European Union

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Sustainable Textiles for Sustainable Development

Occupational Health & Safety Manual for Artisans

TRAIDCRAFT
Fighting poverty through trade

aiaca
All India Artisans and Craftworkers Welfare Association

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SECTION I

Introduction

The necessity of a safety manual for artisans has not been a prime concern for a developing nation like India although a large skilled workforce has been engaged in this sector for over a long period of time. Hundreds of hand-made products contribute to the economy, but the health and safety of the artisans involved in this ancestral profession are ignored. Since each cluster of handicraft producers may not employ more than 10-12 workers, they are not covered by the provisions of the labour laws. Moreover, the workers themselves are not aware of health impacts and safety concerns, partly because they are either self-employed or belong to the extended family of the master craftsman, and partly because they accept the risk of injury or damage as being part of the traditional occupation.

In earlier times, handicrafts were largely hand-made with traditional tools and used natural resources available in the local environment. But now, with growing market demand and competition from industrial manufactures, the scenario has changed. The old processes are being replaced with new techniques, machines, and synthetic materials that reduce the cost of material and labour. But this transformation has increased the insecurity of the artisans, whether it is in terms of regular work availability or the handling of unknown hazardous materials. For instance, vegetable tanning is facing stiff competition from chrome tanning; vegetable dyes are giving way to chemical dyes; and manual work is being replaced by machines because of the demand for a particular kind of product from the market and the consumers. While many artisans still try to preserve the traditional methods and materials, they are often hampered by the lack of natural resources because of the degradation of the ecosystem.

As these changes take place in production processes, the associated hazards also change. The exposure to hazardous chemicals can not only lead to incidents of acute toxicity but also have chronic impacts over time. Ergonomic hazards also increase with the use of new equipments and tools. At the same time, traditional processes are not completely free of their own health risks. Hence, there is a need to inform craftworkers across the country about the hazards that they face during work, and what may be done to ensure a greater degree of safety. Such a task is hampered by two factors: firstly, there has been very little research done to document the hazards, both in the traditional forms as well as in the newly emerging commercial varieties of craft production; secondly, due to a wide diversity of materials, tools, equipment, and practices followed in the handicrafts sector, each one has to be studied in some detail to spell out the safety measures.

This manual is a first attempt to lay out the broad principles and strategies to be followed for safety, based on a preliminary study conducted in 2009 of the hazards present and their impacts in five clusters across Rajasthan and Orissa under the Sustainable Textiles for Sustainable Development Project-Switch Asia Programme supported by the European Commission. We have tried to address the issues of all of the 500 respondents that were covered during the study.

Hazard Centre, New Delhi

SECTION II

Chemical Hazards

Chemicals are an essential part of everyday life. At least 400 million tonnes of chemicals are produced each year worldwide, and at least 1,200 new chemicals are developed each year in North America alone. For the majority of chemicals used and developed, there is no information about their possible immediate or long-term health effects; yet, workers are still required to work with potentially toxic substances. Many workers are required to work—without any protection—with chemicals that are known to be hazardous to health. In many countries, chemicals are released directly into the environment, often with serious consequences. In other countries, the laws about chemical disposal are very strict—to protect both people and the environment. Nearly all workers today are exposed to some sort of chemical hazard since chemicals are used in every type of industry. It is important to learn as much as possible about the chemicals we work with, since they can enter the body through the five sense organs.

Basic Concepts of Toxicity of Chemicals

Dose

Chemical toxicity is dependent on the dose—that is, the amount of the chemical which enters the body. The level of harm of a chemical depends on the dose. Highly toxic chemicals can cause serious damage in very small amounts. Moderately toxic substances require larger doses to cause toxic effects. Even substances considered “non-toxic” can be harmful incase of over-exposure. Each toxic substance can produce two different types of diseases depending on their dose: acute and chronic.

Acute Effects

Acute illnesses are caused by large doses of toxic substances delivered in a short period of time. The symptoms usually occur during or shortly after exposure and last a short period of time. Once exposed, the outcome of the disease can vary from complete recovery, and through recovery with some level of disability, and in the worst case—death. For example, heavy exposure to the solvents in spray paints can cause effects ranging from lightheadedness to headache, nausea, and loss of coordination. Higher doses can result in unconsciousness and even death.

Chronic Effects

Chronic effects are caused by repeated exposure to small doses of chemicals over many months or years. Chronic diseases are the most difficult to diagnose. Usually the symptoms are hardly noticeable until severe permanent damage has occurred. Symptoms appear very slowly, may vary from person to person, and may mimic other illnesses. For instance, exposure to small amounts of spray-solvents during a lifetime by craftworkers may produce skin damage (dermatitis) in some, chronic liver, kidney failure and brain damage in others.

Effects between Acute and Chronic

There are also other effects between acute and chronic such as "sub-acute" effects produced over weeks or months at doses below those which produce acute effects. These are difficult to diagnose.

Cumulative Toxins

Every chemical is eliminated from the body at a different rate. Some substances, such as lead, are eliminated from the body so slowly that most of the lead which gets deposited in one's body stays there for most or all of one's life. Other chemicals leave the body so fast that medical tests can detect their presence only for a few hours or days after exposure. A good example is alcohol. Even after

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heavy drinking, alcohol can only be detected in the body for a day or so. Most chemical solvents such as mineral spirits behave like alcohol and leave the body very quickly. But both alcohol and chemical solvents will damage the body. The cumulative effect of such toxins can cause long term damage.

Multiple Exposures

The body is exposed to many chemicals from air and water pollution. In addition, artisans often work with more than one chemical at a time. Sometimes two or more chemicals interact in the body in either an additive or synergistic manner.

Additive Exposure

Exposure to two chemicals is considered additive when one chemical contributes to or adds to the toxic effects of the other. This can occur when both chemicals affect the body in similar ways. Working with paint solvents and alcohol consumption are examples. People who take certain medicines or recreational drugs are also likely to be more at risk from exposure to solvents on the job.

Synergistic Exposure

These effects occur when two chemicals produce an effect greater than the total effects of each alone. Smoking while working with asbestos is known to increase the risk of developing lung cancer almost 100-fold. Also, smoking and working with any type of dust or powdered material can be very harmful to the lungs because smoking damages the ability of lungs to handle dust and particles.

Cancer

Occupational cancers are a special type of chronic illnesses. Chemicals which cause cancer are called “carcinogens”. Examples of carcinogens include many of the synthetic textile dyes and metals such as cadmium, lead, and chromium. Unlike ordinary toxic substances, the effects of carcinogens do not occur right away. In fact, many substances which cause cancer produce no symptoms at all. People think they have not been harmed at all, as it usually takes 10 to 20 years for the cancer to develop. The period of time, during which there are no symptoms, is called the “latency period.”

Birth Defects

Some chemicals should not be handled by pregnant women because they can harm the foetus. Chemicals that cause birth defects are called “teratogens” and they cause damage primarily during the first trimester when the foetus is developing its organs. But many chemicals that do not cause birth defects are still toxic to the foetus, causing brain or organ damage. These chemicals affect the foetus at all stages of pregnancy. Some chemicals that are known to cause both birth defects and toxicity to the foetus include alcohol, certain chemical solvents, and lead.

How Chemicals Enter the Body

Chemicals enter the body primarily in three ways: skin contact, breathing (inhalation), and ingestion.

Skin Contact

The skin has a barrier of waxes, oils, and dead cells to protect the body. But this barrier can be destroyed by chemicals such as acids, caustics like lye, and solvents. Once the skin is damaged, these chemicals can cause deep damage to the tissues beneath the skin. And some of these chemicals can even enter the blood and then be transported throughout the body. Cuts, abrasions, burns, rashes, and other violations of the skin's barrier can allow chemicals to penetrate into the blood and be transported throughout the body. There are also many chemicals that can—without the exposed person knowing it—enter the blood through undamaged skin. Among these are benzene in gasoline and wood alcohol (methanol).

Inhalation

Inhaled substances are capable of damaging the respiratory system at any location—from the nose and sinuses, to the lungs. For example, inhalation of dust of almost any type can cause sinus irritation and

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runny nose, dry or itchy throat, bronchial (the tubes leading into the lungs) irritation or bronchitis, or lung effects such as asthma. Some toxic substances are absorbed by the lungs and are transported via the blood to other organs. For example, lead in solder fumes may be carried via the blood to damage the brain and kidneys. Other substances like cotton dust or the silica dust in clay, can get deeply embedded in the lungs. Although they damage the lungs, they do not travel through the body to damage other organs. Such dust usually do not produce symptoms at the time of inhalation. Instead, they cause chronic diseases such as asbestosis or silicosis or cancer years later.

Ingestion

Some of the dust that is inhaled is trapped by mucous in the bronchial tubes and transported up to the back of the throat where it is swallowed. One can accidentally ingest toxic materials by eating, smoking, or drinking while working, pointing brushes with the lips, touching mouth with soiled hands, biting nails, and similar habits. Accidental ingestion of

Table 1: Summary of Identified Hazards in 5 Craft Clusters in India

Type of Craft	Chemical Hazards	Physical Hazards	Ergonomic Hazards	Accident Hazards	Ailments Reported
Hand block/ Screen/ Digital printing	• Dyes • Adhesives • Acids • Pigments • Bleaching agents • Alum • Caustic soda • Organic dust e.g. cotton	• High decibel machine noise • Odour from chemicals and dyes • Improper ventilation • Falls from heights	• Awkward posture in block making • Standing posture in printing • Bending posture in washing	• Cuts in block making • Cuts from stitching and cutting	• Respiratory problems • Eye problems • Muscular pains • Calluses on palm edges • Itching of hands • Coloured nails
Leather/ Mojdi	• Dyes • Lime • Colour materials • Adhesives	• Fire • Improper ventilation • Odour from hides	• Awkward position in cutting/ curving/ stitching	• Cuts and wounds while cutting, curving and stitching, fixing etc	• Respiratory problems • Eye problems • Muscular pains • Cough
Blue pottery	• Inorganic dust e.g. quartz • Different glazing materials	• Glass • Heat from kiln	• Different work postures	• Cuts and wounds from instruments	• Respiratory problems • Weight loss • Eye problems • Muscular pains • Tuberculosis • Cough and cold • Cuts on palms • Gastric problems
Metal craft (Bell metal)	• Alloy for bell metal • Fumes and dusts	• Improper ventilation • Heat from furnace	• Awkward work postures	• Burns • Accidents in beating process	• Calluses on hands due to constant hammering • Cuts and wounds • Pulmonary problems • Burns • Severe tremor of hands
Metal craft (Dhokra)	• Metal fumes, e.g. brass • Metal dusts • Wax and tar • Polishing materials	• Improper ventilation • Heat from furnace	• Stooped posture	• Burns and boils on feet during casting	• Eye problems • Eye strain • Body ache • Pulmonary problems • Muscular pains • Calluses, hardness, spots, cuts and burns • Tremors

SECTION II A

Printing Process

Basic Information on Materials Used

Dyes and Pigments

The term “dye” or “dyestuff” refers to products which cause reflection or selective transmission of incident light in such a way that they impart colour to the materials on which they are applied. Dyes are soluble and tend to attach to the textile fibres or other materials immersed in the solution. Pigments, on the other hand, are insoluble and impart colour to an object by being dispersed throughout in finely subdivided particles. In the past, the number of colouring materials available consisted of a few organic dyes which were derived from natural sources: tyrian purple made from molluscs; indigo made from a plant; and mineral pigments. But majority of the dyes and pigments which are used today are of synthetic origin.

Inorganic pigments either come from earth (ochres, for example), or are manufactured from metals and minerals (lead white or cerulean blue). These pigments are salts and oxides of lead (particularly lead chromate), cadmium sulphide and selenium sulphides, iron oxides, antimony oxide, and titanium oxide. The potential hazards of these compounds are all related to the biological potential hazards of the parent metals. Thus, although iron and titanium oxides present very little hazard, the inhalation of dust from lead pigments is toxic and has a long history of causing lead poisoning. For this reason, most countries ban the use of lead in consumer wall paints.

Alizarine is an organic compound that is a historically important and prominent dye. Originally, alizarine vegetable dye was prepared from the madder plant Rubia tinctorum, but now a synthetic preparation that is chemically identical is used. Madder has been regarded as a mild diuretic but alizarine is classified as a severe irritant.

Adhesives

Most glues and adhesives are polymers which are either of natural or synthetic origin. The synthetic polymers are toxic plastics like cyanoacrylate in super glue, and latex emulsion glues like white carpenter's glue. The natural polymers include rubber cement from the sap of rubber trees or wheat pastes. Most adhesives are less hazardous to use than paints because they are used in smaller amounts. However, it is still necessary to know their hazards since craftworkers use them for many hours daily in applications that bring them in close contact with the adhesives.

Acids

Organic acids and their derivatives cover a wide range of substances. Generally sulphuric acid is used in the printing process for mild washing of fabrics in a mixture of dyes. Introduced into the body in liquid or vapour form, it causes irritation of the mucous membranes of the respiratory and digestive tracts, teeth, eyes, and skin. Upon contact with the skin, sulphuric acid causes violent dehydration and releases heat in sufficient quantities to produce burns that are similar to thermal burns and may be classified as first, second, and third degree burns. The depth of the lesions depends upon the concentration of the acid used in the process. Inhalation of the acid fumes causes several symptoms like nasal secretion, sneezing, a burning feeling in the throat; these are followed by cough, respiratory distress, sometimes accompanied by the spasm of the vocal cords, a burning sensation in the eyes with lacrimation and conjuctival sensation.

Bleaching Agents

Bleaching agents are substances or mixtures which have the ability to remove dyes or pigments that exist naturally in a material or that have been added to it in an industrial process. Bleaching is based on the principle of oxidation and, in the textile industry chlorine oxide is generally used as the main bleaching agent. There may be minor temporary effects on health, such as localized skin and eye irritation. There are no chronic effects and, while accidental acute effects can be painful, they are

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mostly reversible. Excessive exposure may result in hair thinning or temporary balding.

Caustic Soda

Aqueous solution of caustic soda is used in the dyeing industries for its unique property of reducing effects of air oxidation on any colour. Caustic soda is generally used in the vat dyeing process. The concentrated form of caustic soda is highly corrosive and causes severe burning on the skin. However, most of the artisans frequently use it for cleaning stains from hands and legs. As it is used in a diluted form, the acute toxicity exposure is limited, but there may be cases of chronic toxicity over longer exposure.

Organic Dust

Apart from the dyeing units, some workers are also engaged in manufacturing products such as toys, christmas trees, and decorative items. After the preliminary processing, the dyed fabric is supplied to working groups for the making of these products. Our study shows that in a single unit about 20-25 women are engaged in cutting, stitching, and weaving cotton materials in the same room and most of them reported suffering from cough. The probable effect of long-term exposure to cotton fibres and dust is byssinosis, a disease that impairs the oxygen exchange capacity of the lungs.

Table 2: Hazards Involved in the Printing Process

Materials Used in Textiles	Health Hazards				
	Acute				Chronic
	Skin	Eye	Inhalation	Ingestion	
Dyes & dyestuffs	• Irritation	• Irritation	• Irritation to the respiratory tract		• Carcinogenic • Mutagenic • Neurotoxicity • Acute toxicity • Genotoxicity
Adhesives	• Irritation	• Irritation	• No significant health hazards		• Disease of the skin and respiratory tract.
Alizarin (Synthetic)	• Permeator	• Irritation		• Very hazardous to internal organs	• Eye sight problems • Lung problems • Damage of target organs. • Permeator through skin contact.
Alizarin from madder root	• No significant health hazards	• No significant health hazards	• No significant health hazards	• No significant health hazards	• No significant health hazards
Sulphuric acid	• Corrosive • Blister	• Redness of eyes	• Nasal secretion • Cough • Breathlessness	• Corrosive to internal organs	• Multiple health effects.
Bleaching agents **E.g. Sodium hypo-chloride**	• Irritation • Burns	• Severe irritation • Burns	• Irritation to respiratory tract.	• Corrosive and irritation • Internal irritation	• Damage to lungs
Alum (Aluminium sulphate)	• Irritation to skin • Mucous membrane		• Irritation to respiratory tract	• Sickness • Vomiting	• *Not significant*
Caustic soda	• Corrosive • Burns • Irritation	• Corrosive	• Breathlessness • Irritation to respiratory tract	• Corrosive to internal organs	• *Not significant*
Cotton dusts		• Irritation	• Irritation • Breathlessness	• Not recognized	• Lung disease (byssinosis)
Lime	• Irritation • Burns	• Painful irritation • Damage to eyes	• Irritation to respiratory tract	• Irritation of gastrointestinal tract.	• Severe irritation or dermatitis

SECTION IIA

General Safety Practices

1. Floors and Ventilation

- Floors and work surfaces should be made of materials which are easily cleaned with sponge and do not stain
- Exhaust fans should be provided and workers should be made to work close to a window
- General ventilation rates should not be so high that dust is stirred up

2. Material Data Sheets

- Obtain material safety data sheets for all dyes and textile paints
- If dyes and pigments are not identified (e.g. by colour index names) ask the supplier for this information

3. Labelling

- Proper and separate labelling should be done for each of the dyes and pigments for safety

4. Choose Water-based Products over Solvent-containing Ones

5. Use Pre-mixed Liquid Dyes if Possible

- Avoid buying powdered dyes as they are easily inhaled

6. Handling of Dyes

- Weighing and mixing of dye powder should be done where local ventilation is available
- Use gloves while handling liquid or powdered dyes

7. Dust Control

- Keep containers of powdered dyes and pigments closed
- Sprinkle dry dyes or pigments on wet cloth, airbrush or use other techniques which dampen dust

8. Protective Clothing

- Wear full-length protective, but comfortable, clothing in workplace
- Leave these garments in the studio to avoid bringing dusts home
- Wash workplace clothing frequently and separately from other clothes

9. Protection of Eyes

- Wear chemical splash goggles when using dyes, caustic, acids or corrosive chemicals
- Install an eye wash fountain for cleaning
- Set up emergency shower if large amounts of chemcials are used

10. Avoid Ingestion of Materials

- Do not eat, smoke and drink at the workplace
- Never hold a brush, hood, or cover with your teeth
- Do not use any cooking utensils at the workplace
- Wash hands before eating , smoking , and drinking and follow personal hygiene procedure

11. Heating and Melting

- Do not heat any kind of adhesive/ wax with open flames such as those of gas stoves
- Use double boilers, electric stoves, or frying pans that have good heat control mechanism
- Use wax emulsion products whenever possible
- Irons used to remove wax should be set at as low a temperature as possible
- Send fabrics to professional dry cleaners if viable

12. Disposal

- Dispose off dyes, mordants, and other chemicals in accordance with health, safety and environmental protection laws

13.Health Check-ups

- Report any kind of injury, accident or illness at workplace immediately
- Provide detailed information about the

SECTION II B

Blue Pottery

Basic Information on Material Used

Inorganic Dusts

Quartz dust in Blue Pottery Craft

Finely powdered particles of inorganic substances, especially dust, when inhaled, can cause abnormal conditions of the lungs. The nature of diseases from dust depends on the primary constituents of the raw materials that a particular industry uses over a long period of time: for example, coal dust causes pneumoconiosis, silica causes silicosis and asbestos causes asbestosis. Quartz and glass powder are the two major components in the making of blue pottery which contain a high amount of silica. In some of the villages, artisans engaged in traditional blue pottery work report suffering from 'tuberculosis'; however, they may actually be suffering from a lung disease caused by the silica in quartz—silicosis. Lack of knowledge and the cost of diagnosis are major problems for these artisans. Moreover, as revealed by the sample survey, there appears to be an increase in the cases of TB among the workers.

Ceramic Glaze

Ceramic glaze is a glassy substance that has been applied to a ceramic object and then fired to fuse with ceramic. Ceramic glaze is used to both decorate the product, as well as to strengthen the underlying ceramic and to waterproof it. Early glaze was used primarily to make earthenware vessels suitable to hold drinks and liquid foods, since without the glaze the clay simply soaks up the liquid over time, imbuing the vessel with its taste, and weakening it. Like paint, ceramic glaze contains different ingredients to achieve its vibrant colours and textures, some of which can be harmful if consumed. For example, manganese dioxide is used to darken many different colours; copper carbonate is used in reds, greens, and blues; cobalt oxide and cobalt carbonate are used for vibrant blue pigments; and chrome oxide is used for pinks, reds, and greens. The type of firing also radically affects the colour, with gas firing reducing the glaze, and electric firing oxidizing the glaze.

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Table 3: Hazards Involved in Blue Pottery

Materials used in textile	Health hazards				
	Acute				Chronic
	Skin	Eye	Inhalation	Ingestion	
Glazing materials	• Irritation	• Irritation	• Irritation of respiratory tract	• Very harmful if swallowed	• Dermatitis • Damage to the respiratory system
Quartz powder	• Irritation	• Irritation	• Breathlessness, • Wheezing, • Cough	• Not significant	• Emphysema • Bronchitis • Silicosis • Carcinogenic

General Safety Practices

(In addition to the General Safety Practices given in IIA)

1. Working with Clay

- Use pre-mixed clay to avoid exposure to large quantities of clay dust
- Clay storage and mixing should take place in separate rooms
- Wear separate workplace clothing that does not trap the dust
- Prevent any wound on skin from coming in contact with clay

2. Working with Glazing Materials

- Use lead-free glaze

3. Working with Kiln

- Goggles or hand-held welding sheets should be used while operating the kiln
- Always ensure that the kiln is properly shut off

SECTION II C

Metal Crafts

Basic Information on Materials Used

Metal Alloy

Metals can be heated and melted together into almost any combination. These combinations are called “alloys.” The reason the metals are mixed into alloys is to provide special properties such as specific melting points, hardness, or colour. Almost all metals used in metalworking are alloys. It is rare to see a pure metal used in craftwork. Metal workers must know the composition of the alloys in order to work safely with them. For example, brass is primarily an alloy of copper and zinc. But it also may contain harmful amounts of lead and arsenic. Silver solders contain toxic metals such as cadmium and antimony in order to lower the solder's melting point. Material

Metal Dusts and Powders

Firing is the basic step for any kind of metal fabrication and produces a lot of dust and powder, which is released into the open air. Artisans of bell metal crafts have to fire the metal scrap for its fabrication. Due to the continuous process of firing, a large quantity of small particles is released which creates highly toxic working conditions for the artisans.

Metal Fumes

Welding, casting, and soldering create tiny, invisible metal oxide particles called 'fumes'. Even though artisanal clusters produce a small quantity of fumes from the process of welding, in the long run they could become a source of chronic toxicity for the artisans at their workplaces. The tiny particles from the fumes float for hours in the air and can be inhaled easily. In general, the smaller the particles, the deeper they can be inhaled, and the more toxic they are likely to be. For this reason, they are more toxic than larger particles of metal dust. These floating particles later settle on surfaces as dust, thus contaminating the entire workplace.

Scrap metal used in Bell Metal Crafts

Workplace for the Bell Metal Crafts

Smoke and dust formed at work

Metal-containing Gases

Due to the complex nature of scrap metals, some toxic gases may also be released; for example, metals like arsenic and antimony emit toxic gases when in contact with acidic water. When inhaled, these gases pass easily through the airsac’s

SECTION II C

membranes and enter the blood stream causing severe problems for the workers.

Metal Compounds

Metal Compunds are formed when they combine with another element. Iron oxide (rust), which is formed by the combination of iron with oxygen, is not very toxic. However, when iron combines with cyanide to become ferric cyanide it is highly toxic.

Table 4: Hazards Involved in Metal Crafts

Materials used in textile	Health hazards				
	Acute				Chronic
	Skin	Eye	Inhalation	Ingestion	
Metal alloy	• Irritation • Rashes	• Irritation	• Irritation of respiratory tract	• Nervous system disturbances • Diarrhoea	• Carcinogenic
Metal dust / fumes	• Irritation	• Irritation	• Asthma • Wheezing • Bronchospasm • Dyspnoea	• Nausea • Vomiting • Diarrhoea • Sensation to hotness	• Fibrosis • Interstitial pneumonitis • Myocardial • Thyroid disorders

Hazards from Metal Contamination

Skin Contact Hazards

When metals are first cast or cut, they are shiny and clean. Soon their surfaces may become dull, rusted or tarnished. This is caused by the combination of metal with chemicals in air or water such as oxygen and sulphur dioxide. Merely touching or handling some toxic metals can be harmful, if these corrosion compounds are transferred to the mouth while eating or smoking. Some metals also cause skin allergies, and some (powdered lead, lead oxide and lead nitrate) may get absorbed into the blood stream through the skin.

Metal Fume Fever

Fumes of metals such as zinc, copper, magnesium, and iron, can cause metal fume fever. The onset of the fever takes about 2 to 6 hours after exposure and symptoms may include fever, chills, and body aches. However, when toxic fumes such as cadmium are inhaled, the early symptoms may be similar, but serious consequences or even death may result.

Nervous System Diseases

A number of metals are known to affect the brain and other nervous system tissues. For example, lead, mercury, and manganese can cause effects ranging from psychological problems at low doses, to profound retardation and paralysis at higher doses. Chronic manganese exposure can cause a disease similar to Parkinson's disease.

Cancer

Some metals and/or compounds containing metals are known or suspected of causing cancer. They include metals or compounds of metals that contain arsenic, beryllium, cadmium, chromium6, cobalt, lead, nickel, rhodium, selenium, and uranium. Fortunately, these metals, with the exception of cobalt, can be eliminated from jewellery, ceramic,

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and other crafts without damaging the quality of the product but only slightly limiting the colour options achievable.

Others

Some of the other hazards related to metal contamination are respiratory system diseases, reproductive disorders, and nervous disorders from lead batteries etc.

General Safety Practices

1. **Identify the Metals in the Materials.** Only use metals and alloys for which material safety data sheets are available. Recycled scrap metals should not be used for making crafts unless the craftsperson is absolutely certain that the products from the scrap are safe for the customers.
2. **Eliminate Highly Toxic Metals** such as lead, cadmium, nickel, and beryllium from the workplace. Never use alloys containing nickel for items that will come in contact with the consumer's skin.
3. **Use Ventilation Systems** to capture dust from grinding and polishing and fumes from welding, brazing, casting, and soldering. Clean up dusts that escape such systems daily.
4. **Avoid Use of Metal Powders if Possible.** If they must be used, be careful as they are flammable and/or explosive. Keep sparks or static discharge away from them, especially when transferring powder from one container to another. Store powdered metals in non-flammable storage cabinets and secure metal cabinets.
5. **Avoid Excessive Skin Contacts with Metals.** Wash hands regularly during and after work.
6. **Wear Protective Clothing** including a full length smock, shoes, and hair covering (if needed). Leave these garments in the studio to avoid bringing home dust from the workplace. Wash workplace clothes frequently and separately from other clothes.

Table 5: Permissible Levels of Certain Chemical Substances in the Work Environment

Sl. No.	Substance	Time-weighted contraction (8 hrs.)		Short-term exposure limit (15 minutes)	
		ppm	Mg/m^3	ppm	Mg/m^3
1.	Acetic acid	10	25	15	37
2.	Arsenic and soluble compounds	-	0.2	-	-
3.	Copper fumes	-	0.2	-	-
4.	Cotton dust	-	0.2	-	-
5.	Iron oxide fume as Fe	-	5	-	-
6.	Lead, inorganic dusts and fumes	-	0.15	-	-
7.	Sulphur dioxide	1000	6000	-	-
8.	Sulphuric acid	-	1	-	-
9.	Zinc oxide				
	a. Fume	-	5.0	-	-
	b. Dust (total)	-	5	-	10

SECTION III

Physical and Ergonomic Hazards and General Safety Practices

The hazards arsing from unsafe working conditions in a workplace are termed as physical hazards. The main factors for the unsafe working conditions are lack of knowledge (not recognised as a hazard), neglecting improvement due to high costs, or simply delaying the required changes. Some examples are given below.

- Electrical hazards: frayed cords, missing ground pins, and improper wiring
- Unguarded machinery and moving machinery parts: guards removed or moving parts that a worker can accidentally touch
- Constant loud noise
- High exposure to sunlight/ ultraviolet rays, heat or cold
- Working from heights, including ladders, scaffolds, roofs, or any raised work area
- Working with mobile equipment such as fork lifts (operation of fork lifts and similar mobile equipment in the workplace requires significant additional training and experience)
- Spills on floors or tripping hazards, such as blocked aisle or cords running across the floor.

Printing

Noise Pollution

High level noise from the process of fabrication

Craftworkers perform many noise-producing tasks such as working with power tools and hammering on metal or other hard surfaces. But even playing loud music can produce ear-damaging sound. Signs of overexposure may include a temporary ringing in the ears or difficulty in hearing for a while. Except for these minor symptoms, there are no symptoms or pain to warn people that their hearing is being damaged. In addition to loss of hearing, noise may also cause increased blood pressure and stress-related illnesses. High blood pressure is also a physical problem which has no symptoms until the pressure causes strokes or heart problems. Noise is measured in levels of sound intensity called "decibels" (dB). These levels of sound can be measured by instruments used by safety professionals and industrial hygienists. Employers can hire industrial hygienists, who will come to a workplace, measure the dB to which people are exposed. Power tools, which are used in the washing process of fabrics for printing production, produce a very high level of noise and artisans have to stand near the source for more than 8-9 hours daily. This kind of overexposure may lead to permanent loss of hearing.

Fall from Heights

Bamboo roofs used for drying

This hazard is mainly observed in the printing crafts. For the fixation of colour, the printing fabrics are dried under the sun; for this purpose, the artisans manually make one or two bamboo roofs in some of the printing units. These roofs are at a height of 15-20 feet and artisans have to climb up repeatedly for hanging the materials on them.

Improper Ventilation

Improper ventilation is seen in printing processes where a number of chemicals are used. Powdered forms of dyes and chemicals are mixed in solvents before the printing process and the study demonstrates that the mixing part is done in a closed room without any precautions. The continuous exposure to these powders is the cause of chronic hazards.

Blue Pottery

Glass

One of the main ingredients for the blue pottery craft is the glass powder. Artisans collect bottles from waste pickers and crush it to powdered form

SECTION III

Glass powder for the manufacturing of blue pottery

manually with the help of stones. Women work with bare hands and feet and use only glass spectacles for their general safety. From this kind of routine work, women get cuts and wounds every day

Heat from Kiln

Heat is also one of the main hazards for the workers of blue pottery crafts and metal workers. In blue pottery the pottery has to be fired at an average temperature of 200°- 600°C using wood fuel.

Kiln used for firing of pottery

Keen observation and control is required as there is a chance of damaging the pottery due to the unregulated heat. Therefore an artisan has to keep regulating the fire of the kiln, and in doing so, has to face the heat hazards from the kiln.

Leather

Very high odour from hides

Odour

Odour nuisance can have physical as well as mental effects (health effects and negative experiences). The direct relationship between the odour of substances and their toxicity, expressed as a pathogenic effect is very complicated. In leather crafts, although the use of vegetable dyes may cause lower chemical hazards, the hides produce a very strong smell in and around the workplace. In one complete cycle of the process, almost 50-60 hides are tanned in 2-3 months; although the artisans may get habituated to the smell, there can still be symptoms of headache or vomiting on first entrance to the workplace each day.

Metal Crafts

Improper Ventilation

Ventilation is an integral part of health safety wherever heating, cooling, and humidifying appliances are installed for making an enclosed workroom suitable for the work process. The main purpose of ventilation is to reduce the concentration of contaminants and to supply the occupant with fresh air. Ventilation is thus normally accomplished by the simultaneous replacement of polluted air from the workplace with fresh air.

Store room of chemicals

Bell metal production

Noise Pollution

Constant hammering takes place in bell metal production units. Collective beating is done with hammers by 6-7 artisans for the formation of a vessel from the ingot, followed by individual beating processes to ensure evenness. In these processes, very high intensity noise is produced for long periods of time.

Continuous hammering in Bell metal crafts

SECTION III

Heat

Firing in bell metal

Heat hazards for artisans in bell metal crafts are a serious concern as they work with bare bodies in front of the furnaces. Constant heating and beating is required in bell metal fabrication, and thus the artisans are exposed to two types of heat hazards: a) from the firing itself, and b) from the molten metal.

Poor Illumination

Constant pressure on eyes in leather works

In most of the villages, the majority of the artisans have to work in natural light whether it is inside a particular area or out in the open. But in an environment with poor illumination the constant pressure of work is hazardous for the eyes. Even very high illumination can cause severe damage to eyes.

Table 6: Regions of the Optical Radiation Spectrum

Region	Wavelength range in nanometres (nm)	Effects
Ultraviolet (UV)	100 to 380-400	Severe eye damage; cancer
Visible (light)	380-400 to 760-780	Eye strain if either too much or too little light is present during work
Infrared (IR)	760-780 to 1,000,000	Burns the skin and forms cataracts in the eyes from the heat produced in the body

Ergonomic Hazards

Any physical factor within the workplace that harms the musculoskeletal system (muscles, joints, bones and related structure) of workers is termed as ergonomic hazards. They are the hardest to spot since the strain on the body or the harm these hazards pose is not immediately noticeable. Short-term exposure may result in "sore muscles" the next day or in the days following exposure, but long-term exposure can result in serious long-term injuries. Ergonomic hazards impact employers and workers and their families. Poor workplace design, awkward body mechanics or postures, repetitive movements, and other ergonomic hazards induce or contribute to a staggering number of cumulative trauma disorders (CTD) that affect hands, wrists, elbows, arms, shoulders, the lower back, and the cervical spine area. Structures involved include tendons, muscles, bones, nerves, and blood vessels.

One can plan strategies for abatement by learning to recognize the hazards that contribute to CTD. OSHA (Occupational Safety and Health Administration) has published the Ergonomic Program Management Guidelines. It has also given out Advance Notice of Proposed Rulemaking for an Ergonomic Standard that will affect all industries. A companywide ergonomic assessment has to be developed, followed by a well written ergonomic plan. Ergonomic abatement will decrease the costs associated with CTD and ultimately impact the economic "bottom line."

Ergonomic Hazards Include

- Improperly adjusted workstations and chairs
- Frequent lifting
- Poor posture
- Awkward, Limited, and Repetitive movements
- Having to use too much force, especially if it has to be done frequently

General Safety Practices

To prevent these injuries, craftworkers must pay careful attention to their bodies for signs of fatigue, pain, changes in endurance level, weakness, and the like. In other words, one should listen to the body while it is still whispering rather than waiting until pain shouts for attention. Certain good work habits can help resolve early symptoms. Some of these are as follows:

- Keep good posture
- Take frequent and regular rest and bathroom breaks
- Alternate tasks or vary the type of work done frequently
- Warm up the muscles before work; move and stretch muscles during breaks
- Ease back into heavy work schedules rather than expecting to work at full capacity immediately after holidays or periods away from work
- Modify techniques and/or equipment to avoid uncomfortable positions or movements
- Buy tools, machines, and office furniture that have been redesigned to enable workers to avoid the

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