



# **Abu Dhabi EHSMS Regulatory Framework**

## **(AD EHSMS RF)**

### **EHS Regulatory Instrument**

#### **Code of Practice**

#### **EHS RI - CoP 47.0 – Machine Guarding**

**Version 2.0**

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## ACKNOWLEDGEMENTS

With gratitude Abu Dhabi EHS Center acknowledges the great support provided by the Executive Council in facilitating the issuance of Abu Dhabi Emirate Environment, Health and Safety Management System (AD EHSMS) and its implementation at Emirate level.

The issuance of the system would not have been possible without the supervision, diligent efforts and productive recommendations of the AD EHS Center Board of Directors.

These documents (Regulatory Instruments) constitute the efforts of the Abu Dhabi EHS Center and the concerned Sector Regulatory Authorities and who worked together to integrate all relevant regulatory requirements under *AD EHSMS RF*. The input, contribution and constructive views of all sectors is highly appreciated.

May these documents prove to be beneficial and helpful in system implementation and in expanding the knowledge in the EHS field.



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## Preface

This Abu Dhabi EHS Regulatory Instrument was developed by the Industry Sector Regulatory Authority as the primary Competent Authority for this topic to set the minimum mandatory requirements.

Every effort was made in developing this document so that it does not conflict with existing local or federal laws and regulations. In case of conflict, requirements of the existing local and federal laws and regulations shall prevail, and all concerned are obliged to bring the same to the attention of AD EHS Center for resolution.

This AD EHS Regulatory Instrument has been developed, reviewed and approved, following the process as described in *AD EHSMS Implementation Guideline: The Integration of EHS Requirements in the Emirate of Abu Dhabi*, by the following stakeholders:

- Abu Dhabi EHS Higher Committee;
- Abu Dhabi EHS Center;
- Environment Agency Abu Dhabi;
- Department of Municipal Affairs;
  - Abu Dhabi City Municipality;
  - Al Ain City Municipality;
  - Western Region Municipality;
- Department of Transport – Abu Dhabi;
- Abu Dhabi Water and Electricity Authority;
- Health Authority - Abu Dhabi;
- Higher Corporation for Specialized Economic Zones (ZonesCorp);
- Center for Waste Management – Abu Dhabi;
- Abu Dhabi Tourism Authority;
- Abu Dhabi Food Control Authority;
- Abu Dhabi Education Council;
- Regulation and Supervision Bureau; and
- Other Relevant Federal and Local Competent Authorities.

The AD EHSMS consists of the following hierarchy of documents:

- AD EHSMS RF Elements - Mandatory System Requirements

EHS Regulatory Instruments:

- Standards and Guideline Values - Mandatory EHS threshold and exposure levels
- Codes of Practice - Mandatory EHS technical requirements – subject specific
- Mechanisms - Mandatory system implementation processes and procedures

Guidelines:

- Technical Guidelines - Non-mandatory guidance on how to implement an EHS Regulatory Instrument
- AD EHSMS Guidance Documents - Non-mandatory guidance and interpretation of an *AD EHSMS RF* concept and/or principle

Further, this document is not intended to conflict with any contractual obligations in effect at the time of its issuance. However, all future contracts shall adhere to applicable requirements stated herein, and existing long term contracts shall be brought into compliance with its requirements as soon as reasonably practicable as stipulated by relevant subject authorities.

This document will be reviewed periodically as part of the continual improvement cycle.

## 1. Introduction

- (a) This Code of Practice (CoP) applies to all employers within the Emirate of Abu Dhabi. This CoP is designed to incorporate requirements set by Abu Dhabi EHS Center and Sector Regulatory Authorities in the Emirate of Abu Dhabi.
- (b) This CoP establishes the requirements and standards so that the risks associated with the guarding of machinery are assessed, that control measures are implemented in accordance with the hierarchy of controls and those control measures are implemented to prevent injury, illness and disease to persons who might be exposed to risks arising from those activities.

## 2. Training and Competency

- (a) Employers shall ensure that EHS training complies with the requirements of:
  - (i) *AD EHSMS RF – Element 05 – Training and Competency;*
  - (ii) *AD EHS RI – Mechanism 7.0 – AD EHS Professional Entity Registration;* and
  - (iii) *AD EHS RI – Mechanism 8.0 – AD EHS Practitioner Registration.*
- (b) Employers shall ensure that all persons who use work equipment have received appropriate training for purposes of health and safety, including training in the methods which may be adopted when using the work equipment, any risks which such use may entail and precautions to be taken.
- (c) Employers shall ensure that any of his employees who supervises or manages the use of work equipment has received appropriate training for purposes of health and safety, including training in the methods which may be adopted when using the work equipment, any risks which such use may entail and precautions to be taken. The training shall include the following items as a minimum:
  - (i) a description and identification of the hazards associated with specific machines;
  - (ii) the safeguards themselves, how they provide protection, and the hazards for which they are intended;
  - (iii) how to use the safeguards and why;
  - (iv) how and under what circumstances safeguards can be removed, and by whom (in most cases, repair or maintenance personnel only); and
  - (v) what to do if a safeguard is damaged, missing, or unable to provide appropriate protection.

## 3. Requirements

### 3.1 Roles and Responsibilities

#### 3.1.1 Employer

- (a) Employers shall undertake their roles and responsibilities in accordance with the general requirements of *AD EHSMS RF – Element 01 – Roles, Responsibilities and Self-Regulation* Section 3.2.5.
- (b) Employers shall undertake their specific roles and responsibilities in accordance with the following:
  - (i) shall identify, through a documented risk assessment, all areas of machinery that could pose a hazard to human health through access to or contact with any dangerous part of machinery or rotating stock bar; or
  - (ii) shall prevent access to any dangerous part of machinery or to any rotating stock-bar, or stop the movement of any dangerous part of machinery or rotating stock-bar before any part of a person enters a danger zone.
- (c) The control measures required by section 3.1.1 (b)(i)(ii) shall consist of:
  - (i) the provision of fixed guards enclosing every dangerous part or rotating stock-bar where and to the extent that it is practicable to do so, but where or to the extent that it is not, then;
  - (ii) the provision of other guards or protection devices where and to the extent that it is reasonably practicable to do so, but where or to the extent that it is not, then; and
  - (iii) the provision of jigs, holders, push-sticks or similar protection appliances used in conjunction with the machinery where and to the extent that it is reasonably practicable to do so.

#### 3.1.2 Employees

- (a) Employees shall undertake their roles and responsibilities in accordance with the general requirements of *AD EHSMS RF – Element 01 – Roles, Responsibilities and Self-Regulation* Section 3.2.7.
- (b) Employees shall undertake their specific roles and responsibilities in accordance with the following:
  - (i) undertake all tasks in line with the training and instruction given by the employer;
  - (ii) never attempt to access dangerous parts of machinery unless authorised to do so by the employer and only once the machine has been made safe; and
  - (iii) report any defects immediately and mark the machine out of use.

### 3.2 Planning and Assessment

- (a) Employers shall evaluate each site or operation to determine if hazards are present and the workplace shall be assessed using risk management practices as required by *AD EHSMS RF – Element 2.0 – Risk Management*.
- (b) Employers shall ensure that the risk assessment is reviewed on a regular basis in line with the requirements of *AD EHSMS RF – Element 02 – Risk Management*.
- (c) Risk assessments shall include not only the operators of machinery, but also other who could be affected by its operation.

### 3.3 General Machinery Guarding

- (a) One or more methods of machine guarding shall be provided to protect the machine operator and other employees in the area from hazards such as those created by point(s) of operation(s), in-running nip points, rotating parts, flying chips and sparks.
- (b) The point of operation of a machine is the area where work is performed on material being processed. Any point of operation whose operation exposes an employee to injury shall be guarded.
- (c) Guards shall be affixed to the machine where reasonably practicable and secured elsewhere if attachment to the machine is not reasonably practicable.
- (d) Safety guards are to be painted the same colour. Use high visibility yellow (provided it is different to the general machinery colour) so that it can be clearly seen when a guard has been removed or when it is not in its appropriate place. It is also good practice to paint the surfaces behind the guard a different colour (eg. blue or red), so that when the guard has been removed, the exposed colour is clearly visible. It is then easy to identify that the guard has been removed and employees are alerted to possible danger.
- (e) Guards shall consist of physical barriers, two hand trip devices, point of operation devices, electronic safety devices, or other device that meets the requirements of this CoP.
- (f) Guards and guarding devices shall be installed, inspected and maintained in working order as per the manufacturer's instructions.
- (g) Employer shall ensure that no employee operates a machine for which a guard or guarding device has been fabricated or installed unless that guard or device is in place, secured and functioning appropriately.
- (h) Hand tools for placing and removing materials into the point of operation shall be designed to permit handling of materials without placing a hand into the point of operation. However, such tools shall not be substituted for a guard as required by this CoP.
- (i) Revolving barrels, containers, and drums shall be guarded by an enclosure. Entrances to such enclosures shall be interlocked to the operating mechanism so that the barrel, drum or container cannot rotate unless all openings to the enclosure are in place.

- (j) Machines designed for a fixed location shall be securely anchored to prevent walking or moving of the equipment during operation.
- (k) Large machinery or plant may require extensive guarding, and these guards may need to be removed for maintenance access. While some sections may remain fixed, it is a requirement that the guard be divided into easily removable sections. Sections shall be designed to be removed and handled easily by one person. Appropriate placement of handles on movable sections shall facilitate ease of removal, lifting and handling and thus reduce the risk of manual handling injuries.
- (l) With the exception of those circuits required for safety systems, all machinery shall be fitted with a means of isolation from all energy sources. Such isolators shall be clearly identified and be capable of being locked if reconnection could place people at risk.
- (m) An appropriate isolation method is a lock-out/tag-out system, in which one or more padlocks are fitted to the isolation switch, with keys being held by the operators or maintenance personnel. Their name and reason for the lock-out are written on the tags attached to the padlock. When the task is completed, the locks and tags are removed and power can be restored. Refer to *AD EHS RI – CoP 24.0 – Lock-out / Tag-out (Isolation)*.
- (n) Emergency stop devices shall be located where an operator can easily reach them. Poorly located devices may encourage dangerous practices, such as reaching across moving parts, a failure to shut down machinery or plant when a problem occurs, or situations where the machine or plant can be started by one employee while another is in a dangerous location (eg. cleaning a bin).
- (o) As part of the risk assessment process, employers shall consider the need for breaking devices where high speed machines are in use.
- (p) Emergency stop devices shall be tested on a regular basis and the results and frequency recorded.
- (q) The number of emergency stop devices required needs to be considered. If the machine or plant is large, several devices may be necessary. When there are multiple devices, safe operating practices shall be adopted so that machinery or plant is not restarted when it is undergoing maintenance or other temporary operations. A lock-out/tag-out system, as outlined above, is therefore an essential part of isolating an energy source to prevent accidental plant start-up.
- (r) To safeguard operators and other staff, cleaning, repair, maintenance and emergency procedures shall be in place and understood by employees. A regular inspection regime shall be in place to identify any problems with plant and machinery and safeguards. Any additional hazards associated with these activities shall be identified and assessed as part of the risk management process. Special precautions need to be taken where employees undertaking these tasks are obscured, or where there are multiple operating switches. Apply isolation procedures whenever maintenance or repair requires people to enter the danger area around machinery.
- (s) Guards shall only be able to be opened or removed with the aid of a tool and when the machine is not in operation.

- (t) Guards that move out of the way for each operation (automatic guards) need special consideration. Watch for potential risks in the interactions between guard and machine, between guard and person and between guard and work-piece.

### 3.4 Types of Guards

- (a) **Fixed guards.** These are stationary guards and prevent contact between moving machinery parts and any part of the body. They offer protection only when appropriately fixed in position. Fixed guards may be adjusted or moved and shall be easy to remove and replace, but only be able to be opened, removed or adjusted with the aid of a tool and when the machine is not in operation.
- (b) **Interlocking guards.** They prevent machinery and plant from being operated, unless the guard is in place. Interlocking guards such as enclosure guards are known as movable guards and have the moving part interconnected with the control system. Interconnections are usually electrical, mechanical, hydraulic or pneumatic.
- (c) **Automatic guards.** They are self-adjusting and automatically move into position as the machine or cycle starts. They are also known as push-away guards. These are only appropriate on slow machines.
- (d) **Distance guards** These prevent access to dangerous areas through a barrier or fence. Any access points through the guard (eg. gates and doors) shall be secured with a lock or interlocking system.
- (e) **Trip guards.** These are presence-sensing and stop the machine when a person gets into a position where they are liable to be injured. Photoelectric curtains, laser scanners and pressure mats are examples of this type of guard.

### 3.5 Basic Rules for Guard Design

- (a) The primary function of a guard is to provide a physical barrier between an employee and the dangerous parts of machinery or plant. When selecting control measures, careful attention to design and layout at the outset can avoid later problems. Basic rules for guard design include:
  - (i) ensure the materials used are of appropriate strength and good quality;
  - (ii) having any sort of guard may not be enough. Poorly designed or inappropriate guarding has contributed to injuries from machinery or plant. Ideally a guard would be custom-designed for the machine and the work process;
  - (iii) interlock devices may need to be used in conjunction with other types of guarding to ensure safety; and
  - (iv) avoid second best when designing a guard. If a guard is used from another machine, it shall be checked carefully to ensure that it is not defective, that it fits the target machine, is of appropriate strength and quality for the new application and that it achieves the aim of controlling the risk presented by the target machine.

- (b) In determining the most appropriate control measure for the hazard, risk and machine, other issues or risks shall also be taken into consideration. Guarding can play a useful role in both dust and noise reduction. In many cases, issues of wear, heat and ventilation affect operating efficiency and may also have consequences for employee health and safety.

### 3.6 Servicing Considerations

- (a) Guards shall be designed for easy removal and replacement. These types of guard make tasks such as regular cleaning, maintenance and machine adjustment or belt changes easier, particularly if this work needs to be done frequently. Safe procedures for removal of guards for repair, or to clear jams or breakdowns shall be considered. In all cases, guards shall be designed so they can only open or be removed with the aid of a tool and when the machine is not in operation.

Servicing issues include:

- (i) documented safe work procedures, including reference to manufacturer's recommendations;
- (ii) proximity to hot or sharp parts;
- (iii) cool down or warm up periods;
- (iv) lock-out provisions or permission for guard removal;
- (v) appropriate room to perform tasks without risk of injury or strain;
- (vi) any additional hazards arising from maintenance procedures (eg. testing while machine is unguarded (dry run), working at heights, use of solvents); and
- (vii) maintenance of servicing records.

### 3.7 Guard Placement and Reach

- (a) The design and positioning of guards shall provide at least the following clearance indicated in Table 1:

Reach	Minimum Distance Assumed to the Danger Point
Arm reach	Greater than or equal to 850 mm from under arm to fingertip
Elbow reach	Greater than or equal to 550 mm from the inside elbow to fingertip
Wrist reach	Greater than or equal to 230 mm from wrist to tip of middle finger
Finger reach	Greater than or equal to 130 mm
Vertical reach	2500 mm maximum when standing on toes

**Table 1 – Minimum Clearance Distance**

### 3.7.1 Guard Placement and Mesh Size.

- (a) The size of mesh or other openings in the guard and the distance of the guard from the danger point can be selected based on the Table 2.

Mesh Size	Distance to the Danger Point
Mesh size openings up to and including 9 mm	Distance of guard from danger point virtually the same
Mesh size over 9mm but less than 40 mm	Guard at least 200 mm from danger point
All types of guards	Distance between bottom opening and floor not to exceed 250 mm

Table 2.0 – Guard Distance

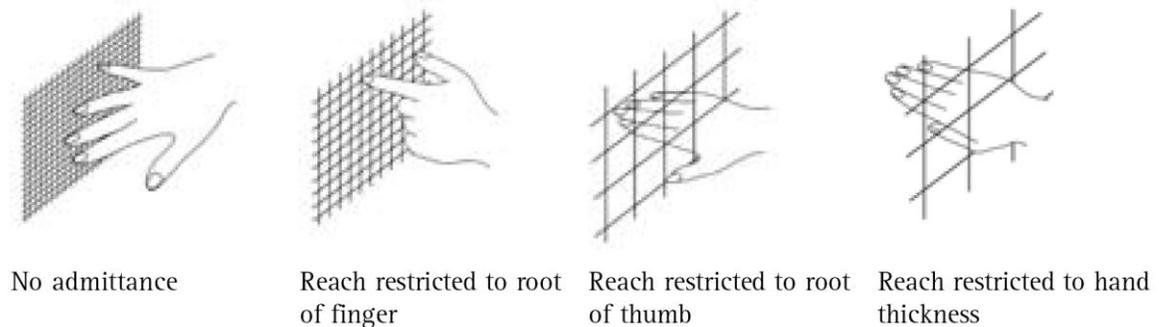
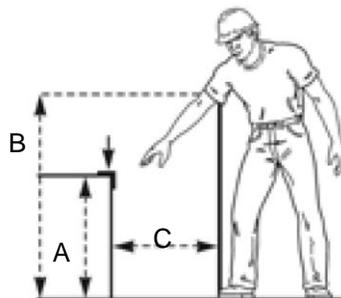


Figure 1.0: Example Distances

### 3.7.2 Reaching Down and Over

- (a) In table three and Figure 2:
- (i) A = distance of danger point from the floor or working surface;
  - (ii) B = height of the barrier; and
  - (iii) C = horizontal distance to be maintained between edge of barrier and danger point.



Note: Barriers must not be able to be stepped over.

Figure 2: Barriers

A – distance of danger point from floor (mm)	B – height of the barrier (mm)							
	2400	2200	2000	1800	1600	1400	1200	1000
	C – horizontal distance to be maintained between barrier and danger point (mm)							
2400	-	100	100	100	100	100	100	100
2200	-	250	350	400	500	500	600	600
2000	-	-	350	500	600	700	900	1100
1800	-	-	-	600	900	900	1000	1100
1600	-	-	-	500	900	900	1000	1300
1400	-	-	-	100	800	900	1000	1300
1200	-	-	-	-	500	900	1000	1400
1000	-	-	-	-	300	900	1000	1400
800	-	-	-	-	-	600	900	1300
600	-	-	-	-	-	-	500	1200
400	-	-	-	-	-	-	300	1200
200	-	-	-	-	-	-	200	1100

Table 3 – Barrier Distances

#### 4. References

- AD EHSMS RF – Element 01 – Roles, Responsibilities and Self-Regulation
- AD EHSMS RF – Element 02 – Risk Management
- AD EHSMS RF – Element 09 – Compliance and Management Review
- AD EHS RI – CoP 3.0 – Occupational Noise
- AD EHS RI – CoP 3.1 – Vibration
- AD EHS RI – CoP 17.0 – Safety Signage and Signals
- AD EHS RI – CoP 24.0 – Lock-out / Tag-out (isolation)

- *AD EHS RI – CoP 36.0 – Plant and Equipment*
- *Guide to safeguarding common machinery and plant | Workplace Health and Safety Queensland, Australia*
- *L22 - Safe use of work equipment -Provision and use of Work Equipment Regulations 1998 - Approved Code of Practice and guidance – HSE books - ISBN 978 0 7176 6295 1*

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