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TRAINING MATERIAL FOR ASSESSING THE RISK IN THE TEXTILE INDUSTRY



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M4-EN INTRODUCTION

This module aims at assessing employee safety and health in a typical workplace in Textile Industry. The module covers the following topics:

- Detailed analysis of hazards present in textile industries is given with safety measures to prevent the risk where this is possible
- Safety tips, requirements for personal protective equipment and recommended safety and health protection labels and signs are presented
- Risk assessment tool in textile industry with examples of good practice

This module is arranged in such a manner that it might be used by a tutor in class and for self-study by any person interested in Health and Safety in Textile Industry. The participants during lectures make themselves aware of the types of hazards that an employee may encounter and perform risk assessment in a specific job.

M4-EN.1 PRODUCTIVE PROCESS AND WORKING CONDITIONS

M4-EN.1.1 Cotton ginning (A´)

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Description of chapter

In this chapter, the individual departments of textile manufacturing unit are examined and individual risks per workplace are analyzed.

Aim of the chapter is to familiarize all the involved parties with the Occupational Health and the Safety in the sector of Textile Industry with their individual dangers at sub-sector.

M4-EN.1.1 Cotton ginning (A´)

The nature of productive process together with the age of mechanical equipment of most units, in combination with more general factors (e.g. seasonal and no well-educated personal) render ginning as the most dangerous activity in textile industry and with considerably higher risk than remainder ones.

One of the most important risk sources is the presence of various persons that does not constitute permanent personnel of the enterprise. In ginning houses that is the entrance of producers which arrive independently and massively to deliver the seed cotton. Contrary to the remainder sub-sectors (spinning, weaving) where few and concrete suppliers exist, in this case massive gathering of non-employee (and consequently not educated nor immediately controlled) individuals exist in the workplace.

One further problem derives from the particularity of the cotton ginning operation (3 or 4 months per year) concerning the same workers. The majority is non-specialised seasonal personnel that arrives and works for varied time interval depending on the needs and often not necessarily repeatedly for the same employer each year.

M4-EN.1.2 Cotton ginning (B´)

The time pressure of operation plants is severe and work schedule combined with the working conditions is in many cases over exaggerated. Of course, this pressure is still more increased in workers (maintenance personnel, electricians, etc) who also face the most severe risks.

The ginning work environment is considerably inferior in quality compared to the remainder sub-sectors. The levels of total cotton dust and noise are very high in all

stages of production. Moreover, in many of the installations (in older ginning houses) the peripheral walls from metal sheets are worn out resulting to exposure of many the workers to be in unfavourable weather conditions (temperature alternations, humidity) specifically during the last months of ginning period (winter).

Apart from health damage (professional total or partial hearing loss, byssinosis etc.) these unfavourable conditions also increase risks with regard to safety. High levels of noise decrease the capacity to notice dangerous moving equipment as well as the self-concentration and attention of worker.

These unfavourable conditions and lack of comfort can cause lack of attention in the workers or lead them to the adoption of arbitrary dangerous means for the prevention of these risks. It is recorded that the continuous monitoring is awkward particularly at the night shifts and due to the particularly time pressing conditions and complicated structure of workplace.

M4-EN.1.3 Cotton ginning (C')

Ginning sector is the only workplace in the textile industry, where the worker should work on occasion also in height because of the nature of equipment and productive process. This fact creates important risks for accident specifically in older ginning houses that do not ensure the essential means of protection for working in height.

Maintenance and repair are critical and particularly dangerous activities in ginning sector. Technicians are a “scarce resource” speciality during the ginning period, so they are in continuous alert and in many cases with exhaustive schedule.

This severe time pressure along with the 24 hours operation in many cases work against the adoption of essential measures of safety (complete immobilisation and detachment of equipment before touch, use of all essential means and measures to ensure visibility and accessibility - included the detachment of more elements, etc). On the contrary, in many cases intervention becomes hasty resulting to severe risks for the technician and for the operator afterwards.

Another risk source for the health and safety of workers is the continuous presence and movement of vehicles (Lorries, chargers, forklifts, etc.) in the workplace and often in closed spaces. Engine exhausts just add to the already problematic environment.

M4-EN.1.4 Cotton ginning (D')

In older ginning houses lack of sufficient lighting and the presence of obstacles and sensitive installations (system of suction) near vehicle pathways increase risks.

Many times this movement is unverifiable (absence of corridors of circulation is characteristic) and excessively fast, prompted from the time pressure during the ginning period, increasing considerably the risk of accident. This situation gets worse by the above-mentioned presence and handling of vehicles from individuals that do not constitute personnel (producers).

A critical point for the ginning operation is control room from where handling of production line is controlled. This room should be placed so that visibility to all other areas is naturally ensured (or alternatively with technical assistance, such as cameras and sensors). It should be insulated for noise and dust and it must ensure comfort for the operator that should have increased attention).

M4-EN.1.5 Cotton yarning (A')

The production process is completely automated, resulting in the reduction of workplace risks in combination with improvement of working conditions. The worker has mainly supervisory role, intervening only to correct. There are only few cases (e.g. not automated spinners) of continuous tasks from the worker (feeding). In modern spinning frames doffing (conjunction of utmost thread that is disrupted), which constituted the usual intervention of workers has also been automated.

With regard to the arrival of raw material, conditions are better than in ginning sector, since there are fewer suppliers and the phenomenon of presence of many uncontrolled visitors is not present. The presence of vehicles in the working place is usually limited in the openers section (blow room) and in the storage of finished product. Exhaust fumes from engines in combination with the mixing of dust is a remarkable factor but not as much as in ginning houses.

The most important problems in spinning sector concerns noise, cotton dust and cotton fibres, as well as weight lifting and handling and postures. Noise is observed in all stages of the production process and specifically in yarning because of the high speed of spindles.

M4-EN.1.6 Cotton yarning (B')

Cotton dust and the cotton fibres appear in a reverse order. The levels of dust are higher in the first stages of the production process (openers) where cotton is dirtier, whereas levels of pendulous fibres are increased in the last stages where the yarn has become thin and is moving with high speed.

Noise has been considerably limited in latest technology equipment. Great improvement is also been achieved concerning the emissions of cotton fibres in modern yarning equipment that usually includes means of suction (cleaners).

In older spinning equipment high emission of fibres in the spinners that are densely placed (roughly in a distance of 2m), creates a cloud, that apart from respiratory problems, decreases the concentration and attention of workers (reduction of visibility, hastiness) thus increasing the risk for an accident. Risks, for safety at the regular operation, mainly concern opener's movement and forklifts in the opening sector, in entanglements with overdraft moved and sharp elements (mainly in interventions for cleaning), in the transport of intermediary products specifically when it is manually handled, in wounds of fingers in spindles and in risk of accident from vehicles at the transport of ready product.

M4-EN.1.7 Cotton yarning (C')

The highest risk for an accident appears in maintenance. Even if regular operation is characterized by low risk, the access in the interior of machines during maintenance and repairs includes dangers because of the mobile and sharp parts that are revealed.

Essential measures should be taken, as the complete immobilisation and detachment from sources of energy or motion, reliance and means of ensuring control of free movement of mobile parts, means to achieve complete visibility and accessibility, etc).

The workers are usually full time employees and work environment is much better than in the ginning sector, which gives better opportunities for training of personnel

and acquisition of experience. Workers in spinning sector are characterized by more industrial culture contrary those working in ginning sector.

M4-EN.1.8 Yarning

It is a considerably more limited sector. Enterprises of this sector are smaller with limited accessibility to capitals and economies of scale that would allow modern equipment and measures for occupational health and safety. Work environment quality is lower than that in cotton yarning.

Workers are also in this case mainly full time employed, which allows training and acquisition of experience and industrial culture.

The levels of dust and fibres are much lower than those in cotton yarning because the nature of raw material. The noise is in higher levels mainly because of the technology of equipment.

Operation in spinning sector is also 24 hours. Risks during maintenance, repairs and cleaning are similar with those in cotton spinning (most parts are similar) and should be provided the above-mentioned precaution measures.

M4-EN.1.9 Weaving

Levels of dust cotton are decreased, since cotton already has also been cleaned. However, high concentration of dust appears in weavings with use of amylaceous fecula. The more important hazardous factors are noise and emissions of cotton fibres that are in high levels in the looms' sector.

The role of workers is also supervisory in the most important part (looms) but it involves higher intensity in the preparation (wrappers). The risk remains the same for equipment maintenance.

Employment is also in this case continuous, but the consequences of new flexible forms of work occur here as well.

M4-EN.2 Workplace Specifications in Textile Industry

M4-EN.2.1 Workplace ventilation

M4-EN.2.2 Floor, Walls, Ceilings, Roofs

M4-EN.2.3 Fall from height, dangerous zones

M4-EN.2.4 Docks and handling-loading platforms

M4-EN.2.5 Free space, suitable air volume

Chapter Description

In this chapter, the minimum specifications of a workplace are described according to the EU Directive 89/654. This chapter aims at the familiarization of those who are engaged in Occupational Health and Safety with the minimum specifications in a work place and especially in Textile Industry, resulting in better workplace arrangements.

M4-EN.2.1 Workplace Ventilation

Air quality should be secured in the base of hygiene (M4.02.01 and M4.02.02). In case that air renewal is being achieved through mechanical way (air-ducts), they should work continuously, being kept in well situation (M4.02.03) and every problem must be directly observable.

Employees must avoid air streams produced by the ventilation system (M4.02.04 and M4.02.05) and should make sure that that improper air can be extracted from low height to a safe place in the open air away from people, sources of ignition and nearby buildings and equipment.

Exposure to fumes involves health risks for the employees especially fumes from engine exhausts (forklifts, compressors), cotton dust and cotton fibres must be immediately limited.

M4-EN.2.2 Floor, Walls, Ceilings, Roofs

Floors should be stable, without dangerous slopes and adequately resistant (M4.02.06). They should also have a drain and should also have adequate vibration absorbing capacity.

The covers of any sort of floor openings should be safely established. If they are temporarily removed, proper labelling should be placed, to prevent slips and trips of employees. Any disorders (e.g. broken drains) in the floor must be immediately repaired (M4.02.7).

Walls' surface must be easily cleaned. Any glass walls should be indicated and labelled clearly and be made of safe materials especially when lying above work posts. Ceilings must be easy for cleaning and maintenance (M4.02.08 and M4.02.09).

Roofs must be easy accessed. Suspension of weights from ceiling should only take place after an expert's permission (M4.02.10).

M4-EN.2.3 Falls from height, dangerous zones

Working surfaces, corridors, loading bays, platforms and any other level placed above 0.75 metres (especially in ginning houses where this is more frequent) should have a protective screen of 1.00 m. at least, either of compact structure or a fence with handrail, baseboard of 0.15 m. and a middle horizontal bar (M4.02.11). Where there is case of fall, protective measures should be taken. Dangerous zones have to be identified (M4.02.12).

M4-EN.2.4 Docks and handling-loading platforms

Docks and loading platforms should be of proper size with a minimum width of 0.80 m. If is possible they should also have a rain screen and at least one exit along their frontage (if their length is above 20 metres two exits, one for each side). These exits should be stable. In certain cases where the level of the dock is higher than 0.75 metres, there should be a protective arrangement (though not a compact wall or fence). This kind of arrangements (portable fences) should be placed also near loading platforms in such way that would serve the easy handling of bulks. They may be convertible and easily basifugal.

M4-EN.2.5 Free space, suitable air volume

All workplaces should have adequate surface, size, height and air volume that will permit employees to do their job without danger. The size of the workplace should fill all requirements. They should provide safety both for normal everyday tasks, maintenance, fixing or installation of equipment. In all cases, the size of the workplace must allow employees to move through bulky equipment or materials.

M4-EN.3 HEALTH AND SAFETY SIGNALLING

M4-EN.3.1 Labelling – General introduction

M4-EN.3.2 Signs' characteristics

M4-EN.3.3 Prohibition, warning and mandatory signs

M4-EN.3.4 Temporary signalling- Acoustic and lighting signals

Chapter Description

In this chapter, the minimum signs in a workplace are described according to the EU Directive 92/58. This chapter aims at the familiarization of those who are engaged in Occupational Health and Safety with the signs used in a workplace and especially in Textile Industry, resulting in health and safety of the employees.

M4-EN.3.1 Labelling – General introduction

Signs are something more than just necessary because signs inform for the potential dangers that can appear in the workplace. All kinds of signs- prohibition, warning and mandatory- are compulsory to be placed according to certain legislation. These involve the use of acoustic and lighting signs, gesticulation signs, announcements and chemical substances labelling. Inextricable part of health and safety signalling is also fire safety and warning signs together with marking for dangerous location.

M4-EN.3.2 Signs characteristics

Signs characteristics are:

- simple for easy understanding
- proof and hardy
- colours and size must be appropriate to the workplace size

Use of signs:

- Must be placed in a proper height, so that can be seen from any point in the workplace
- Colours must be bright and if daylight is inadequate, artificial light should be used
- Signs must be taken off when the certain risk is no longer present
- A poster with all the signs and their explanation should exist, preferably in areas where employees are gathered for breaks

M4-EN.3.3 Prohibition, warning and mandatory signs

Prohibition signs characteristics:

- They prohibit employees of doing a specific work
- They are round-shaped, with a black symbol on white background with a red contour which should cover the minimum of 35% of sign surface
- They should have a red erasure line with 45 degrees inclination

(M4.03.01, M4.03.02, M4.03.03, M4.03.04, M4.03.05, M4.03.06, M4.03.07, M4.03.08)

Warning signs characteristics:

- They warn of a specific danger
- They are triangle-shaped with a black symbol on yellow background with black contour which should cover the minimum of 50% of sign surface

(M4.03.09, M4.03.10, M4.03.11, M4.03.12, M4.03.13, M4.03.14, M4.03.15, M4.03.16, M4.03.17, M4.03.18, M4.03.19, M4.03.20, M4.03.21, M4.03.22, M4.03.23, M4.03.24, M4.03.25, M4.03.26)

Mandatory signs characteristics:

- They indicate a specific action
- They are round-shaped with a white symbol on blue background, which should cover the minimum of 50% of sign surface.

(M4.03.27, M4.03.28, M4.03.29, M4.03.30, M4.03.31, M4.03.32, M3.03.33, M4.03.34, M4.03.35, M4.03.36, M4.03.37)

M4-EN.3.4 Temporary signalling- Acoustic and lighting signals

Temporary signalling should be used when:

- There is an emergency
- It is necessary to call someone for a specific action
- To evacuate in case of emergency
- To guide someone to do some conduct

Acoustic signal characteristics:

- The sound level should be higher than the background and different than the other sounds of the workplace
- The sound should be easily recognized
- The sound should have unsteady frequency
- Combined use of two different signals should be avoided
- The electric current should be continuous and in case of blackout there should be another energy source.
- Signal sources should be carefully installed and maintained

Lighting signals characteristics:

- There should be appropriate contrast to avoid eye problems
- One colour must be used (usually orange and red are preferable)
- Signal should be intermittent to spot danger
- Signal should be easy recognized

- The electric current should be continuous and in case of blackout there should be another energy source
- Signal sources should be carefully installed and maintained

Acoustic and lighting signals in Textile Industry are used specifically in:

- Cotton ginning press so that employees evacuate the area before rotation of the press frame
- Looms to indicate the potential error that has occurred
- Forklifts wherever they are used
- All other machinery that has no dedicated operator

M4-EN.4 ELECTRICAL HAZARDS

M4-EN.4.1 Electrocutation

M4-EN.4.2 The spectrum of electrical accidents in textile industry

M4-EN.4.3 The effects of electric current on human body

M4-EN.4.4 First aid in case of electrocutation

M4-EN.4.5 Safety in electrical installations

Description of chapter

The specific chapter deals with issues concerning the potential electrical hazard at textile industry workplaces, particularly focusing on electrocutation accidents, the means of preventing electrical hazard, the impact of electric current flowing through human body, first aid measures and general safety guidelines.

M4-EN.4.1 Electrocutation

Electrocutation happens when electric current flows through human body while the latter becomes part of an electrical circuit, which has a voltage capable of overcoming the body's (electrical) resistance. The most crucial factor regarding injury is the quantity of electric current passing through human body.

An electrical accident usually occurs because of a direct (or indirect) contact with a bare wire or another live part of a circuit. On the other hand, in some cases, the approach of human body, especially when holding a conductive object, near a strong electromagnetic field may prove evenly dangerous.

M4-EN.4.2 Range of electrical accidents in Textile Industries

Electrical accidents in textile industries may be classified into three categories:

- Electrical accidents caused by the direct effects of electric current on human body. These accidents include contact with:
 - plugs or sockets connected to eclectic hand tools such as drills, angle grinders, or other supplementary appliances like refrigerators, water boilers etc
 - cables damaged by overheating due to overload, by exposure to harsh weather conditions (high temperatures, moisture), especially in outdoors installations, cables run over by vehicles on passageways, or even damaged by various rodents (rats, etc)
 - Battery poles found on eclectic vehicles such as fork lift trucks, loading vehicles, etc
 - Step down transformers found in power substations. This is the case of industrial installations supplied directly with high voltage from the grid
 - Metal body of machinery like presses, cutting machines and generally all metallic surfaces which are not properly earthed
 - Any machine due to a fault during maintenance procedure

- Indirect contact and skin burns caused by high thermal load originating from an eclectic arc. These accidents are prone to happen in larger industrial plants or some specific small workshops, mostly in the vicinity of power substations, usually accessed by qualified personnel only
- Minor accidents usually caused by weak (low voltage) currents, which may result for example in slipping or falling due to a panic reaction. This sort of accidents may happen during the replacement of light bulbs, or during various repairs performed in height, such as maintenance of air conditioning units, or fume extractors

M4-EN.4.3 Effects of electric current on human body.

It is worth mentioning that the effects of electric current are a function of its intensity (measured in Amperes – A). Currents on the order of 0,9 to 1,2 mA are hardly perceptible. At higher intensities like 10 - 15 mA women can no longer release the live object, thus appearing the “grabbing effect”.

At values as high as 20 to 45 mA, muscles begin to cringe violently and painfully. If this contracture reaches the thoracic muscles, respiration is suppressed, a fact that may lead to death from asphyxiation. In the latter case, the only feasible means of recovery is performing C.P.R. (artificial respiration) to the victim. Current values higher than 200mA = 0,2A usually cause instant death.

M4-EN.4.4 First aid in case of electrocution

- Move the victim away from the live part of the circuit by means of immediate power cut off, if this does not cause any severe problems (such as a total blackout, or interruption of operation of crucial equipment)
- Avoid any contact whatsoever with the victim using bare hands. In order to move the victim, always use insulating objects
- Never use pipes, gads or any other metal objects, commonly found at metal processing industries. Seek immediate medical attention
- In case the victim does not breath, perform C.P.R and chest compressions

M4-EN.4.5 Safety in electrical installations

In order to work safely in textile plants, the following guidelines should be implemented:

- The equipment maintenance should be always conducted by a licensed electrician, especially when heavy electrical load machinery, (heating and metal fusion kilns) is involved
- Where possible reduce operating voltage at 42V, particularly when working inside moist areas, as well as close to cooling water tanks
- Use isolation transformers (transform ratio 1:1), when working outdoors
- Always use well insulated hand tools
- All machinery having metal covers should be properly earthed

- Separation of electric circuits and use of multiple differential circuit breakers (one per circuit) for the effective protection of working personnel
- Switch off power and place appropriate signs and labels before any maintenance work is performed

M4-EN.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

M4-EN.5.1 Definition of PPE

M4-EN.5.2 Personal Protective Equipment

M4-EN.5.3 Face and Eyes

M4-EN.5.4 Ears

M4-EN.5.5 Respiratory protection

M4-EN.5.6 Body

M4-EN.5.7 Arms and hands

M4-EN.5.8 Legs and feet

Chapter Description M4-EN.5

In this chapter, Personal Protective Equipment is described. This chapter aims at the familiarization of those who are engaged in Occupational Health and Safety with the PPEs used in a workplace and especially in textile industry, resulting in health and safety of the employees.

M4-EN.5.1 Definition of PPE

Every workplace has its own dangers for the health and safety of employees. Those dangers can be found in many points like sharp surfaces, falls, chemical substances, noise etc. The best way for the employees to be protected is to minimize the danger at the source. When this is impossible because of technical or economic problems then the employer should supply his employees with Personal Protective Equipment.

Personal Protective Equipment: Every apparatus that a person should wear or bring to be protected from any danger that threatens his health and safety.

The Personal Protective Equipment includes apparatus, which protect employees from injuries or accidents and minimize the risk of exposure to chemical substances. The PPEs are made to protect:

- The eyes
- Hearing
- The face
- The respiratory system
- The head
- The legs and feet
- The arms and hands
- The whole body

M4-EN.5.2 Personal Protective Equipment

There are many PPEs to mention for instance like, goggle, respirators, helmets, safety shoes, safety gloves, working clothes. The PPEs should fit the special characteristics

of the user. The majority of those PPEs are capable at many sizes so the employee can choose the right for him. Moreover, it is important to take into consideration the compatibility of the different PPEs.

In a Textile Industry, there are many dangers that oblige employer to buy some PPEs for the employees.

M3-EN.4.3 Face and Eyes

Some potential dangers in a textile industry that can cause severe damage to employee's eyes and face are the existence of pendulous particles- particularly cotton fibres at cotton grabbing and yarning. The selected form of eye protection at a workplace must be appropriate to the work being performed and properly fits each worker exposed to the hazard. Employees wearing corrective lenses or contact lenses are not being protected from eye hazards. Therefore, they must use eye protective equipment that incorporates with the prescribed lenses they use. It is important to make sure that the protective eyewear does not disturb the proper positioning of the prescription lenses, and that the employee's vision will not be inhibited or limited.

M4-EN.5.4 Ears

Where noise levels exceed the standards, ear protection must be provided and used. A variety of effective hearing protection exists, so that employers can choose the proper hearing protective equipment. With all these, moving parts at textile industry's machines there is a lot of noise. While noise reduction can be achieved when oiling these moving parts, however it is essential for employees to have and use their personal protective equipment for noise. The choices are:

- Earmuffs, which completely cover the ear
- Earplugs, which are inserted in the ear canal
- Semi-inserts (called 'canal caps'), which cover the entrance to the ear canal

M4-EN.5.5 Respiratory protection

In the textile industry, there is a high concentration of cotton fibres. Therefore, the use of respiratory protection is essential. Respirators protect the user in two main ways. The first is by the removal of contaminants from the air. Respirators of this type include particulate respirators, which filter out airborne particles; and "gas masks" which filter out chemicals and gases. Some other respirators protect by the supply of clean and Respirable air from another source. Respirators that fall into this category include airline respirators, which use compressed air from a remote source; and self-contained breathing apparatus (SCBA), which include their own air supply. Respirators should only be used as a last protective measure when engineering control systems are not sufficient. Engineering control systems, such as adequate ventilation or scrubbing of contaminants should be used to negate the need for respirators.

In some cases like fire there should be respiratory apparatus to help employees to escape the danger and the smoke.

M4-EN.5.6 Body

Personal protective clothing equipment, should be safely designed and constructed, and should be maintained in a clean and reliable fashion. Employees in textile industry may meet a variety of threats for their body and skin. Examples of body protection include laboratory coats, coveralls, vests, jackets, aprons, surgical gowns and full body suits. The protection should be in the form of a single overall that can provide a gas-tight unit. Boots worn must also be sealed to the overall.

M4-EN.5.7 Arms and hands

If a textile industry hazard assessment shows that employees face potential injury to hands and arms that cannot be eliminated through engineering and work practice controls, employers must ensure that employees wear appropriate protection. Potential hazards include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures and amputations. Protective equipment includes gloves, finger guards and arm coverings or elbow-length gloves.

A variety of gloves exists for the protection against several hazards. The way gloves will be selected, depends on the type of the hazard and the operation involved.

Gloves:

- Against physical impacts
- Against chemical impacts
- For electrical dangers
- For protection from heat

M4-EN.5.8 Legs and feet

When employees might face possible foot or leg injury, then protective footwear should be used. Injuries might occur as a result from falling or rolling objects, or from crushing or penetrating materials.

Some examples of situations in which an employee should wear foot and/or leg protection are among others:

- When heavy objects (barrels or tools) might roll onto or fall on the employee's feet
- Working on or around hot, wet or slippery surfaces
- Working when electrical hazards are present

There are also “special purpose shoes”; such as electrically conductive shoes that provide protection against the build-up of static electricity; and foundry shoes that keep the isolate the feet from the extreme heat of molten metal, and keep hot metal from lodging in shoe eyelets, tongues or other shoe parts. As with all protective equipment, safety footwear should be inspected prior to each use.

M4-EN.6 FIRE SAFETY

M4-EN.6.1 Particularities of cotton

Description of Chapter M4-EN.6

In this chapter titled “Fire safety in the Textile Industry” the particularities of cotton in the event of fire are developed.

Aim of this chapter is to familiarize all the involved parties with the Occupational Health and Safety in the sector of the Textile Industry, with this particular material (cotton) and the way it ignites.

M4-EN.6.1 Particularities of cotton

Cotton, depending on its cleanliness, has a point of ignition about 200° C. Apart from cleanliness it also depends on humidity and pressure of cotton.

Humidity also influences the temperature of cotton itself. Particularly, cotton with high levels of humidity easily develops a high temperature (“burns”). Humidity and potential resistances (friction) that cotton finds at its route in the air-ducts are the main reasons for temperature rise.

Therefore, the operation of the system of cleaning - drying is critical for fire safety. The first drier depending on the humidity of cotton, operates between 70° C and 130° C (usually 100° C), whereas the second drier usually operates in lower temperature for the improvement of the initial regulation of humidity (70° C - 80° C).

If the initial seed cotton has much a higher humidity and driers need to operate in very high temperatures, then there is a severe risk for ignition of cotton without even the existence of a spark.

Due to the characteristics of cotton, it is likely that the flame does not extend immediately in the ducts but it remains enclosed and non-detectable in some places of the ball of final packing. The result will be a direct ignition when the parcel will be decompressed in spinning frames. Therefore, particular attention should be paid in the initial humidity of cotton and the limits of humidity reduction for each unit should be known.

M4-EN.7 NOISE

M4-EN.7.1 Hearing problems and noise existence in the Textile Industry

M4-EN.7.2 Levels of noise in a textile-manufacturing unit

Description of Chapter

In this chapter, the indicative levels of noise in a textile-manufacturing unit are presented.

Aim of chapter is to familiarize all the involved parties with the Occupational health and Safety in the sector of Textile Industry with noise and to propose measures and methods of prevention.

M4-EN.7.1 Hearing problems and noise existence in the Textile Industry

- Hearing problems are caused by the high levels of noise (above limit values) that are observed in almost all stages of the production process
- High levels of noise remain also in the modern units in textile industry
- The consequences depend mainly on the use of personal protective equipment
- It is remarkable that workers in maintenance have been observed having higher frequency of acoustic lesion, obviously related with their working conditions, as well as with improper use of individual personal hearing protective equipment
- For workers in spinning sector it should be taken into account that intense mobility is observed, consequently most of them have only few years of employment, question that probably is related with the phenomenon of healthy worker. The same seems to be in effect with regard to the hearing problems, but the results are not comparable. The percentages appear to be resembling, with regard to elements for professional loss of hearing compared to older studies
- The confrontation of noise is particularly practically difficult and so noise can also be found in modern units too
- In most stages of production the use of personal protective equipment is essential for the confrontation of noise consequences

M4-EN.7.2 Levels of noise

Following, mean levels of noise are presented from a relative study of Hellenic Institute for Occupational Health and Safety in a sample of Textile Manufacturing units in Greece. These values should be considered as indicative.

Productive process	Equipment-Process	Noise Levels in dB (A)
Cotton grinning	Seed cotton feeding	91,47
	Seed cotton warehouse	82,30
	Dispenser	86,67
	Separator-feeder	95,74
	Burner-blower	98,13
	Drier	94,72
	Inclined cleaner	95,23
	Lint cleaner	96,28

	Press	92,50
Cotton yarning	Openers	82,79
	Cleaners	85,80
	Cards	85,30
	Drawers	85,69
	Combing preparation	86,40
	Combers	88,63
	Roving frames	88,34
	Spinning frames	92,79
	Winding frames	91,73
Wool yarning	Openers	83,10
	Cards	90,00
	Spinning frames	86,50
	Winding frames	89,10
Weaving	Warping frames	82,73
	Lustring	77,70
	Looms with new type arrow	98,20
	Looms with old type arrow	94,30
	Air jet looms	102,90

M4-EN.8 SAFE USE OF EQUIPMENT

M4-EN.8.1 Cotton ginning-Seed cotton feeding

M4-EN.8.2 Cotton ginning-Dispenser

M4-EN.8.3 Cotton ginning-Separator, Feeder, Drier, Inclined cleaner

M4-EN.8.4 Cotton ginning-Ginning machine

M4-EN.8.5 Cotton ginning-Air jet cleaner, Lint cleaner, Concender

M4-EN.8.6 Cotton ginning-Press

M4-EN.8.7 Cotton ginning-Bagging and Yarning-Openers, Cleaners-Mixed blenders

M4-EN.8.8 Yarning-Cards

M4-EN.8.9 Yarning-Drawers, Combing preparation, Combers, Roving frames, Spinning frames

M4-EN.8.10 Spinning-Winding frames and Weaving-Warping frames, Lustring

M4-EN.8.11 Weaving-Looms

Description of Chapter

In this chapter, all departments of textile manufacturing unit are developed together with practices of safe use. Finally, general directives of maintenance of mechanical equipment are presented.

Aim of the chapter is to familiarize all the involved parts with the Occupational Health and Safety in Textile Industry with the safe use of mechanical equipment.

M4-EN.8.1 Cotton ginning-Seed cotton feeding

In seed cotton feeding, intervention and the handling of suction hopper is particularly dangerous. Approaching can cause entrapment and serious injury. Suction is particularly powerful (there have been observed phenomena of suction of particularly heavy and bulky objects from the lorry) (M4.08.01).

Seed cotton feeding takes place in height, which requires experienced operators (quite difficult for seasonal workers) and all protective measures, as railings, non-slip floor, interruption buttons in frequently placed and PPE. While in most ginning houses the use of telescopic hoses takes place on the lorry, the existence of collective protective measures cannot be ensured and for this reason, the strict use of PPE together with training and supervision is very important.

In order to reduce exposure to risk, this work post should not be covered for eight hours' shift from the same worker but through job rotation.

M4-EN.8.2 Cotton ginning-Dispenser

It is not manned equipment and presence of workers is casual. In any case the speed of movement conveyor is particularly slow and it does not encompass particular risk for personnel, who can only seldom be found in this stage. Rolls of rolling conveyor should be covered and systems of direct interruption of operation should exist. Due to the bulky size of this machine a continuous wire system is proposed so that it is

accessible from workers that can be trapped anywhere (the absence of workers renders necessarily the possibility of interruption by the victim) (M4.08.02).

There should also be provisions for restriction of entry of persons in the conveyor machine. It is noticed that even with the conveyor's low speed there is still a risk that workers may fall in it, losing their senses. Something like that is difficult to be noticed, since the only regularly present worker in the warehouse is the operator of the derrick, who due to the nature of his work, it is difficult to notice it. This system is closed and not involving particular dangers during operation. The most important risks for safety occur during maintenance, since it includes sharp parts with non-negligible weight (gear wheels) that should relatively frequently be cleaned.

M4-EN.8.3 Cotton ginning-Separator, Feeder, Drier, Inclined cleaner

Separator, Feeder

Although the presence of an operator at this stage is not required, maintenance occurs in height and therefore suitable protective measures should be taken. Placement and maintenance of protective railings in good condition is required for prevention of falls of workers or objects falling on the workers.

It is a closed system from where cotton goes through without the direct intervention of worker. The risks during operation are limited but they are increased considerably at the maintenance process. (M4.08.03)

Drier

Risks during operation here are also limited, since human presence is particularly infrequent even for monitoring. The most important risks in this case occur during maintenance too. (M4.08.04)

Inclined cleaner

Inclined cleaner is placed in height. Since human presence is not necessary during operation, maintenance involves many risks due to height and density of parts that reduces accessibility and visibility. (M4.08.05)

M4-EN.8.4 Cotton ginning-Ginning machine

Ginning machine is one of few machines that require frequent presence of worker during operation. The worker optically checks proper feeding and smooth flow of cottonseed. Moreover, worker generally checks the smooth operation of machine. (M4.08.06)

Risks mainly concern entrapment and compression of upper lumps between moving rolls if the hand of worker that controls feeding enters deep where likely overdraft ginning rolls exist. New type machines usually have a system of detection with photocell in this point, or automatic mechanism of braking in case of entanglement of a big object (human limb compared to cotton) to stop the machine. Moreover, an automatic system of interruption of feeding should also exist in case that ginning rolls stopped.

Risks can be also be caused in cases that interlock systems that do not allow the operation of machine with open access in moved parts do not exist or have been

neutralized. In this case workers are exposed in moving parts and probably dangerous electric junctions and parts, particular in the event of careless movement or slipping towards the machine.

Ginning machines should allocate permanent bumpers that would deter the contact with the ginning saws while they are in moving. Blades of saws in the booth are considered sufficiently removed if they stand out from the ginning bars when the parapet is out of its place. Moving saws (in cleaners of fibres that have doors of access in the saws) should be covered with constant bumpers or proportional provision that would prohibit direct contact of hands or fingers with the saws when they are moving.

While ginning machines require continuous human presence, in most modern ginning houses there is a control room that allows sound insulation of operator most of the time of work, which decreases noise exposure, as well as the exposure in dust and fibres of cotton.

M4-EN.8.5 Cotton ginning-Air jet cleaner, Lint cleaner, Condenser

Air jet cleaner

Risks during operation are limited since presence of worker during operation is not required. The main risks concern the entry of hand deeply so that it reaches in the conveyor. It has been observed that in certain types of machines the conveyor is relatively accessible. Therefore, provision is proposed that would prohibit the contact with the conveyor in any case. (M4.08.07)

Lint cleaner

Neither in this instrument continuous presence of worker during operation is required. In any case, however constant barriers and interlock systems should be placed so that they stop operation when door is opened. (M4.08.08)

Condenser

Workers' presence is not required. Risks appear only in during maintenance. (M4.08.09)

M4-EN.8.6 Cotton ginning-Press

The most important risks during press operation are the following:

- conflict with the piston or the surface of compression
- entrapment between wires and piston
- entanglement with wires and tying system

(M4.08.10)

Press requires the workers' presence and in particular continuous presence for three workers at least, who should also execute manual work. Concretely at minimal two of the workers should pass the wires that withhold the cotton ball before each ball. Their placement is a strainful and repetitive work. It involves the risk of worker being struck from the bent bars if they are not well supported, to slip in bars that are left in the floor or to cause accident due to bad co-ordination (two workers place

simultaneously the wires). The process is particularly strainful for the musculoskeletal system, since workers are usually forced to place the wires with time pressure and bending.

A particularly dangerous process for release of stressed wire to the worker is the moment at which the piston of press releases the parcel, which is left to be retained from the wires. If they are not well tied up the pressure can immediately release some wire violently to the worker. For this reason, the minimum distance of worker from the ball should be ensured. A provision of automatic locking should be placed in all ball-making machines so that they cannot open the doors for access while the piston is in use. The plates in the top of exporters should be closed and possibly equipped with a latch.

Another risk concerns the rotation of the press, particularly when the rotating apartment is not built completely under the floor. An automatic system should be placed that would not allow the rotation while worker is in the dangerous area, which should also be properly signalled. Additional sonic and luminous signalling should exist before rotation, while noise in whole plant is in particularly high levels. The operator of press should find himself always in place, at least during rotation. Another risk is the possibility of operation of the piston of the press while workers have not been yet removed. Therefore, special provisions like the one that is portrayed in the following picture (detector of weight) should exist so that no rotation or operation of press can take place while there is a worker in this point.

In some ginning houses the process of removal of a ball from the press becomes with pistons that prompts straight the ball on the conveyor, while in others this occurs manually. The manual handling includes risks of musculoskeletal disorders, while the dangers of possible worker blow in metal part of press from the release of mechanic energy (momentum) with the falling of the ball. [\(M4.08.11\)](#)

M4-EN.8.7 Cotton grinning-Bagging and Yarning-Openers, Cleaners-Mixed blenders

Cotton grinning-Bagging

It is another process with continuous presence of a worker. Proper systems (e.g. strings in the sides) should be placed to stop immediately the carriers in the event that somebody is trapped. Proportional provisions should also exist for pushers. Maintenance does not involve particular problems because of the simplicity that allows good visibility and accessibility. [\(M4.08.12\)](#)

Yarning-Openers

Automatic opener is usually used in new types of spinning machines. It scans a distance of few metres with particularly low speed, which decreases considerably the potential of entrapment or suddenness of worker during operation, since human presence is limited. [\(M4.08.13\)](#) Danger concerns entrapment in the gear wheels of opener assisted by the suction in this region) resulting to compression or injury. Frequent feeding of deposition line does not allow placing a constant barrier that would cover all its length. Therefore, any preventive measures should be limited in the area around the opener. A system of approach detection in safe distance (e.g. a photocell parametrically covering area of movement), which in the event of detection

stops immediately movement and suction. Alternatively, constant barriers can be placed that would follow openers' movement. (M4.08.14)

Cleaners-mixed blenders

They are closed arrangements where entry and exit can take place via a closed system of ventilators. Dangers concern in the maintenance process. (M4.08.15, M4.08.16, M4.08.17, M4.08.18)

M4-EN.8.8 Yarning-Cards

The nature of human work in cards is supervisory and corrective. The dangers during operation are relatively limited and they mainly concern the report in overdraft moved parts, which however are moving relatively slowly, as well as the danger of involuntary approach of human member in the particularly dangerous moving parts of the needles belt and the rolls. Therefore, constant barriers and systems of interruption of operation when a human limb enters should be placed in dangerous areas. (M4.08.19)

Another stage that includes important dangers during regular operation is the process of change of bucket, specifically when it happens manually. These dangers involve entrapment and compression in moving parts which are under approach. When the change of bucket happens manually it should be ensured that the external moving parts are covered with a constant barrier or with a system of detection of approach of human limb and an interruption button exists in a place that can be easily reached by the operator. It should also be ensured that there is enough space that allows the worker to move the buckets safely so that the probability to be entangled between buckets or a bucket and machine is decreased. Constant barriers that will not allow the worker to approach in the mechanism of buckets change when this is in use should be placed. Additionally systems that interrupt operation in case of entry of a worker's limb should exist.

M4-EN.8.9 Yarning-Drawers, Combing preparation, Combers, Roving frames, Spinning frames

Drawers

Main danger during operation is the entanglement and compression of fingers mainly during cleaning, but also during operation from involuntary approach. Placement of transparent self secured cover that would not allow the operation when it is open is proposed. Important dangers also exist during the maintenance. (M4.08.20)

Combing preparation

The dangers in combing preparation machines are proportional to those of drawers, while in combing preparation, apart from fuse feeding, the remainder process is closed. The role of operator is clearly supervisory and mainly concerns the change of bucket of catering and the reunification of cut fuse. (M4.08.21)

Combers

The dangers during operation concern mainly the entanglement, entrapment and compression of upper limbs of workers in the overdraft rolls of comber. Therefore it

is proposed to place constant barriers and where this is not possible systems with photocell that would detect any possible approach of human limbs. A dangerous work that could lead to approach of human limbs to the moving parts is the initial passage and cleaning from fibres and dirt that are gathered in the rolls. The most important dangers however, concerns maintenance. [\(M4.08.22\)](#)

Roving frames

Dangers are also limited in this case and the role of worker is supervisory. They are in effect the same with those of the combing preparation machine, except transport in the next stage, which is usually automatically conducted. [\(M4.08.23\)](#)

Spinning frames

Human intervention of operator concerns interventions in the stopped spindles and heads, cleaning, etc. The most important danger concerns entrapment and finger's injuries and slipping and fall in the sharp and rotating parts because of the limitations in space and lack of comfort because of noise and clouds of pendulous cotton fibres.

M4-EN.8.10 Spinning-Winding frames and Weaving-Warping frames, Lustring

Winding frames

The dangers from the use of winding frames are limited. Moving arms can injure fingers that will approach near to the point of reconnection, even if this case of approach is considered rare. There is always the risk of a potential slip and fall of the worker in this area. Another problem for winding frames is the limited space that increases the concentration of hazardous factors and the probability of slipping. Complete exploitation of available space and provisions for safe vertical crossing in winding frames should be achieved. [\(M4.08.24\)](#)

Warping frames

Main danger concerns intervention before the moving parts are immobilised completely. It is proposed to place constant (where possible) barriers or provisions of detection of approach of limb that would automatically stop the operation, at least in the roll where this is feasible. In the most modern warping frames, the machine closes automatically from all sides before it begins, as it is portrayed in the pictures. The most important dangers concern maintenance. [\(M4.08.25\)](#)

Lusting

Operator's presence is not required. Dangers during operation concern the placement and removal of warp rolls before and after lusting, which should be as possibly mechanized and the operator should continuously have absolute control of the process and to be possible for him to interrupt it safely. The most important dangers concern maintenance. [\(M4.08.26\)](#)

M4-EN.8.11 Weaving - Looms

Irrespectively of the type of loom, dangers are almost the same. In the modern looms, continuous presence of operator is not necessary. On the contrary, lamps of different colour exist that call operator to intervene. [\(M4.08.27\)](#)

The interventions concern mainly disengagements, cleanings and small corrective tasks. Danger for entanglement and fingers compression exists in rotating or sharp part. This danger is increased by the lack of visibility and balance in certain cases, which also increases the danger of fall.

In any case what should exist is a system that would not allow the movement when worker approaches a dangerous point and slow movement to be imposed until they are found in a safe distance. This can be achieved with time delaying or with requirement of a second activation of system in order to reach complete power.

The first solution is proposed, because with workers get used to the solution of double activation, so that it loses its effectiveness. The situation from musculoskeletal point of view is awkward (long standing) and the placement of special seats and the reception of organisational measures (breaks) are proposed.

M4-EN.9 PENDULOUS PARTICLES

M4-EN.9.1 Main health problems- Respiratory problems

M4-EN.9.2 Respiratory problems (continuous)

M4-EN.9.3 Prevention metres

M4-EN.9.4 Levels of pendulous particles

Description of Chapter

In this chapter, an extensive presentation of prevention metres that should be taken in their individual sectors of textile manufacturing unit is shown and the measurements are presented in a formal manufacturing unit of Textile.

Aim of the chapter is to familiarize all the involved parties with the Occupational Health and the Safety in the sector of Textile Industry with the prevention metres of high concentrations of pendulous particles in the specific sectors.

M4-EN.9.1 Main health problems- Respiratory problems

Respiratory problems that concern workers in the sector of textile are due to two main factors:

- Cotton dust: it is consisted of particles of cotton or wool dirt that suspended during its treatment. Often it contains dangerous substances from pesticides. This dust contains a mix of many substances, as soil, fibres, bacteria, mushrooms, germicides, materials not related with the cotton, etc
- Cotton fibres: it is consisted of thin cotton fibres that suspended in the atmosphere, especially in spinning and weaving sectors

These two factors are presented reversely in the productive process:

- Dust is found in high levels in the initial stages where the cotton (wool) is impure and it is decreased within progressive cleaning
- Cotton fibres are found in low levels in the beginning and are increased in the advanced stages while the processing product slims

In previous years cotton dust constituted the main reason of byssinosis in this sector, which was its most characteristic illness. The first symptoms of illness are difficulty in breathing and perhaps a constriction in the chest, which becomes particularly stronger at the first day of return in the work after absence of few days. The workers can also have cough with faints. While in the initial stages of illness difficulties in the breathing are reversible, the damage in the advanced stages of illness is permanent.

The exposure in cotton dust can also result to increased probabilities of chronic bronchitis or emphysema. In modern textile units the levels of pendulous particles have been decreased considerably under the value limits.

M4-EN.9.2 Respiratory problems (continuous)

No specific symptoms of respiratory system, as alleviation of respiratory operation and decreased sensitivity of ventilators, constitute precocious responses of the respiratory system in the effect of dust. Contrary to asthma, that as long as the

exposure in the irritant factors is repeated symptoms are worsened, in the byssinosis as long as the patient is exposed in allergenic, so much faster the symptoms are disappeared.

The frequency of byssinosis, chronic bronchitis and respiratory dysfunction in cotton grinning workers oscillated from 15% until 50%, depending on the quality of raw material, the concentration of dust and smoking. In inferior percentages, yarning workers were presented and their percentage depends on the distance they worked from cotton grinning unit, the ventilation of space but also from the remaining factors (smoking, dust etc).

Byssinosis, is an illness without known diagnostic criteria, it allocates only characteristic symptoms. It does not have pathological characteristic points, no characteristic radiological discoveries, but also no pathogenic discoveries that they would certify or reject the diagnosis.

The prevention is achieved with the reduction of concentration at Gram (-) negative microbial executives of dust in workplaces. In order to do this measures are taken in cotton cultivation and in its processing. Values that concern male workers are generally higher comparing with those of female workers due to the habit of smoking (despite the age-related differences, which are not statistically important).

For male workers, between smokers and not smokers, values that concern the latter are higher comparatively with those of the smokers.

M4-EN.9.3 Prevention metres

- The employer's program of dust control should include at least:
 - Floor sweeping with absorption or other means that limits the diffusion of dust
 - Management of dust with a way that dust scattered just a little
- Use of mechanic methods for the stowing, storage and more generally management of cotton or dust, where this is possible
- Control, cleaning and immediately repair of equipment for dust restriction and ventilation systems. The compressed air should not be used for the cleaning of clothes and floor, but only for the cleaning of equipment if no other way exists and if workers wear protective masks. If the above measures do not achieve the dust reduction under the permissible limits, the employer should take additional control measures. Worker that because of health problems cannot use mask should have the possibility to be transferred in other workplace where the levels of pendulous dust is below limits, without reduction of salary, place in the hierarchy or other rights and privileges provided that is possible. Apart from the reduction of dust in air, the employer should provide free annual medical examinations, included respiratory examinations for all workers in areas where exists cotton dust. In order to ensure that workers know the dangers from the cotton dust, employers should carry out an educational program at one time per year. Warning signals should be placed in workplaces where the level of cotton dust is higher than limits.

M4-EN.9.4 Levels of pendulous particles

Work in textile industries in Greece, one of the main countries of production of textiles in Europe, the levels of pendulous particles in the various stages of production are as follows:

(it is marked that the inhaleable fraction concerning what goes through the respiratory system with value limit 10 mg/m³ and the respirable fraction that reaches the lung with value limit 5 mg/m³)

Processing	Specific processing sector	Mean of respirable fraction (mg/m ³)	Mean of inhalable fraction (mg/m ³)	Cotton fibres (mg/m ³)
Cotton ginning	Seed cotton feeding	0,080		
	Seed cotton warehouse	0,080		
	Dispenser	0,470		
	Separator-feeder	0,320		
	Burner-blower	0,450		
	Drier	0,490		
	Inclined cleaner	0,310		
	Lint cleaner	0,400		
	Press	0,480		
	Openers	0,320		0,740
Cotton yarning	Cleaners	0,350	0,420	
	Cards	0,230	0,790	
	Drawers	0,257	0,346	
	Combing preparation	0,284	0,370	
	Combers	0,252	0,370	
	Roving frames	0,210	0,301	
	Spinning frames	0,190	0,292	
	Winding frames	0,177	0,234	0,140
	Openers	0,170	0,236	
Wool yarning	Cards	0,640	0,828	
	Spinning frames	0,211	0,247	
	Winding frames	0,153	0,159	
	Warping frames	0,112	0,167	
Weaving	Lustring	0,176	0,290	
	Looms with new type arrow	0,377		
	Looms with old type arrow	0,570	0,872	1,150
	Air-jet looms	0,160	0,262	
	Seed cotton feeding	0,200		0,445

M4-EN.10 VEHICLES AND FORK LIFT TRUCKS

M3-EN.10.1 Basic industrial forklift truck operation guidelines (Part A')

M3-EN.10.2 Basic industrial forklift truck operation guidelines (Part B')

M3-EN.10.3 Basic industrial forklift truck operation guidelines (Part C')

M3-EN.10.4 Vehicle traffic in Textile industry

Description of chapter

The specific chapter includes a thorough presentation of forklift truck basic operation guidelines as well as rules for vehicle traffic in Textile plant areas.

The objective of this chapter is to familiarize all personnel involved in occupational health and safety at metal processing installations, with the safe use and operation of vehicles and forklift trucks.

M4-EN.10.1 Basic industrial fork lift truck operation guidelines (Part A')

- ONLY licensed and certified personnel are authorized to operate and drive forklift trucks
- Use of an acoustic warning signal when moving backwards
- Use of a warning flashlight when in operation

Before using a fork lift truck or starting an operation, check:

- a) The condition and pressure of the tire
- b) The condition of brakes
- c) The elevation mechanism
- d) The warning signals equipment (the horn, etc)
 - Precautionary measures:
 - There should be a site plan showing the standard routes of fork lift trucks available at workplace
 - Additional equipment has to be installed, where necessary
 - Always use the most suitable forklift truck for the job
 - The involved personnel should be adequately trained
 - All obstacles should be marked or removed
 - Furthermore, sensitive installations should be protected by means of bars or banisters

A remarkable number of accidents may be avoided if forklift trucks are equipped with a sheltered driver's cabin. A sheltered cabin offers the following advantages:

- Protects the driver from possible injuries

- Prevents the ejection of driver in case of overturning
- Helps facing bad weather conditions
- Prevents body strain originating from working in areas with great variations in temperature

M4-EN.10.2 Basic industrial fork lift truck operation guidelines (Part B')

- If one or more forklift trucks move inside a personnel-working area, a set of appropriate traffic safety rules should be defined and implemented
- The presence of personnel inside the standard forklift truck route should be avoided. If this is not practicable, additional safety measures have to be taken
- The presence or transport of personnel in of automobile equipment, should only take place at safe parts of the vehicle specially arranged for this purpose
- In case multiple operations during manoeuvring are necessary, the vehicle's speed should be accordingly adjusted
- Operation of internal combustion engine equipment indoors should be allowed only where adequate room ventilation is provided
- Devices which prevent equipment operation by non authorized personnel (controlled keys)
- Braking mechanism equipped with a back up system
- Fire fighting system
- Visibility improvement equipment (mirrors, lights, etc)
- Headlights in order to work in dark areas
- Labelling which states the basic operation properties and ratings

M4-EN.10.3 Basic industrial forklift truck operation guidelines (Part C')

- In case vehicles are not designed for elevating people, this should be clearly mentioned. Personnel should be exclusively elevated by means of special vehicles having working platforms equipped with protective lattice or bars
- All personnel working in height should obtain reliable communication means and secure their safe return to the ground level. When people are elevated, the vehicle operator must always be at the control panel. Vehicle manoeuvring should not take place when moving on steep slopes
- Forklift trucks should move forward when driving on an upward slope and backward when driving on a downward slope. The load should maintain a slight inclination towards the vehicle. Reversing is considered necessary when the load is particularly large obstructing visibility
- The forklift truck is particularly unstable when moving on rough ground. Always ensure that the driving surface is smooth and solid

- Loads should never be carried at a dangerous height or with forks raised
- The load should be steady, balanced, properly secured and leaning on both forks equally
- Never drive a forklift truck in the vicinity of another vehicle
- Personnel elevation machinery should:
 - Be installed in a way that minimizes the need to raise various loads towards elevated persons
 - Prevent falling of various objects on elevated people (e.g. by means of a protective overhead lattice), as well as falling of people themselves, considering that the working platform space is limited
 - Unless absolutely necessary, avoid standing or working underneath elevated pendulous loads

M4-EN.10.4 Vehicle traffic in Textile industry

There is a danger from vehicles moving in all areas of raw material input or finished products output but especially in input of seed cotton, where farmers arrive with their own vehicles that they drive to feeding installations. All possible measures should be taken depending on the situation. Indicatively some measures follow:

- Substitute need for reverse motion where possible
- Where reverse motion is inevitable clearly indicate where it is allowed so that it is obvious for pedestrians
- Ensure that no other people exist where vehicles move reversing. Restrain the presence of people without any reason to be there
- Reduce the distance of reverse motion as much as possible
- Where visibility is low (e.g. due to dust or during the night shift) provide employees distinguishable clothing (e.g. phosphorescent)
- Properly train everyone involved
- Ensure that there is a properly trained person to guide and ensure no presence of pedestrians. Ensure a way of communication with the driver, so that the guide is always in a safe place and is always visible from the driver, who must be informed to stop immediately when losing site of the guide
- Increase the area of visibility of the driver. Vehicle mirrors leave blind spots low. Properly placed stable mirrors could solve the problem
- Place bumpers to ensure slow motion so that the above measures can be applied
- None of the above measures is enough by itself. Proper measures should be chosen and applied in combination

M4-EN.11 RISK ASSESSMENT TOOL

Hazard		Who (Employees that might be harmed)	Harm	Current Safety Measures
Source	Hazard description			
Offices – Supporting Services	<ul style="list-style-type: none"> • Inability to rapidly and safely evacuate workplace • Inability to confront fire • Slips and trips • Improper indoor air quality • Improper temperature • Improper lighting • Breaking in glass surfaces • Ergonomic strain of work-post • Eye fatigue due to computer screen 	<p>Employees working in the offices and at supporting services like secretaries, clerks, managers, accountants, cleaners etc.</p>	<ul style="list-style-type: none"> • Entrapement in the office • Burns • Musculoskeletal injuries • Respiratory hardness • General Injuries • Neck and back pains • Ophthalmologic problems 	<ul style="list-style-type: none"> • Efficient (by means of number and dimensions) safety exits that can easily open outwards, are never locked or obstructed, signal-indicated and lighted with redundant lighting • Mechanical doors should have a redundant manual handling system • Efficient escape routes that remain always unobstructed, signal-indicated and lighted with redundant lighting • Efficient number of fire extinguishers that are easy to access and use, recently retread and signal-indicated. If possible place a fire detection and extinguish that is frequently maintained • Properly trained personnel • Alarm systems maintained in a good operating fit • Efficiently wide pathways, housekeeping, cleanliness, re-motion of every obstacle lower than knee height or shelves opening towards the corridor, fixation of cables, proper floor maintenance • Efficient renewal with fresh air and control of continuous and proper operation of technical systems for air renewal when this cannot be achieved naturally • Keeping temperature in proper levels for the kind of tasks executed • Efficient lighting (natural if possible) • If electrical lighting is required then it should

				<p>not be glaring and redundant lighting should exist for the case of blackout</p> <ul style="list-style-type: none"> • Glass surfaces should be signal-indicated and if placed close to employees should be of safety glass • Seats and computer screens should be adjustable in height and lean and there should be frequent change of body positions that are not straining. Frequent motion • Frequent interruption of work in screens interfering other tasks
<p>PRODUCTION FLOOR</p> <p>General safety</p>	<ul style="list-style-type: none"> • Improper indoor air quality • Improper temperature • Improper lighting • Improper signaling • Excessive noise • Aerosols 	<p>All employees working in the production floor, or those being present temporarily</p>	<ul style="list-style-type: none"> • Respiratory problems • Ophthalmological problems • Accidents • Hearing problems 	<ul style="list-style-type: none"> • Efficient renewal with fresh air and control of continuous and proper operation of technical systems for air renewal when this cannot be achieved naturally • Keeping temperature in proper levels for the kind of tasks executed • Efficient lighting (natural if possible) • If electrical lighting is required then it should not be glaring and redundant lighting should exist for the case of blackout • Glass surfaces should be signal-indicated and if placed close to employees should be of safety glass • Proper noise insulation of mechanical equipment and displacement of pumping equipment outside the production place • Use of ear protection in all stages of production • Often cleaning and automatic cleaners presence in spinning frames and winding frames and looms • Use of personal protective equipment especially in grinning sector
<p>Equipment and installations (operation)</p>	<ul style="list-style-type: none"> • Trapping in general • Struck by moving object • Ergonomic strain • Burn 	<p>All employees working in the production floor</p>	<ul style="list-style-type: none"> • Neck and back pains • Musculoskeletal injuries • Burns 	<ul style="list-style-type: none"> • Stopping stripes along dispenser • Weight photo-cell to avoid movement of press while human being is present • Enclosure of the whole press machine • Where possible interlock or photo-cell system

			<ul style="list-style-type: none"> • Stress, anxiety • Upper limbs entrapment • Mutilation 	<p>for automatic stoppage in case of presence in dangerous area especially near grinning frames</p> <ul style="list-style-type: none"> • Automation of press feeding and control system of pushers movement when power stops and guardings at the back of the pusher • Photo-cell in opener arm • Protection of moving and sharp surfaces at lustring frames with protective guardings • Transparent covers at Drawers, combers and combing preparation. Doffing automation. Interlock in warping frames • Doffing automatization • Stepping operation at looms and brake system. Arrow protection at the specific looms • Protective gauze when cotton suction • Lustring automatization and enough space ensurance at the down part od lustring frame • Seed cotton feeding cleaning before sunction. Keeping system of cotton parcels in case of emergency at press. • Cotton parcel opening automatization • Cotton parcel handling automatization in packing sector kai opening sector in spinning frames • Wastage collection and refeeding automatization • Ergonomic design of bucket • Automatization in winders handling from combing preparation to combers, changing canes and cones at roving frames, spinning frames and winding frames • Job rotation
Maintenance	<ul style="list-style-type: none"> • Release of kinetic energy • Release of hydraulic - pneumatic energy • Electrical danger • Contact with sharp surfaces 	All employees working in maintenance services	<ul style="list-style-type: none"> • Electrocution • Entrapment • Upper limbs injuries • Mutilation 	<ul style="list-style-type: none"> • Proper lighting • Efficient space • Isolation of the area and prohibition of entry of other employees • Backing up of heavy parts before disassembling

				<ul style="list-style-type: none"> • Shutoff of pressurized water – air supply, depressurization and disassembling of supply before starting with maintenance • Shutoff of electrical power supply and disconnection • Proper backup and personal protection during work in height
Vehicle movement	<ul style="list-style-type: none"> • Risks from private cotton supply lorries • Risks from suppliers’ clients’ trucks • Risk from forklift trucks • Risk from derricks in grinning sector • Risks from personnel cars 	<p>Forklift operators Clients Employees from other departments</p>	<ul style="list-style-type: none"> • Accidents • Falls • Struck by trucks • Head, arms, hand, legs injuries • Permanent disability • Death 	<ul style="list-style-type: none"> • Strict control of incoming – outgoing vehicles in gate • Installation of certain pathways for each vehicle kind • Guidance of third party vehicles in workplace • Isolation of the area when a derrick is working • Strict control of incoming – outgoing vehicles in gate • Installation of certain pathways for each vehicle kind • Guidance of third party vehicles in workplace • Isolation of the area when a derrick is working • Checking of vehicles’ good shape, especially braking system, backwards beeper, mirrors and lights • Personnel allowed only in specially designed seats of the vehicle • Use of vehicles only from skilled authorized personnel • No use of forklift trucks in tasks not specified • Low speed, especially when loaded • Load up to the point where visibility is not disturbed • Travel so as to keep load always leaning towards the vehicle • Signaling of vehicle pathways • Fixed mirrors in corners • Training of all related personnel
Manual	<ul style="list-style-type: none"> • Risks during use of metallic objects • Risks during box handling 	All employees in all departments	<ul style="list-style-type: none"> • Musculoskeletal disorders • Upper limbs 	<ul style="list-style-type: none"> • Training of personnel on correct load lifting • Automatization of handling with special lifting equipment where possible

handling			entrapment	<ul style="list-style-type: none"> • Use of lifting equipment and buggies in all boxes where possible
Strain due to body position	<ul style="list-style-type: none"> • Risk due to prolonged standing • Risk due to hands working in height over the shoulder • Risk due to bending 	All employees in all departments	<ul style="list-style-type: none"> • Musculoskeletal disorders 	<ul style="list-style-type: none"> • Avoiding standing position by putting proper seats where possible, or with small intervals • Doffing automatization • Job rotating • Canes changing automatization at roving frames and spinning frames • Changing of foot pushing system at spindle with a manual one
Slips and trips	<ul style="list-style-type: none"> • Risk of trip in badly lighted areas • Risk of foot trap in drainage, missing cover or cable • Risk of slip • Risk of struck against fixed object of low height 	All employees in all departments	<ul style="list-style-type: none"> • Accidents • Falls • Head, arms, hand, legs injuries • Permanent disability 	<ul style="list-style-type: none"> • Efficiently wide pathways, housekeeping, cleanliness, remotion of every obstacle lower than knee height or shelves opening towards the corridor, fixation of cables, proper floor maintenance • Efficient natural lighting where possible. • Efficient lighting (natural if possible) • If electrical lighting is required then it should not be glaring and redundant lighting should exist for the case of blackout
Falls	<ul style="list-style-type: none"> • Risk of falling on underlying floor • Risk of falling during maintenance • Risk of falling during cleaning 	Employees working in height	<ul style="list-style-type: none"> • Accidents • Falls • Head, arms, hand, legs injuries • Permanent disability 	<ul style="list-style-type: none"> • Rail of 1 m with a mast of 15 cm in every surface lying above 75 cm. Immediate replacement of any missing covers • Use of anti-fall equipment during specific maintenance tasks • Use of scaffolds or special personnel lifting vehicle with a continuous presence and control of the operator when work in height is required
Fire	<ul style="list-style-type: none"> • Risk of spark production and fire • Risk of cotton ignition at the openers • Risk of cotton ignition before lustring • Risk of chemical substances ignition in weaving • Risk of yarns ignition, fabric ignition • Risk of fire in workplace • Risk of fire transfer to by-standing 	All employees in alla departments	<ul style="list-style-type: none"> • Accidents • Falls • Burns • Respiratory problems • Panic • Stress • Anxiety 	<ul style="list-style-type: none"> • Efficient (by means of number and dimensions) safety exits that can easily open outwards, are never locked or obstructed, signal-indicated and lighted with redundant lighting • Mechanical doors should have a redundant manual handling system • Efficient escape routes that remain always unobstructed, signal-indicated and lighted with redundant lighting • Efficient escape charts for cases of danger

	<p>workplaces</p> <ul style="list-style-type: none"> • Wrong selection of fire extinguishers • Risk of panic and chaos due to fire 			<p>should be placed in meeting points and corridors</p> <ul style="list-style-type: none"> • Attention at cotton first stage humidity and limits should be known at every textile manufacturing stage • Efficient number of fire extinguishers that are easy to access and use, recently retread and signal-indicated. If possible place a fire detection and extinguish that is frequently maintained • Frequent inspection of fire extinguishing means and systems according to fire service guides • Fire resistant doors and a system for checking ventilation • Proper signaling of fire extinguishing means and proper training of personnel on its use • Founding of a fire protection squad, development of a plan for risk management and information of squad members on their specific responsibilities • If possible a visual and auditory warning signal for fire and personnel evacuation. • Efficient number of Personal Protective Equipment and fire extinguishing means to be stored in a specially signaled area
<p>Electrical risks</p>	<ul style="list-style-type: none"> • Bad maintenance of electrical installations • Worn cables and plugs • No grounding of electrical installations in places with non-insulated floor • Risk of electrical shock in humid places • Risk of electrical shock from contact to naked wire, worn hand tools, etc • Risk of electrical shock from overheating and strain of cables • Risk of electrical shock during 	<p>All employees</p>	<ul style="list-style-type: none"> • Electrocution • Permanent injuries • Death 	<ul style="list-style-type: none"> • Installation and maintenance of electrical infrastructure only from skilled and authorized personnel • Frequent check and inspection of electrical installations • Immediate replacement of broken switches and plugs, as well as worn-out equipment and cables • Immediate replacement of fuse cartridges that burn with new ones of the same nominal intensity. However, if they burn often, identification and repair of the potential impairment or change in the load of the specific line. Check for turnout box covers in

	<p>maintenance of electrical installations</p> <ul style="list-style-type: none"> • Risk of electrical shock of an employee coming to the rescue 			<p>guards installations in every part of a device or machine under voltage before electrical power supply is connected</p> <ul style="list-style-type: none"> • Grounding for every electrical installation, device or machine, especially if it is in area without insulated floor. This also concerns small devices like drillers. Shutoff of power supply before any tasks of cleaning, repair, maintenance or movement of machinery. Especially in cleaning, in order to avoid water, soap, etc. that leave humidity before power supply is reconnected • Avoid contact with switches, plugs and electrical equipment or devices with wet or very sweaty hands • Proper training of personnel on First Aid in electrical shock victims • Use of proper hand-tools with insulated handles
Chemical risks	<ul style="list-style-type: none"> • Non properly ventilated area for the use of emulsifiers, stabilizers, anti-corrosives, biocides, aromatics and high pressure additives • Improper indoor air quality due to breathable droplets or smother of oil and fumes that can be produced during machine operation • Risk of mistaken use of metal cutting fluids • Risk of contamination of personal effects or clothing of personnel from chemical substances • Non-available Material Safety Data Sheets of chemical substances - dissolvers • Risk of infection of employee coming to the rescue from chemicals 	Employees working with chemical substances	<ul style="list-style-type: none"> • Breathing difficulties • Dermatitis • Respiratory problems • Poisoning • Confussion • Stress • Burns 	<ul style="list-style-type: none"> • Efficient renewal with fresh air naturally, or when it can only be by artificial means, to check their effective and continuous operation • Proper training of personnel in correct handling of metal cutting fuels • Use of the proper Personal Protective Equipment for skin, eye and face protection from chemical substances • Handling of metal cutting fluids should take place in a well ventilated area under controllable conditions • Ensuring that protective equipment has been thoroughly cleaned with water after use and checked for slashing (e.g. needles or cuttings in gloves, especially in finger covers) • All contaminated clothes should be professionally cleaned before used again • Employees should avoid contact with contaminated equipment, as well as putting respiratory protection off with their gloves,

				<p>which could lead to burns in face</p> <ul style="list-style-type: none"> • Material Safety Data Sheet of every substance should be demanded by importer, producer or vendor of the substance • Proper training of personnel on issues of First Aid of chemical accidents victims
<p>Personal Protective Equipment</p>	<ul style="list-style-type: none"> • Erroneous selection • Erroneous use • Non-use • Bad maintenance 	<p>All employees having given PPE</p>	<ul style="list-style-type: none"> • Confussion • Allergic reaction due to PPEs' materials • Injuries due to non-use 	<ul style="list-style-type: none"> • Use of only certified Personal Protective Equipment • Selection of the proper equipment for every post and charging to employee • Personnel training on use and maintenance of Personal Protective Equipment • Hearing Personal Protective Equipment use in all production stages • Head, eye and hand protection to all working in maintenance • Anti-slip shoes in all stages of production • Anti-fall equipment for occasional work in height
<p>Stress at work</p>	<p>Problems with colleagues Stress by floor-walkers Stress by the boss Incapability of inferiors Monotonous and repetitive work Absence of breaks</p>	<p>All employees</p>	<ul style="list-style-type: none"> • Absenteeism • High staff turnover • Poor time-keeping • Errors • Poor decision making • Bullying • Isolation • Aggressive communication • Sleep problems • Irritability • Alcohol or drug abuse • Back problems • Phychosomatic problems 	<ul style="list-style-type: none"> • Clarity of employee's role and responsibilities • Development of knowledge, skills and capabilities • Organization of work (rotation, vacations, pauses etc) • Avoidance of repetitive and monotonous work • Training of managers and workers to raise awareness and understanding of stress, its possible causes and how to deal with it • Provision of adequate management support for individual and team • Performance of Risk Assessment

M4-EN.12 WEB BIBLIOGRAPHY

No	Internet links	Short description of the website
1.	http://www.osha.gov/SLTC/textiles/	Textile Industry topics' description
2.	http://www.lni.wa.gov/wisha/rules/textiles/default.htm	Safety Standards for the textile Industry
3.	http://www.setonresourcecenter.com/environmental/publications/Hazardous/all-in-one.pdf	Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities
4.	http://www.yale.edu/ynhti/curriculum/units/1996/2/96.02.07.x.html	Occupational Health and Safety in Textile by Alina Chrostek
5.	http://www.hse.gov.uk/pubns/texindex.htm	Free leaflets for Textile Industry
6.	http://www.ispesl.it/safety_checks/_en/tessuti.htm	Safety Checklist for the Textile Finishing Industry

M4-EN.13 EVALUATION TEST

In the following pictures, identify the hazards and risks for the worker who is present or for the worker that might be present.



- A: Body strain
- B: Contact (skin, eye) to dangerous substances - particles
- C: Slip or trip
- D: Crash to moving objects or parts



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- C: Slip or trip
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- D: Crash to moving objects or parts