Principles of Chemical Management in the Textile and Garment Industries in Bangladesh

Promotion of Sustainability in the Textile and Garment Industry in Asia - FABRIC

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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Module 3: Identifying and assessing chemical hazards and risks

Module 3: Identifying and assessing chemical hazards and risks

3.1 General principles

3.2 Assessing, classifying and mapping chemical hazards and risks

3.3 Monitoring chemicals and exposure in the workplace

3.4 Medical and health surveillance

Module 3: Identifying and assessing chemical hazards and risks

3.1 General Principles

3.1.1 A hazard is an intrinsic property of a chemical substance to cause harm to humans and/or the environment.

Risk is the probability of a chemical substance causing harm or an adverse impact. Hazard and risk are linked by exposure, the possibility of a chemical coming in contact with a person or the environment.

3.1.2 Factory should establish and implement a procedure for assessing the hazards and risks associated with chemical products identified in the chemical inventory and plan precautionary actions to mitigate these risks.

Module 3: Identifying and assessing chemical hazards and risks

3.1 General Principles

3.1.3 The assessment should be carried out by the responsible personnel who have the necessary information, instruction and training and are competent to do so.

3.1.4 Exposure of workers to hazardous chemicals should be monitored so that workers are not exposed to chemicals more than the established exposure limits or other exposure criteria.

3.1.5 The significance of risk may depend on the duration and frequency of exposure and the concentration of the chemical substance(s) involved. Any operational risks such as leaks, overflow of tanks, fire, flood, waste storage, and chemical handling, should also be considered.

Module 3: Identifying and assessing chemical hazards and risks

3.2 Assessing, classifying and mapping chemical hazards and risks

3.2.1 The standard classification systems of hazards under the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) distinguishes between three main groups of hazards:

Physical: Chemical substances that may be explosive, self-reactive, corrosive to metals, oxidising liquids, etc.

Health: Chemical substances that may be toxic or cause cancer, germ cell mutagenicity, skin/ eye allergies, damage organs, affect fertility & reproduction or may be an endocrine disruptor.

Environmental: Chemical substances that are toxic to aquatic or terrestrial life, persistent, bio accumulative or impact the ozone layer.

Classifying chemical hazards and risks

Physical (P)		Health (H)	Environment (E)
1. Explosives	11. Self-heating substances and mixtures	1. Acute toxicity	1. Hazardous to aquatic environment
2. Flammable gases	12. Substances and mixtures which, in contact with water, emit flammable gases	2. Skin corrosion/irritation	2. Hazardous to ozone layer
3. Aerosols and chemicals under pressure	13. Oxidizing liquids	3. Serious eye damage/ irritation	
4. Oxidizing gases	14. Oxidizing solids	4. Respiratory or skin sensitization	
5. Gases under pressure	15. Organic peroxides	5. Germ cell mutagenicity	
6. Flammable liquids	16. Corrosive to metals	6. Carcinogenicity	
7. Flammable solids	17. Desensitised explosives	7. Reproductive toxicity	
8. Self-reactive substances and mixtures		8. Specific target organ toxicity (single exposure)	
9. Pyrophoric liquids		9. Specific target organ toxicity (repeated exposure)	
10. Pyrophoric solids		10. Aspiration hazard	

These groups are further separated into classes of hazards.

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Module 3: Identifying and assessing chemical hazards and risks

Hazard identification

3.2.2 Hazards in chemical products can be identified in the following ways:

a) By consulting information in the safety data sheets (SDS)

b) By consulting the labels on the chemical container

c) Information on ingredients through chemical identification codes such as the Chemical Abstracts Service (CAS) numbers.

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Hazard identification

3.2.3 Factories should specifically consult the following sections on the GHS SDS for chemical hazards and properties associated with the chemical:

(i) Section 2 on general description of hazards,

(ii) section 11 on toxicological information,

(iii) Section 12 – ecotoxicological information

(iv) Section 9 on physical and chemical properties and

(v) Section 10 on information related to stability and compatibility aspects.

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3.2 Assessing, classifying and mapping chemical hazards and risks

3.2.4 Once the hazard(s) of the chemical product has been identified; the information should be documented in the Chemical Inventory List (CIL).

Hazards in chemical products applied in the production should be communicated to workers and other stakeholders in the factory through signage and/or chemical snapshots.

3.2.5 Chemicals should be assessed for their impact on the safety and health of staff by identifying which activities at the factory and to which extent may expose them to the chemical risk(s).

Module 3: Identifying and assessing chemical hazards and risks

3.2 Assessing, classifying and mapping chemical hazards and risks

3.2.6 The following aspects may consider for health and safety assessment:

a) General housekeeping and maintenance of machinery, piping and other equipment for leakages, pressure gauges, heat emissions, etc. as well as emergency response equipment (eye wash and body showers), First-Aid boxes, engineering controls, electrical wiring, ventilation, secondary containment, spill kits, assembly points, etc.

b) Safety precautions at all solid and hazardous waste collection and storage areas

c) Ergonomic risks such as the heavy lifting of containers/cartons for work-related musculoskeletal disorders

d) Expiry, adequacy and appropriateness of PPE

Module 3: Identifying and assessing chemical hazards and risks

3.2 Assessing, classifying and mapping chemical hazards and risks

3.2.6 The following aspects may consider for health and safety assessment:

e) Records of incident management with preventive actions implementation

f) Regular training and drills to all workers and staff on chemical handling and Health and Safety measures

g) Emergency contacts for responsible persons, First-Aid, nearest hospital, fire station, etc. to be displayed prominently throughout the factory

3.2.7 The factory shall establish and maintain a procedure for identifying and assessing chemical hazards as well as train the concerned personnel in the application of the procedure.

Template 3: Training Record

Factory Name:

Location:

Updated by: **Date:**

Training Title	Date of training	Training Duration	Trainer Name	Training Provider Organization, address and contact	Location of Training	No. of Participants	Trainees' Assessment (Yes/No)

Template 4: Training Participants' Record

Factory Name:

Training Title:

Date: **Duration:**

No. of Participants: **Location:**

Trainer Name & Designation:

Participant's Name	ID Card No.	Designation	Department	Years in the Factory	Signature

Template 5: Health Check-up Record Template

Factory Name:

Location:

No. of person checked-up: **Total Clinically fit:** **Total Clinically unfit:**

Updated by: **Date:**

Date	Name of Employee	Department	Designation	Attended physicians (Name, Designation, Contact)	Check-up description (Tests performed, diagnosis, etc)	Result summary (Test results, disease diagnosed)	Clinical fitness (Fit/Unfit)	Actions for remedy	Physician's signature	Physician's remarks

Template 6: Chemical Accident and Incident Log Book

Description of the accident/incident

Sl	Victim's info		Accident/ Incident info		Accident/Incident detail			Treatment info	
	Name		Date		Severity (tick)	Affected organ of victim person	Death (Yes/No)	Hospital/ Clinic where treatment taken place	Doctor/Assistant conducting the treatment
	ID		Time		high				
	Section		Location		medium				
	Designation				low				
	How much percentage of earning capability worker has lost due to the accident/incident								
	Date of return to the workplace								
	How much time/day worker had to be absent due to the accident/incident								
	Compensation that has been given from company								

Module 3: Identifying and assessing chemical hazards and risks

Prioritizing chemical hazards and risks using the classification system of GHS

3.2.8 It is recommended that the factory maps all chemical hazards and risks to get a complete picture of the prevalence of certain groups and types of chemical hazards and risks and decide on prioritization of chemical issues to be addressed.

3.2.9 The factory may refer to the GHS hazard statements (short: H-statements) that should be displayed on the label on the chemical container /packaging as well as listed in the respective safety data sheet. These hazard statements usually appear in the form of three-digit codes, preceded by the capital letter “H”, where H2xx, H3xx and H4xx represent physical, health and environmental hazard, respectively.

3.2.10 The factory may consider including information such as H-statements or similar information on hazard classes and categories in the chemical inventory list or other documentation to allow for an easy/ clear documentation of prevalent hazards and prioritization of risk assessment or workplace monitoring.

Module 3: Identifying and assessing chemical hazards and risks

Risk assessment methodologies

3.2.11 The factory shall also establish and maintain a procedure for conducting a chemical risk assessment as well as train the concerned personnel in the application of the procedure.

3.2.12 The assessment of risk shall take into account (i) the quantity of chemicals present at the workplace, (ii) the operating conditions and processes applied at the workplace, (iii) the range of uses of chemicals for which the employers is responsible (e.g. including storage, transport, handling and disposal), (iv) the variety of tasks that contribute to work activity, particularly those where engineering controls provided are not available (e.g. during maintenance, break-down or cleaning tasks), (v) the nature of the chemicals and whether the hazards and associated risks are increased by the way they are used (e.g. high temperature, pressure, mixing) and (vi) the consequences and likelihood of a possible failure or sequence of failures of control measures.

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Risk assessment methodologies

3.2.13 The results of the risk assessment shall be documented and used as a reference base of deciding the selection and implementation of control measures to either eliminate or contain the risk at an acceptable level.

3.2.14 The assessment of risks should be reviewed on a regular basis (at last once a year) and whenever significant changes occur in the work to which the assessment relates (e.g., change of chemicals or process machinery, retrofitting of control measures).

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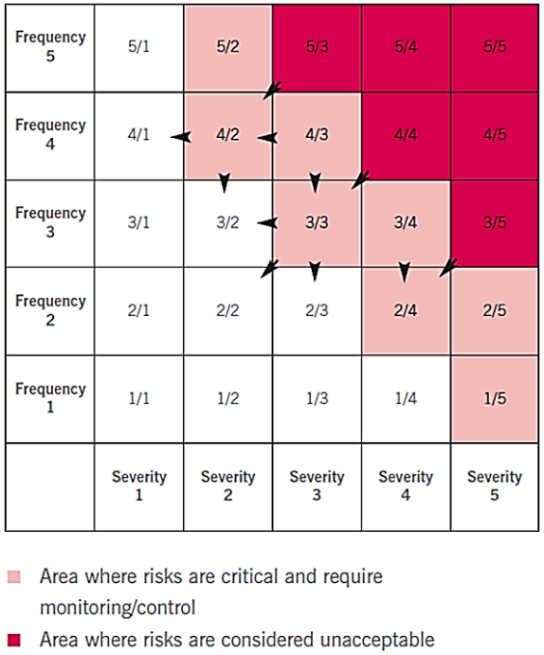
Risk assessment methodologies

3.2.15 The use of a risk assessment matrix may be considered as one possible approach to establish a risk factor for the chemical handling and storage in the factory. The following steps should be followed to perform a risk matrix-based risk assessment:

a) Description of the situation/process/task

b) Determination of the number of persons involved (e.g., contractor, supervisors, worker)

c) Identification and categorization of severity - as part of the factory´s risk assessment procedure, the severity categories will have to be defined separately (examples of severity rating can be found in UNEP Responsible Production Toolkit)



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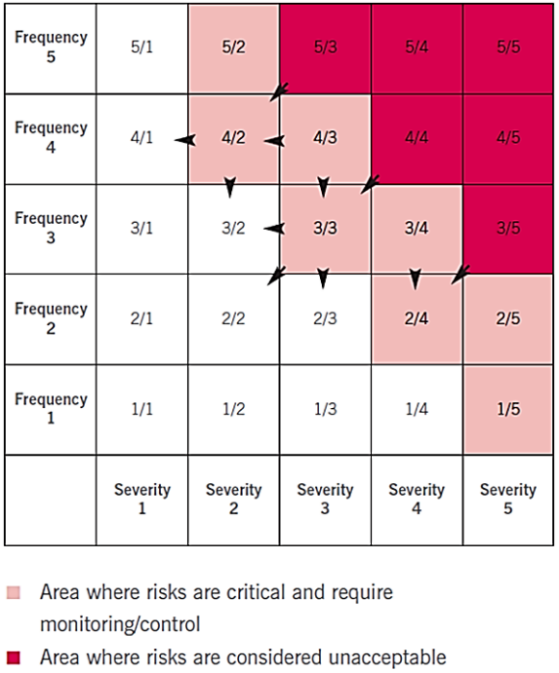
Risk assessment methodologies

3.2.15 The use of a risk assessment matrix may be considered as one possible approach to establish a risk factor for the chemical handling and storage in the factory. The following steps should be followed to perform a risk matrix-based risk assessment:

d) Estimation of probability/ likelihood – similar to the severity categories, criteria for the probability/likelihood will have to be defined as part of the factory´s risk assessment procedure.

e) Establishment of a risk scoring system, such as by using the risk matrix assign each hazard situation risk factor from 1/1 (lowest) to 5/5 (highest) (see graphic below)



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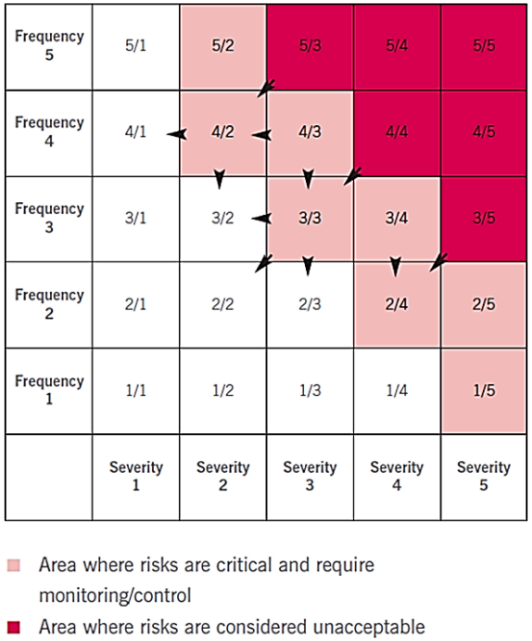
Risk assessment methodologies

3.2.15 The use of a risk assessment matrix may be considered as one possible approach to establish a risk factor for the chemical handling and storage in the factory. The following steps should be followed to perform a risk matrix-based risk assessment:

f) Verification of the controls in place. The top right corner of the matrix is the riskiest scenarios and should be avoided. The bottom left corner is the scenario where it is typically safe to operate.

g) Deciding whether further action is required, and assignment of priorities

h) Repetition of steps for each activity in the manufacturing processes involving use of chemicals and mark the risk factor on your flow chart.



Module 3: Identifying and assessing chemical hazards and risks

Example for severity ratings (Source: UNEP Responsible Production)

Class	Category	Life and Health		Impact on			Cost impact (materials loss, damage to production and community infrastructure)	Company image, fines, loss of orders
		Workers	Community	Land use, agri-culture/ fisheries	Water resources	Air		
1	Unimportant, negligible	Temporary slight discomfort	Temporary slight discomfort	No contamination, localised effects)			< 0.5 Million US$	Small disturbance with no consequences)
2	limited	Injuries/health effects resulting in temporary worker absence	Injuries/health effects resulting in temporary discomfort of a person	Simple contamination, localised effects, natural remediation			0,5 - 1 Million US$	Disturbance in affected area of company, without significant press coverage in the media)
3	serious	Injuries/health effects resulting in temporary disablement	Injuries/health effects resulting in temporary disablement of a person	Simple contamination, widespread effects with need for simple remediation			1 - 5 Million US$	Partial evacuation of company and/or negative press coverage in local media)
4	very serious	Death or serious injuries/health effects resulting in permanent disablement of a worker	Death or serious injuries/health effects resulting in permanent disablement of a person	Heavy contamination, localised effects with need for remediation			5 - 20 Million US$	Evacuation of company and/or negative press coverage in national media
5	catastrophic	Death or serious injuries/health effects resulting in permanent disablement of several workers	Death or serious injuries/health effects resulting in permanent disablement of several persons, community evacuation	Very heavy contamination, widespread effects with need for remediation)			> 20 Million US$	Evacuation of community, negative press coverage in international media

Module 3: Identifying and assessing chemical hazards and risks

Example for probability ratings (Source: UNEP Responsible Production)

Probability/ Frequency		Example 1	Example 2
1	Practically impossible	Not expected to happen during the lifespan of the operation	Infrequent; known to have happened somewhere else
2	Unlikely	Never happened, but could occur, perhaps during the lifespan of the operation	At least once in a year;
3	Rarely	Expected to occur at least once every 10 years	At least once to five times a month
4	Regularly	Expected to occur at least once per year	At least once to five times a week
5	Frequently	Occurring more than once per year	At least once a day

You will need to define your own probability ratings as part of your risk assessment procedure.

Module 3: Identifying and assessing chemical hazards and risks

3.3 Monitoring chemicals and exposure in the workplace

General principles and concept of workplace monitoring

3.3.1 Airborne concentrations of hazardous chemicals should be measured in all relevant places of work to ensure the safety and health of workers against inhalation risks. Measurements of airborne contaminants are necessary if no other techniques are available to provide a valid estimate of the risk of exposure and to assess the existing control measures.

Module 3: Identifying and assessing chemical hazards and risks

3.3 Monitoring chemicals and exposure in the workplace

General principles and concept of workplace monitoring

3.3.2 Techniques for this risk assessment may include the following:

a. information on the intrinsic health and physical hazards obtained from the chemical safety data sheets;

b. estimation of exposure based on the method of work and work pattern;

c. advice from the supplier;

d. experience of exposure in the workplace or of other users; and

e. simple qualitative tests such as the use of smoke tubes or pellets to determine ventilation characteristics and the dust lamp for illuminating dust emissions.

Module 3: Identifying and assessing chemical hazards and risks

3.3 Monitoring chemicals and exposure in the workplace

Measuring methods and approaches in monitoring workplaces

3.3.3. Sampling equipment should be compatible with the available analytical methods and should have been validated over a suitable range of concentrations above and below the exposure limits or other exposure criteria in accordance with national or international standards.

3.3.4. Static monitoring should be used to determine the distribution of an airborne chemical throughout the general atmosphere of the working area. Air samples should be taken:

a) close to sources of emission to evaluate concentrations or the standard of engineering controls;

b) at various places in the working area to assess the extent of the chemical's general distribution;

c) from working areas that represent typical exposure.

Module 3: Identifying and assessing chemical hazards and risks

3.3 Monitoring chemicals and exposure in the workplace

Measuring methods and approaches in monitoring workplaces

3.3.5. Risk of exposure to the individual worker should be measured through personal monitoring. Air samples should be collected in the worker's breathing zone by means of personal samplers while the work activity is in operation.

3.3.6. If the concentrations vary from one work operation or phase to another, personal sampling should be done in such a manner that the average, and in any case the maximum, level of exposure of each individual worker can be determined.

3.3.7. Personal sampling should measure exposure or allow assessment of exposure throughout the work shift. The exposure should be compared to occupational exposure limit values, for an eight-hour period or, for short term limits, 15 minutes. The measurement may be continuous over the whole shift or intermittent, so long as this allows a valid calculation of the average exposure and where necessary is supplemented by short-term sampling during periods of peak emission.

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3.3 Monitoring chemicals and exposure in the workplace

Strategy and elements of a workplace monitoring program

3.3.8. A systematic measurement program should evaluate whether the exposure of workers to certain hazardous chemicals is within the exposure limit prescribed by the relevant authority.

3.3.9. The aims of this program are

a) to ensure that the health of the workers is efficiently protected;

b) to ensure that the preventive actions which have been taken are still effective;

c) to ensure that the levels, as measured previously, remain unchanged or fall;

d) to ensure that any changes made in work practices will not lead to an excessive exposure to hazardous chemicals;

e) to promote the implementation of more efficient preventive measures.

Module 3: Identifying and assessing chemical hazards and risks

3.3 Monitoring chemicals and exposure in the workplace

Strategy and elements of a workplace monitoring program

3.3.10. The employer should arrange for regular inspection, maintenance and calibration of the measuring equipment.

3.3.11. Only personnel who has been specifically trained for the purpose should be involved in monitoring the airborne concentrations of chemicals in the working environment.

3.3.12. The team responsible for monitoring the working environment should be kept informed about any change in plant, equipment, process, materials or work practices likely to change the levels of exposure to hazardous chemicals.

Module 3: Identifying and assessing chemical hazards and risks

3.3 Monitoring chemicals and exposure in the workplace

Record keeping

3.3.13. Employers should keep the records on measurements of airborne hazardous chemicals clearly marked by date, work area and plant location.

3.3.14. Personal sampling measurements should be recorded and the workers and their representatives, and the competent authority, should have access to these records.

3.3.15. Apart from the quantitative results of measurements, the monitoring data should include,

a) the marking of the hazardous chemical;

b) the location, nature, dimensions and other distinctive features of the workplace where static measurements were made; the exact location of personal monitoring measurement as well as the names and job titles of the workers involved;

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3.3 Monitoring chemicals and exposure in the workplace

Record keeping

c) the source (or sources) of airborne emissions, their location and the type of work and operations being performed during sampling;

d) the date and exact time of sampling;

e) the sampling instrument used, its accessories and the method of analysis;

f) information on the functioning of the process, engineering controls, ventilation and weather conditions with respect to the emissions;

g) the duration of the workers' exposure, respiratory protection usage records and other comments relating to the exposure evaluation;

h) the names of the persons responsible for the sampling and for the analytical determinations.

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3.3 Monitoring chemicals and exposure in the workplace

Record keeping

3.3.16. Records should be kept for a period of time determined by the competent authority such as DOE or DIFE. Typically, it is recommended that the records or a suitable summary should be kept for:

a) at least 30 years if the record is representative of the personal exposures of identifiable employees;

b) at least five years in all other cases.

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3.3 Monitoring chemicals and exposure in the workplace

Interpretation and application of monitoring data

3.3.17 The risk of exposure should be assessed on the basis of the quantitative results obtained, supported and interpreted in the light of other information such as length of exposure, work procedures and patterns, measurements of ventilation performance and other particular circumstances of work during measurement.

3.3.18 If any measurement data exceeds the exposure limits, employers should inform and explain the workers and their representatives so that they understand the risk and the action to be taken to reduce this as part of the action program.

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3.4. Medical and health surveillance

3.4.1 Medical surveillance, particularly of workers engaged in handling of hazardous chemicals should include pre-assignment and periodical (annual) medical examinations.

3.4.2 Where applicable, medical examinations upon resumption of work after a prolonged absence for health reasons, and upon and after termination of work involving exposure to chemicals should also be considered.

3.4.3 The medical surveillance should be conducted by an approved medical practitioner and include simple techniques for the early detection of effect on health. These should also comprise examination and questioning about health complaints to be collected by the employer.

Module 3: Identifying and assessing chemical hazards and risks

3.4. Medical and health surveillance

3.4.4 This medical surveillance should be carried out for

a) the assessment of health of these workers in relation to risks caused by exposure to chemicals. For this refer to the information in the respective safety data sheets of the hazardous chemicals identified. For example, if the chemical in question may affect the respiratory tract, medical surveillance may include a check of the pulmonary function.

b) early diagnosis of work-related diseases and injuries caused by the exposure to hazardous chemicals

c) the assessment of the workers´ ability to wear and use required respiratory or other personal protective equipment.

3.4.5 In case of exposure of workers to specific hazards, medical and health surveillance should include, where appropriate, any examination and investigation which may be necessary to detect exposure levels and early biological effects and responses.

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3.4. Medical and health surveillance

3.4.6 Medical surveillance should be carried out when

a) it is required by the national law whenever workers are liable to be exposed to chemical hazards to health (see also Bangladesh Labor Rules, chapter 7); or

b) the factory is advised by an occupational health service that it is necessary as part of protection of workers exposed to chemicals hazardous to health. Special attention should be given to pregnant and breastfeeding women and other susceptible workers (see also Bangladesh Labour Rules 2015, chapter 4, para 37 (b) and (c)); or

c) atmospheric or biological monitoring of workplace air show that there could be effects on the health of a worker because of exposure to chemicals at work, and medical surveillance will assist early detection of ill effects.

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3.4. Medical and health surveillance

3.4.7 Medical surveillance should be done in case of possible exposure to the following types of chemicals:

a) Chemicals that have a recognised system toxicity

b) Chemicals that are known to cause chronic effects (e.g., occupational asthma)

c) Chemicals that are known to cause severe dermatitis

d) Chemicals that are known or suspected carcinogens

e) Chemicals that are known or suspected teratogens or mutagens, as science develops.

f) Other chemicals where there is a likelihood that the disease or effect may occur under particular conditions of the work activity

Module 3: Identifying and assessing chemical hazards and risks

3.4. Medical and health surveillance

3.4.8 The employer and relevant staff should refer to safety data sheet or other communication for identifying the relevant chemicals for medical surveillance and specifically mark these in the factory´s chemical inventory.

3.4.9 Apart of chemicals specifically listed in the national regulations, the employer should also apply medical surveillance to those chemicals which may be specifically listed as being hazardous to health, and communicated as such though international supply chain standards and requirements (i.e., manufacturer restricted substances lists).

3.4.10 The employer should communicate the list of such hazardous chemicals to the factory´s medical practitioner, together with relevant information (i.e., related health hazards) from the safety data sheets.

3.4.11 In case results of medical test or investigations reveal clinical or preclinical adverse effects, the employer should arrange for appropriate medical treatment.

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3.4. Medical and health surveillance

3.4.12 In case results of medical test or investigations reveal clinical or preclinical adverse effects, the employers should also take measures to improve the working conditions and environment with a view of preventing or reducing exposure of the workers concerned, including a reassessment of the risks and corresponding control measures of relevant hazardous chemicals.

3.4.13 The results of the medical examinations should be used determine the health status with respect to exposure to chemicals, and should not be used to discriminate against workers.

3.4.14 The results of the medical examinations and biological monitoring should be clearly explained to the workers concerned.

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