: OSHA PEL: 5 ppm ceiling and ACGIH TLV: 2 ppm ceiling, STEL: N/A.

MSDS # 337.00

Hydrochloric Acid, 1% Scholar Chemistry

Section 9: Physical and Chemical Properties

Molecular formula	HCl.	Appearance	Clear, colorless liquid.
Molecular weight	36.46.	Odor	Pungent odor.
Specific Gravity	1.01 g/mL @ 20°C.	Odor Threshold	N/A.
Vapor Density (air=1)	0.7.	Solubility	Completely soluble in water.
Melting Point	0°C.	Evaporation rate	< 1 (Butyl acetate = 1).
Boiling Point/Range	100°C.	Partition Coefficient	N/A. (log P _{OW}).
Vapor Pressure (20°C)	14.	pH	2, acid, (corrosive).
Flash Point:	N/A.	LEL	N/A.
Autoignition Temp.:	N/A.	UEL	N/A.

Section 10: Stability and Reactivity

Avoid heat and ignition sources.

Stability: Stable under normal conditions of use and storage.

Incompatibility: Alkalis, strong bases, metals, amines, carbonates, metal oxides, cyanides, sulfides, sulfites and formaldehyde.

Shelf life: Indefinite, store in a cool, dry environment.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: **Eyes:** Redness, tearing, itching, burning, damage to cornea, conjunctivitis, loss of vision.

Skin: Redness, blistering, burning, itching, tissue destruction with slow healing. **Ingestion:** Nausea, vomiting, burning, diarrhea, ulceration, convulsions, shock. **Inhalation:** Coughing, wheezing, shortness of breath, headache, spasm, inflammation and edema of bronchi, pneumonitis.

Chronic Effects: Repeated/prolonged skin contact may cause thickening, blackening or cracking. Repeated eye exposure may cause corneal erosion or loss of vision.

Sensitization: none expected

Hydrochloric Acid: LD50 [oral, rabbit]; 900 mg/kg; LC50 [rat]; 3124 ppm (1 hour); LD50 Dermal [rabbit]; N/A

Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): LC50 - 282 mg/l - 96 h - Gambusia affinis (Mosquito fish)

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Small amounts of this material may be suitable for sanitary sewer disposal after being neutralized to pH 7.

Section 14: Transport Information

DOT Shipping Name:	Hydrochloric Acid.	Canada TDG:	Hydrochloric Acid.
DOT Hazard Class:	8, pg II.	Hazard Class:	8, pg II.
Identification Number:	UN1789.	UN Number:	UN1789.

Section 15: Regulatory Information

EINECS: Listed (231-595-7).

WHMIS Canada: CLASS E: Corrosive liquid.

TSCA: All components are listed or are exempt.

California Proposition 65: Not listed.

The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16: Other Information

Current Issue Date: January 23, 2009

Disclaimer: Scholar Chemistry and Columbus Chemical Industries, Inc., ("S&C") believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because S&C has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. S&C makes no warranty, expressed or implied, including (without limitation) warranties with respect to the completeness or continuing accuracy of the information contained herein or with respect to fitness for any particular use.

Contents of SDS

- The sections of the SDS:
 - 1. Identification
 - 2. Hazard Identification
 - 3. Composition/ Information on Ingredients
 - 4. First aid Measures
 - 5. Fire Fighting Measures
 - 6. Accidental Release Measures
 - 7. Handling and storage
 - 8. Exposure Controls/ PPE
 - 9. Physical and chemical properties
 - 10. Stability and reactivity
 - 11. Toxicological information
 - 12. Ecological information
 - 13. Disposal Consideration
 - 14. Transport Information
 - 15. Regulatory information
 - 16. Other information



CLP Regulations

- Classification, Labelling and Packing Regulation (EC) NO 1272/2008

Classify

- Manufacturers, importers and downstream users classify substances and mixtures

Label and Package

- Suppliers label and package them in accordance with CLP

Communicate

Manufacturers, importers and downstream users notify substance to ECHA's (European Chemicals Agency) classification and labelling inventory.

Harmonise

- CLP implements UN Globally Harmonised System
- The classification of certain substances is harmonised



CLP Regulations

- You must classify, label and package mixtures in accordance with CLP before placing them on the market.
- If you are formulating or changing the composition of a mixture, you must derive the classification of the mixture
- If you do NOT change the composition of a mixture, you may take over the classification for the mixture already derived by another actor in the supply chain
- You must keep up-to-date with new scientific or technical information that may affect the classification of the mixtures you place on the market (Article 15(1) CLP).



Globally Harmonized System

- The Globally Harmonized System of Classification and Labelling of Chemicals (GHS):
- An international standard for classifying and labelling chemicals. It was developed by the United Nations to ensure consistent communication of chemical hazards and safety information worldwide.
- Key component of the GHS:
 - Classifications of hazards
 - Labels
 - Safety Data Sheets
 - Pictograms



GHS Pictograms



Explosives



Flammables



Oxidisers



Gases Under Pressure



Corrosives



Acute Toxicity



Irritants/Sensitisers/Other Hazards

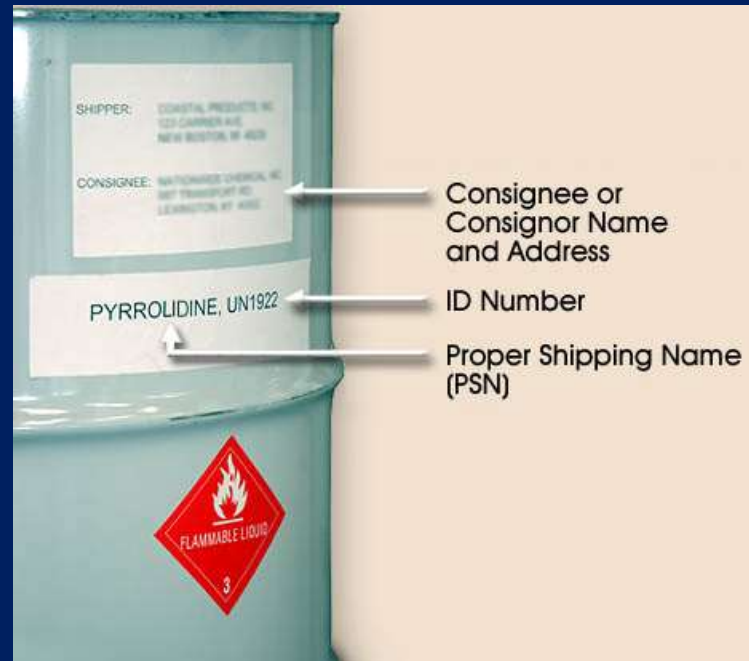


Specific Toxicity Hazards



Environmental Hazard

Hazard Identification



EPICHLOROHYDRIN ¹

UN No. 2023
CAS No. 106-89-8

² **DANGER**

⁴ Flammable liquid and vapor. Toxic if swallowed. Toxic in contact with skin. Causes severe skin burns and eye damage. May cause an allergic skin reaction. May cause cancer.

⁵ Do not breathe dust/fume/gas/mist/vapors/spray. Wear protective gloves/protective clothing/eye protection.

Fill Weight: 18.52 lbs.
Gross Weight: 20 lbs
Expiration Date: 1/15/2018

Lot Number: A0323111323
Fill Date: 1/15/2012

⁶

JACKSON CHEMICAL COMPANY - City of Industry, Los Angeles, California, USA (800)-444-456-8989



Spill Response

- Identify spilled material
- Size-up incident severity
- Determine mitigation methods
- Implement methods



Chemical Incident Response - Decision Logic

Key Information

- Container label is legible
- MSDS available

- No injuries
- Low reactivity
- Low flammability
- Familiar quantity
- No fire
- Low volatility
- Not a strong oxidizer

- I feel comfortable enough, to deal with this situation.
- I am trained in proper protective equipment use.
- I am trained how to use spill control equipment.
- All the right equipment is available to me here and now.

Ask yourself

Do I know what this substance is?

NO

YES

Is this release small enough to manage myself?

NO

YES

Can this chemical be contained or isolated safely?

NO

YES

Get Help!
This is not a "Simple" Spill

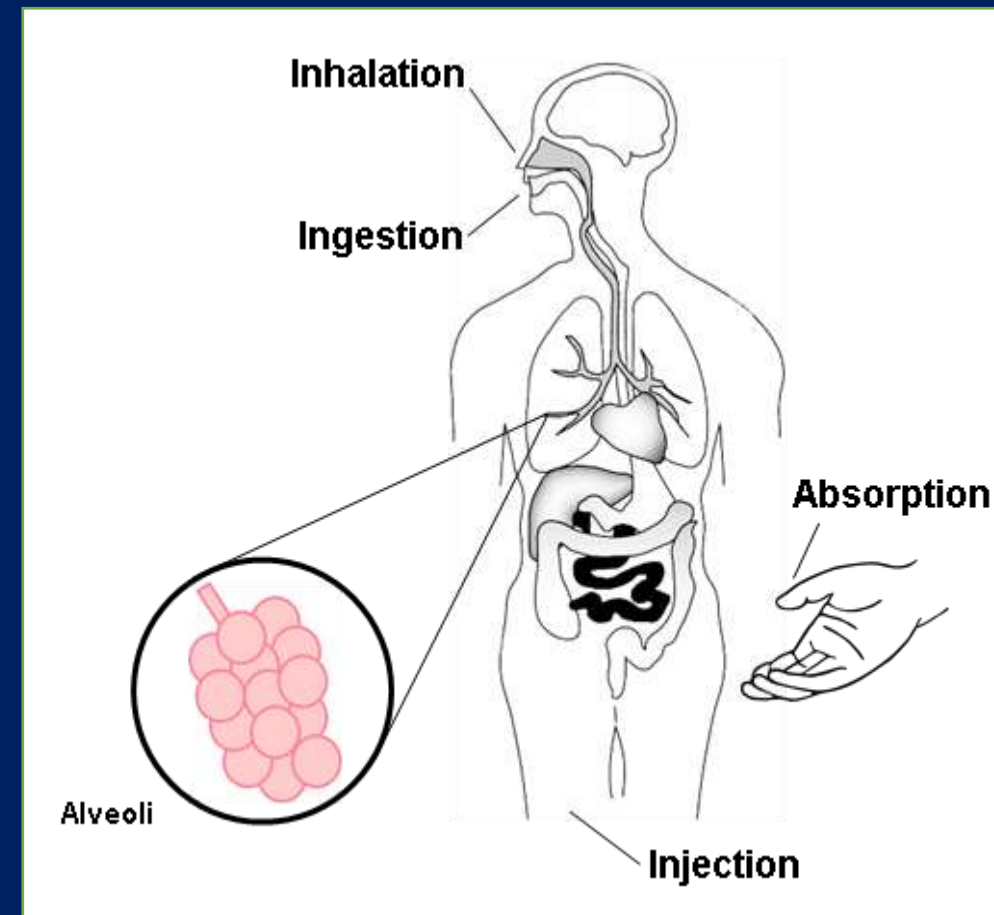
Follow your campus emergency response procedures. This could involve:

- Pull Alarm
- Evacuate
- Call 911
- Call your campus Environmental, Safety, or Facilities Management department

This is a "Simple" spill
I can clean it up myself,
within my normal
workday.

Exposure to Hazardous Materials

- Routes of entry:
 - Inhalation*
 - Ingestion
 - Absorption
 - Injection
- * Most Common
























Acute and Chronic Toxicity

- Some chemicals will only make you sick if you get an Acute or high dose all at once. Example Ammonia
- Some chemicals are mainly known for their chronic or long term effects. Example – Asbestos
- Most chemicals have both acute and chronic affects. Example – carbon monoxide.



Storage Compatibility

DANGEROUS GOODS & COMBUSTIBLE LIQUIDS STORAGE COMPATIBILITY CHART													
Class or Subsidiary Risk													
FLAMMABLE GASES		OK TO STORE TOGETHER	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
NON TOXIC NON FLAMMABLE GASES		OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
TOXIC GAS		SEGREGATE At least 3m	OK TO STORE TOGETHER	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
OXIDIZING GAS		SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
FLAMMABLE LIQUIDS + COMBUSTIBLE LIQUIDS		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 5m	SEGREGATE At least 3m
FLAMMABLE SOLID		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES
SPONTANEOUSLY COMBUSTIBLE		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 3m
DANGEROUS WHEN WET		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	OK TO STORE TOGETHER	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
OXIDIZING AGENT		SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 5m	KEEP APART	SEGREGATE At least 5m	SEGREGATE At least 5m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 3m

What is Crystalline Silica?

- Crystalline silica is an essential raw material of products which have an abundance of uses in the industry.
- Silica is a group of minerals made of silicon and oxygen, mainly found in crystalline state.
- This exposure is respirable crystalline silica can be found in quarrying, mineral processing, slate working, stone crushing and dressing, foundry work, brick and tile making.



What is Silicosis?

- Silicosis is a type of pulmonary fibrosis, a lung disease caused by breathing in tiny bits of silica, a common mineral found in sand, quartz and many other types of rock. Silicosis mainly affects workers exposed to silica dust in jobs such as construction and mining.



Silicosis

- Silicosis is a commonly known health hazard and one of the world's oldest known occupational diseases, silicosis is historically associated with the inhalation of crystalline silica-containing dust,
- Silicosis is one of the most common types of pneumoconiosis. It is a nodular progressive fibrosis caused by the deposition in the lungs of fine respirable particles of crystalline silica.
- Larger particles are more likely to settle in the upper airway of the respiratory system and may be cleared by mucus.
- Common silicosis is generally caused by prolonged chronic inhalation of respirable crystalline silica dust generated by a work process.



- Acute silicosis occurs as a result of extremely high exposure to respirable crystalline silica over a relatively short period of time (within 5 years). The condition causes rapidly progressive breathlessness and death, usually within months of onset
- Accelerated silicosis can develop within 5 to 10 years of exposure to high levels of respirable crystalline silica
- Chronic silicosis is often described as the result of exposure to lower levels of respirable crystalline silica, occurring over longer periods of time (exposure duration greater than 10 years)



- <https://www.youtube.com/watch?v=CZmUGFm7Pxs&t=2s>



Exposure Monitoring

- Reduction and replacement: the employer shall reduce the use of a carcinogen or mutagen at the place of work, in particular by replacing it, in so far as is technically possible, by a substance, preparation or process which is not dangerous or is less dangerous.
- Use of closed systems: where the replacement is not technically possible the employer shall ensure that the carcinogen or mutagen is, in so far as is technically possible, manufactured and used in a closed system.



- Occupational exposure limit value represents the maximum time-weighted average concentration of an airborne contaminant to which a worker can be exposed, normally 8 hours.
- Currently there are many different types of occupational exposure limit value, defined by the EU states. These limitations are all different and in addition cannot be compared directly.
- In the EU directive the exposure limit value is $0.1\text{mg}/\text{m}^3$ is set in Annex 3 of the directive.



- **Chemical Inventory:** List all chemicals used in the workplace.
- **Review Safety Data Sheets (SDS):** Examine SDS for hazard information.
- **Consult Regulations:** Check regulatory lists for hazardous substances.
- **Inspect Workplace:** Identify potential sources of chemical exposure.
- **Determine Who Might Be Harmed and How**
- **Identify Exposed Individuals:** Consider employees, contractors, visitors, and the public.
- **Exposure Routes:** Determine how individuals might be exposed (e.g., inhalation, skin contact, ingestion).
- **Vulnerable Groups:** Pay special attention to vulnerable groups such as pregnant women and those with pre-existing conditions.



Risk management. - What needs to be done?

- Reduction and replacement: the employer shall reduce the use of a carcinogen or mutagen at the place of work, in particular by replacing it, in so far as is technically possible, by a substance, preparation or process which is not dangerous or is less dangerous.
- Use of closed systems: where the replacement is not technically possible the employer shall ensure that the carcinogen or mutagen is, in so far as is technically possible, manufactured and used in a closed system.



- Where a closed system is not technically possible, the employer shall ensure that the level of exposure of workers is reduced to as low a level as is technically possible.
- The employer shall also apply the following measures: - Limitation of the RCS quantities at the place of work - Reducing the number of workers exposed or to be exposed to RCS.
- Design of work processes and engineering control measures in order to avoid or minimise the release of RCS - Evacuation of RCS at source, local extraction system or general ventilation - Use of existing appropriate procedures for the measurement of RCS.



- Application of suitable working procedures and methods
- Collective protection measures and/or individual protection measures
- Hygiene measures, in particular regular cleaning of floors, walls and other surfaces
- Information for workers
- Demarcation of risk areas and use of adequate warning and safety signs (e.g. “no smoking”)
- Plans to deal with emergencies in case of high exposure
- Means for safe storage, handling and transportation, in particular by using sealed and clearly and visibly labelled containers
- Means for safe collection, storage and disposal of waste by workers, including the use of sealed and clearly and visibly labelled containers

Asbestos

- Asbestos refers to a group of 6 naturally occurring fibrous silicates made up of thin microscopic fibers which has a ratio of 1:20. Asbestos is found close to the earth surface. Asbestos is used to strengthen or fire protect objects/ structures.



Different types of Asbestos



White- Chrysotile- Insulation of Pipework

- Chrysotile (white asbestos) is the most commonly used form of asbestos. It can be found today in the roofs, ceilings, walls and floors of homes and businesses. Manufacturers also used chrysotile asbestos in automobile brake linings, gaskets and boiler seals, and insulation for pipes, ducts and appliances.



Blue- Crocidolite- Tiles

- Crocidolite (blue asbestos) was commonly used to insulate steam engines. It was also used in some spray-on coatings, pipe insulation, plastics and cement products. Crocidolite may be responsible for more deaths than any other type of asbestos, because its fibers are extremely thin, causing them to lodge more easily in lung tissue. The most common mining sites for this type of asbestos were Bolivia, Australia and South Africa.



Brown- Amosite- Construction of water tanks and pipework

- Amosite (brown asbestos) was used most frequently in cement sheets and pipe insulation. It can also be found in insulating boards, ceiling tiles and thermal insulation products.



Notification

- All works involving asbestos may only commence once the authority has been duly notified by the employer.

•

Notification is to include;

- Location of worksite, type and quantity of asbestos, activity and procedure, number of workers, start date and duration of work, protective measures to be taken. Workers are to be notified of this information. If the asbestos dust exposure is likely to increase or there is a change in working conditions a new notification is to be submitted.



Control Measures

- Exposure to asbestos dust is to be kept to a minimum and below the limit value of 0.1 fibers per cm³.
- Workers present to be kept to a minimum
- Asbestos dust release into the air must be eliminated or avoided
- Premises and equipment involved in treatment of asbestos must be cleaned and maintained
- Asbestos to be stored and transported in suitable sealed packing as approved by ERA
- Waste to be sealed, and labelled in accordance with applicable legislation
- Measurement and Sampling



Waste Management

- If a company or individual intends to transport hazardous or other waste as deemed necessary by the Authority to be covered with the Consignment Note procedure within Malta, a permit from the Environment and Resources Authority (ERA) is required prior to commencement of transfer.
- <https://www.wsm.com.mt/en/waste-disposal#gsc.tab=0>

