

# WORKING ENVIRONMENT MEASUREMENT SYSTEM IN JAPAN

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# Occupational Health Control

## 1 . Introduction

### ○Workplaces

→many kinds of hazardous factors

building, facilities, equipments, machinery, materials, chemicals

mental stress due to work organization, etc., . . . . .

if not adequately controlled

→may cause adverse effect on workers' health

→may cause industrial injury or even death

### ○Hazard and Risk

**Hazard**: hazardous nature and its degree

the object(chemicals, machinery etc.,) inherently possess

**Risk**: the severity and the extent of possibility of occurrence of injuries or diseases that might be caused due to the hazards

# Occupational Health Control

## 2 . Five pillars of occupational health control

- working environment control
- work control
- health control
  - < 3-way approaches of occupational health control >
- the structure/organization in the workplaces to implement occupational health control
- workers education on occupational safety and health

# Working Environment Control

## - the basis of good control -

### ○ What is “Working environment control”?

→ to eliminate or control hazardous factors from working environment by technical/engineering methods such as local exhaust ventilation, etc.. to the level that may not cause any unacceptable risk to workers

→ this approach is the basis of occupational health control

○ The first step of working environment control

→ “working environment measurements”.

○ Result of the measurements

→ measures to improve /repair /replace equipment /machinery or change in the operation etc., if necessary

○ This process is incorporated in “**the Industrial Safety and Health Law of 1972**”, that is the central and comprehensive law of this sphere.

# Characteristics of Japanese Working environment measurement

- **measurement** of the airborne concentration of chemicals/mineral dusts/asbestos fibers, etc., in the workplace atmosphere
  - **statistical treatment** of the measurements results to calculate geometrical mean value and geometrical standard deviation
  - to **calculate indices** to be compared with “**control levels**” that are values stipulated for each hazardous chemicals by the government
  - **comparison** between “indices” and “control levels”
    - determination of “which Class I, II or III the workplace falls”
      - if Class I → the workplace condition is good and no action is needed
      - if Class III → the workplace condition needs improvement to realize Class I
      - If Class II → the workplace condition is between Class I and II it is encouraged to realize Class I by checking the workplace condition and taking necessary action

# Comparison of Japanese method with those of US/European method

## ○ Japanese methods

→ measuring airborne concentration without regards ,principally, to workers exposure concentration

→ the result is used for **evaluation of workplace conditions** as to whether any action for improvement is needed or not .

\* main purpose → to lead to working environment improvement

## ○ US and most European countries' method

→ measuring **workers' exposure to chemicals**

→ in terms of 8 hours ' time weighted average

→ compare results with "Occupational Exposure Limits (OEL)  
for respective chemicals OELs are recommended from  
some of the institutions such as TLVs from ACGIH.

\* main purpose → to evaluate workers' exposure

# The merit of Japanese system

- ① better practicality/feasibility for employers to make measurement  
→ measuring airborne concentration is easier than measuring exposure of each worker
- ② closer connections between results of measurement and the identification of the facility/equipment that needs improvement

## 2 History of Working Environment Measurement

- Although the Labor Standards Law of 1947 did not enforce employers a working environment measurement, a research was initiated in 1954 under the government support for industrial health experiments and research to develop measuring methods in order to encourage such measurement.
- The findings of this research were published as the “Guidelines for Working Environment Measurement” in 1958.
- In these guidelines, new measuring methods were prepared and appropriate ones were selected from among the conventional methods, necessary improvements were made to them after a series of experiments, and research was also done on those substances for which a measuring method was not established.
- The revised edition with newly added methods were published in 1964.



- In 1960, the Ordinance on Prevention of Organic Solvent Poisoning was enacted under the Labor Standards Law.
- Under this ordinance, the concentration of organic solvents in the atmosphere was to be measured once every three months in indoor workplaces where the organic solvents designated by the Minister of Labor are put to constant use.
- In 1967, the Ordinance on Prevention of Lead Poisoning was enacted. This ordinance made it mandatory to measure the concentration of lead in the atmosphere in indoor workplaces where lead is handled and lead vapor, fume and dust are constantly generated.

○The Ordinance on Prevention of Hazards due to Specified Chemical Substances was enacted in 1971. It is stipulated in this Ordinance that at indoor workplaces where Group 1 and 2 substances are produced or handled constantly, the concentration of gas, fume or dust in the air shall be measured.

○With regard to the specified chemical substances, a Committee for the Research of Measurement Methods of Hazardous Substances in the Working Environment was organized with experts participating. For the chemical substances controlled under this ordinance, attempts were made to establish a system for the measurement of their concentration in the atmosphere of the working environment, and the findings were published under the title “Guidelines for the Measurement of the Working Environment” in 1972.

- In accordance with the change of working conditions and status of occupational diseases, the Ministry of Labor has enacted and revised legislation pertinent to industrial safety and health,
- As new techniques and substances were developed one after another, and there were no clear indication of decreasing trend of industrial accidents ,government realized that ,instead of Labor Standard Law, a new comprehensive Law that focused only on the industrial safety and health issue was necessary.
- Given this situation, **the Industrial Safety and Health Law**, the first comprehensive one in this sphere, was enacted in 1972.
- The item “Working Environment Measurement’ was newly incorporated as Article 65 .
- Nevertheless, this article provided merely for the obligation to carry out necessary measurement at indoor workplaces, etc., where hazardous work would be conducted and to keep its records, but the ministry had not come up with any of the detail on the measurement methods.
- Thus the article, at the initial stage, substantially had no binding power on the measurement methods .

- In order to assure accurate working environment measurement, the “**Working Environment Measurement Expert**” was introduced in the new law entitled “**Working Environment measurement Law**” that was enacted in 1975.
- On the other hand, Article 65 of the Industrial Safety and Health Law was amended and stipulated that the measurement shall be carried out in accordance with the Standards for Working Environment Measurement stipulated by the Labor Minister.

### 3 . The Overview of Article 65 of the Industrial Safety and Health Law

- The employer shall ensure the measurement of temperature, humidity, concentration of dust, chemicals etc., and shall keep records in regard to specified workplaces, such as those where risky work will be performed.
- The working environment measurement shall be carried out in accordance with the **working environment measurement standards** prepared by the Minister of Labor.

#### <Justification of the measurement and evaluation method>

- The airborne concentration of toxic substances in the workplaces generally varies to a significant degree even if the measuring point and time are fixed.
- Given this factor, in order to make an accurate quantitative assessment of the working environment, there is a need to statistically process data with consideration given not only to the mean concentration but to the degree of variance as well,  
And the measuring method was developed in line with the above concept.

## Definition of Working environment measurement by law

- The “working environment measurement” by the law consists of (1) design, (2) sampling and (3) analysis,
- “Design” is particularly important so that the result of the statistical treatment of figures obtained from each sampling point rightly reflect the actual state of airborne concentration of chemicals.
- The method of “Design” is stipulated by Minister’s Notice entitled “working Environment Measurement Standards”

## Design and sampling

○ According to the notice, the “design” and “sampling” should follow the below ;

- (1) Vertical and horizontal lines are drawn at equal intervals of not more than 6 m on the floor of a **unit work area** (refers to such a necessary section that is designated for working environment based on the condition of distribution of harmful substances and range of movement of workers within the area of a workshop concerned, hereinafter the same shall apply) and a **sampling point** is provided at each intersection of those lines at a **position 50 to 150 cm above the floor** (except such a point where measurement is very difficult due to equipment etc.). However, when it is obvious that the concentration of chemicals/dusts is substantially uniform, vertical **and** horizontal lines can be drawn at equal intervals of more than 6 m on the floor of a unit work area and a sampling point provided at each intersection of those lines.

## Design and sampling(conti-)

- (2) Sampling points shall be provided at not less than 5 points though when they become less than 5 points then the above rule is applied regardless of the provisions of the preceding item. However, when the unit work area is very narrow and it is obvious that the concentration of chemicals/dust is substantially uniform, the number of sampling points may be less than 5.
- (3) The measurement prescribed in the preceding section shall be made at such time when work is regularly performed.



# A-measurement and B-measurement

- (1) Measurement of airborne concentration is considered to be practical and simple in order to obtain the information on where the problems exist ,whether improvement of the instruments/equipments are needed.

The measuring method in this purpose is called “A-measurement”.

- (2) The workers’ temporary high exposure ,however, due to the emission conditions of toxic substances and working postures etc., are perhaps overlooked only by the above measurement (A-Measument) practiced at the unit work area.

Therefore, the concentration at a certain place and time at which workers’ exposure is considered to become maximum level must be measured separately. This type of measurement is called B-measurement and complementary to A-measurement.

- (3) It is usual that Both A-measurement and B-measurement are performed at a unit work area.

# administrative control level

- The concentration for administrative regulation of airborne toxic substances is termed “an administrative control level” and distinguished from the “occupational exposure limit.”
- The administrative control level is an index to determine the control class to judge the propriety of the working environment control, based on the results for working environment measurement which have been implemented for the unit work area in accordance with the Working Environment Measurement Standards.
- The administrative control level have been established from an administrative point of view to achieve the purpose of the working environment control, based on the technological feasibility and international trends concerning working environment control, as well as the trend in standards for exposure control adopted in many countries and exposure limits proposed by academic societies.

## Conti-

- More concretely, measured values should be compared with the **administrative control level** after statistical treatment. The administrative control level should not be compared with individual measured values.
- Thus, the administrative control level is different from the occupational exposure limits(OEL)

## 4. Overview of Article 65-2 of Industrial Safety and Health Law

- In 1988 the Industrial Safety and Health Law was amended to be added a new Article 65-2 about evaluation of working environment measurement and so on.
- In this amendment it was stipulated that ① the evaluation of working environment measurement result shall be carried out in accordance with the Standards for Working Environment Evaluation prepared by the Labor Minister and ② when it is deemed necessary to work for the protection of the workers' health, appropriate measures shall be taken for facilities including their installation, repair, etc.,

## Points of Article 65-2 of Industrial Safety and Health Law

- the employer shall, where on the basis of the result of evaluation of the working environment measurement under the provision of Article 65 he deems it necessary for maintaining the health of workers, establish or improve the facilities or arrangement.
- The evaluation of the result shall be carried out in accordance with the “Standards for Working Environment Evaluation” stipulated by the Labor Minister.
- The employer shall keep the records of the result.

# Control Class I

<condition of working area>

Concentration of airborne hazardous chemical does **not exceed** the administrative control level at **almost** (more than 95%)**points**.

<measures to be taken>

Nothing to be taken. To continue the current working environment control to keep the present condition

## Control Class II

< condition of working area >

Mean concentration of airborne hazardous chemical does not exceed the administrative control level .

< measures to be taken >

Try to take necessary measures ,based on the result of inspection of facilities,equipment,operation or work procedure

## Control Class III

<condition of working area>

Mean concentration of airborne hazardous chemical **exceeds** the administrative control level .

<measures to be taken>

- ① Take necessary measures, as soon as possible, based on the result of inspection of facilities, equipment, operation or work procedure
- ② Use effective respirator, if necessary.
- ③ carry out medical examination or other measures, if necessary.



# Classification of control class(1)

“A-sampling only” case

$Ea < E$	$Ea1 \geq E \geq Ea2$	$Ea2 > E$
Class I	Class II	Class III

## Classification of control class(2)

Both "A-sampling" and "B-sampling" case

	$Ea1 < E$	$Ea1 \geq E \geq Ea2$	$Ea2 > E$
$CB < E$	Class I	Class II	Class III
$E1 \geq CB \geq 1.5 \times E$	Class II	Class II	Class III
$CB > 1.5 \times E$	Class III	Class III	Class III

# definition

## 1st. Evaluation Value (Ea1)

Estimated value suited to 5% from the highest level among the actual value of airborne toxic substances at working hours at all possible points in a unit work area.

## 2nd. Evaluation Value (Ea2)

Estimated value of the arithmetic mean concentration of airborne toxic substances in a unit work area.

-fin-(by S.Asuka)