



# **Abu Dhabi EHSMS Regulatory Framework (AD EHSMS RF)**

**EHS Regulatory Instrument**

**Code of Practice**

**EHS RI - CoP 3.1 – Vibration**

**Version 2.0**

**February 2012**

## 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 AD EHS Center 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 Municipality;
  - Al Ain 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 UAE and Abu Dhabi regulatory authorities. If requirements of this document conflict with requirements set by another regulatory authority, employers are required to follow the more stringent requirement.
- (b) This CoP establishes the requirements and control measures to ensure that the risks associated with the exposure to vibration are minimized and that control measures are implemented in accordance with the hierarchy of control measures and those control measures are taken to prevent injury, illness and disease to persons who might be exposed to risks arising from those activities.
- (c) It covers all worksites where person(s) could have an exposure to vibration at any level. Worksites include, but are not limited to construction, maintenance, manufacturing, operation of heavy plant and equipment, vehicles and trucks.

## 2. Training and Competency

### 2.1 Training

- (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) Where risk assessment indicates that there is a risk to the health of employees are exposed to vibration, it is reasonably practicable that they are to be exposed to vibration at or above the action level, the employer shall:
  - (i) provide training on vibration exposure limit values and action levels set by this CoP;
  - (ii) identify the significant findings of the risk assessment, including any measurements taken, with an explanation of those findings;
  - (iii) inform and educate employees on the signs and symptoms of vibration related injuries and the process for reporting and getting treatment for vibration related injuries;
  - (iv) inform employees on their entitlement to appropriate health surveillance as required by this CoP and *AD EHS RI – CoP 5.0 – Medical Surveillance;* and
  - (v) provide training on safe working practices and other control measures to minimize exposure to and injury from exposure to vibration.
- (c) The information, instruction, and training shall take account of significant changes in the type of work carried out or the work methods used by the employers.
- (d) Employers shall ensure that any visitors, contractors, or temporary employees are trained as needed to minimize exposure to vibration.

- (e) Employees exposed to vibration it is reasonably practicable that they are to be exposed to vibration at or above the action level shall receive annual refresher training as per the requirements of Section 2.1(a) of this document.

## 3. Requirements

### 3.1 Roles and Responsibilities

#### 3.1.1 Employers

- (a) Where reasonably practicable, employers shall eliminate vibration hazards by purchasing low vibration producing equipment, maintaining equipment to manufactures specifications, eliminating vibration hazards, erecting barriers, or implementing other control measures to eliminate / reduce vibration hazards.
- (b) Employers shall ensure when employees are subjected to vibrations exceeding limits set in Section 3.2, reasonably practicable control measures shall be utilized.
- (a) Employers shall ensure employees are protected from vibration hazards.
- (b) Employers shall ensure defective equipment, or equipment that requires maintenance is reported to the appropriate department for repair or replacement.

#### 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 report any activity or equipment defect relating to vibration exposures which they believe is reasonably practicable to cause an overexposure to themselves or another person.
- (c) Employees shall use appropriate vibration protection, equipment or safety devices provided by the employer in accordance with any training or instruction received.

### 3.2 Exposure Limit Values and Action Values

#### 3.2.1 Hand-Arm Vibration

- (a) The daily exposure limit shall be ascertained on the basis set out in Schedule 1 Part I.
- (b) The daily exposure limit value for hand-arm vibration is  $5\text{m/s}^2 \text{ A}(8)$ .
- (c) The daily exposure action value for hand-arm vibration is  $2.5\text{m/s}^2 \text{ A}(8)$ .

#### 3.2.2 Whole Body Vibration:

- (a) The daily exposure limit shall be ascertained on the basis set out in Schedule 2 Part I.

- (b) The daily exposure limit value for whole body vibration is  $1.15\text{m/s}^2$  A(8).
- (c) The daily exposure action value for whole body vibration is  $0.5\text{m/s}^2$  A(8).

### 3.3 Assessment of the Risk to Health Created by Vibration in the Workplace

- (a) Employers who carry out work which is liable to expose any of his employees to risk from vibration shall ensure appropriate risk assessment is undertaken, in accordance with *AD EHSMS RF – Element 02 – Risk Management*. The risk assessment shall identify the control measures that need to be taken to meet the requirements of this CoP.
- (b) In conducting the risk assessment, the employer shall assess daily exposures to vibration to determine if employees are to be exposed to vibration at or above the action level or above the exposure limit value. Assessment shall be by means of:
  - (i) observation of specific working practices;
  - (ii) reference to relevant information (eg. equipment specifications, scientific studies, etc.) on the probable magnitude of the vibration corresponding to the equipment used in the particular working conditions; and
  - (iii) if necessary; measurement of the magnitude of vibration to which employees are liable to be exposed.
- (c) The risk assessment shall include consideration of:
  - (i) the magnitude, type and duration of exposure, including any exposure to intermittent vibration or repeated shocks;
  - (ii) the effects of exposure to vibration on employees whose health is at particular risk from such exposure;
  - (iii) any effects of vibration on the workplace and work environment, including the appropriate handling of controls, the reading of indicators, the stability of structures and the security of joints;
  - (iv) any information provided by the manufacturers of work equipment;
  - (v) the availability of replacement equipment designed to reduce exposure to vibration;
  - (vi) any extension of exposure at the workplace to whole-body vibration beyond normal working hours, including exposure in rest facilities supervised by the employer;
  - (vii) specific working conditions such as low temperatures; and
  - (viii) appropriate information obtained from health surveillance including, where reasonably practicable, published information.
- (d) Employers shall assess proposed modifications to equipment, addition of new processes, or the purchasing of new equipment to assess their effect on the work environment and employees, with special focus placed on vibration hazards. Employers shall:
  - (i) purchase equipment that has built in vibration control devices. Special attention shall be placed on equipment that can cause whole body vibration (eg. jack hammers, earth moving equipment, industrial trucks, etc.) to ensure vibration control devices are built into the equipment and appropriate for their intended use;

- (ii) design new work processes to include vibration dampening devices; and
  - (iii) implement a maintenance program to ensure equipment is maintained to manufacturer's specifications and vibration control equipment is functioning appropriately.
- (e) The risk assessment shall be reviewed regularly, and updated if:
- (i) there is reason to suspect that the risk assessment is no longer valid; or
  - (ii) there has been a significant change in the work to which the assessment relates.
- (f) The employer shall record:
- (i) the significant findings of the risk assessment as soon as reasonably practicable after the risk assessment is made or changed; and
  - (ii) the measures which the employer has taken and which they intend to take to meet the requirements of this CoP.

### 3.3.1 Elimination or Control of Exposure to Vibration at the Workplace

- (a) Where it is not reasonably practicable to eliminate the risk at the source, and an exposure action value is likely to be reached or exceeded, the employer shall reduce exposure to as low a level as is reasonably practicable by establishing and implementing a program of organizational and technical measures which is appropriate to the activity.
- (b) The control measures taken by the employer shall be based on the health and safety hierarchy of controls and shall consider:
  - (i) other working methods which eliminate or reduce exposure to vibration;
  - (ii) choice of work equipment of appropriate ergonomic design, which taking account of the work to be done, produces the least possible vibration;
  - (iii) the provision of auxiliary equipment which reduces the risk of injuries caused by vibration;
  - (iv) appropriate maintenance programs for work equipment, the workplace and workplace systems;
  - (v) the design and layout of workplaces, work stations and rest facilities;
  - (vi) appropriate information and training for employees, such that work equipment may be used correctly and safely in order to minimise employee exposure to vibration;
  - (vii) appropriate work schedules with appropriate rest periods; and
  - (viii) providing clothing, as needed, to protect employees from cold and damp environments.
- (c) When employers are not able to eliminate, use engineering control measures, or implement administrative controls to address vibration hazards, the employer shall provide PPE designed to reduce the transmission of vibrations to the employer (eg. anti-vibration gloves, anti-vibration mats, etc.). The vibration attenuation (effectiveness) of personal protective equipment shall be evaluated to determine if other controls are needed to protect employees and the environment. As per *AD EHS RI – CoP 2.0 – Personal Protective Equipment*.

- (d) Section 3.2 shall not apply where the exposure of an employee to vibration is usually below the exposure action value but varies markedly from time to time and may occasionally exceed the exposure limit value, provided that:
- (i) over exposures do not occur more than two days per week;
  - (ii) any exposure to vibration averaged over one week is less than the exposure limit value, calculated based on Schedule 1 part II and Schedule 2 part II;
  - (iii) there is evidence to show that the risk from the actual pattern of exposure is less than the corresponding risk from constant exposure at the exposure limit value;
  - (iv) risk is reduced to as low a level as is reasonably practicable, taking into account the special circumstances;
  - (v) the employees concerned are subject to increased health surveillance; and
  - (vi) the employer has taken into account any employee or group of employees whose health is likely to be particularly at risk from vibration.

### 3.4 Health Surveillance

- (a) If the risk assessment indicates that there is a risk to the health of employees who are exposed to vibration or likely to be exposed to vibration at or above the exposure action level, the employer shall ensure the exposed employees are placed in an appropriate health surveillance program in accordance with the requirements of *AD EHSMS RF – CoP 5.0 – Medical Surveillance*.
- (b) Health surveillance, which shall be intended to prevent or diagnose any health effect linked with exposure to vibration, shall include:
- (i) medical evaluation from a physician that has experience in diagnosing and treating vibration related injuries and diseases, knowledge of the work environment and vibration exposures;
  - (ii) documentation of any links between the exposure and identifiable disease or adverse health effect; and
  - (iii) a requirement that when a vibration related injury or illness occurs, the treating physician shall review the job duties of the employee and determine if there is alternative work or light duties that can be performed by the employee during their recovery.

## 4. Record Keeping

- (a) Exposure monitoring, medical surveillance, examination and consultation records shall be kept for a minimum of the period of employment plus 30 years, as per *AD EHSMS RF – Element 09 – Compliance and Management Review and AD EHS RI – CoP 5.0 – Medical Surveillance*.
- (b) All compliance and training records shall be kept for a minimum of five (5) years, as per *AD EHSMS RF – Element 09 – Compliance and Management Review*.

- (c) Medical records relating to vibration injuries and illness shall be maintained in the employee's official medical record file.
- (d) Employers shall keep all medical records confidential unless the employee has provided a written and signed release stating who can have access to their medical records (eg. human resources, employee family members, etc.).

## 5. 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 EHSMS RF – CoP 5.0 – Medical Surveillance*
- *American Conference of Governmental Industrial Hygienists 2010 TLVs and BEI's*
- *Health and Safety Executive, The Control of Vibration at Work Regulations 2005, No. 1093*

## Schedule 1: Hand-Arm Vibration

### Part I-Daily exposure to vibration

The daily exposure to vibration ( $A(8)$ ) of a person is ascertained using the formula:

$$A(8) = a_{hv} \sqrt{\frac{T}{T_0}}$$

where:

- $a_{hv}$  is the vibration magnitude, in meters per second squared ( $m/s^2$ );
- $T$  is the duration of exposure to the vibration magnitude  $a_{hv}$ ; and
- $T_0$  is the reference duration of 8 hours (28,800 seconds).

To avoid confusion between vibration magnitude and daily exposure to vibration, it is conventional to express daily exposure to vibration in  $m/s^2 A(8)$ .

The vibration magnitude,  $a_{hv}$ , is ascertained using the formula:

$$a_{hv} = \sqrt{a_{hwx}^2 + a_{hwy}^2 + a_{hwz}^2}$$

where:

- $a_{hwx}$ ,  $a_{hwy}$  and  $a_{hwz}$  are the root-mean-square acceleration magnitudes, in  $m/s^2$ , measured in three orthogonal directions, x, y and z, at the vibrating surface in contact with the hand, and frequency-weighted using the weighting  $W_h$ .

The definition for the frequency weighting  $W_h$  is given in British Standard BS EN ISO 5349-1:2001.

Where both hands are exposed to vibration, the greater of the two magnitudes  $a_{hv}$  is used to ascertain the daily exposure.

If the work is such that the total daily exposure consists of two or more operations with different vibration magnitudes, the daily exposure ( $A(8)$ ) for the combination of operations is ascertained using the formula:

$$A(8) = \sqrt{\frac{1}{T_0} \sum_{i=1}^n a_{hvi}^2 T_i}$$

where:

- $n$  is the number of individual operations within the working day;
- $a_{hvi}$  is the vibration magnitude for operation  $i$ ; and
- $T_i$  is the duration of operation  $i$ .

### Part II-Exposure to vibration averaged over one week

The exposure to vibration averaged over one week ( $A(8)_{\text{week}}$ ) is the total exposure occurring within a period of seven consecutive days, normalized to a reference duration of five 8-hour days (40 hours). It is ascertained using the formula:

$$A(8)_{\text{week}} = \sqrt{\frac{1}{5} \sum_{j=1}^7 A(8)_j^2}$$

where:

- $A(8)_j$  is the daily exposure for day  $j$ .

## Schedule 2: Whole-Body Vibration

### Part I-Daily exposure to vibration

The daily exposure to vibration ( $A(8)$ ) of a person is ascertained using the formula:

$$A(8) = k a_w \sqrt{\frac{T}{T_0}}$$

where:

- $a_w$  is the vibration magnitude (root-mean-square frequency-weighted acceleration magnitude) in one of the three orthogonal directions, x, y and z, at the supporting surface;
- $T$  is the duration of exposure to the vibration magnitude  $a_w$ ;
- $T_0$  is the reference duration of 8 hours (28,800 seconds); and
- $k$  is a multiplying factor.

To avoid confusion between vibration magnitude and daily exposure to vibration, it is conventional to express daily exposure to vibration in  $m/s^2 A(8)$ .

Daily exposure to vibration ( $A(8)$ ) is evaluated separately for the x, y and z directions of vibration.

For horizontal vibration (x and y directions),  $k = 1.4$  and  $a_w$  is obtained using the  $W_d$  frequency weighting. For vertical vibration (z direction),  $k = 1.0$  and  $a_w$  is obtained using the  $W_k$  frequency weighting.

Definitions for the frequency weightings are given in International Standard ISO 2631-1:1997.

If the work is such that the total daily exposure consists of two or more operations with different vibration magnitudes, the daily exposure ( $A(8)$ ) for the combination of operations is ascertained using the formula:

$$A(8) = \sqrt{\frac{1}{T_0} \sum_{i=1}^n a_{wi}^2 T_i}$$

where:

- $n$  is the number of individual operations within the working day;
- $a_{wi}$  is the vibration magnitude for operation  $i$ ; and
- $T_i$  is the duration of operation  $i$ .

### Part II-Exposure to vibration averaged over one week

The exposure to vibration averaged over one week ( $A(8)_{\text{week}}$ ) is the total exposure occurring within a period of seven consecutive days, normalized to a reference duration of five 8-hour days (40 hours). It is ascertained using the formula:

$$A(8)_{\text{week}} = \sqrt{\frac{1}{5} \sum_{j=1}^7 A(8)_j^2}$$

where:

- $A(8)_j$  is the daily exposure for day  $j$ .

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