

Recording of Data of Individual Measurements of Occupational Exposure: Guideline of the Dutch Society of Occupational Hygiene (October 1999)

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Following the recommendations of the European Working Group on Exposure Databases, a Working Group (on Storage of Data of Measurements of Occupational Exposure) of the Dutch Occupational Hygiene Society has developed a Guideline which was presented at the International Symposium on Occupational Exposure Databases and Their Application for the Next Millennium, November 1-3, 1999, London. To establish the present situation, a small-scale telephone survey of monitoring practices and storage of data was done within the Society. The results of the telephone survey and the draft guidance document were discussed with the occupational hygienists and other stakeholders (e.g., authorities, industry, labor unions, and occupational physicians) in a society meeting. This meeting was used to gather ideas on the need and support for a guidance document and to get input for improving the draft guidance document and for implementation of the Guideline. After this meeting, the Guideline was further developed and published by the Dutch Occupational Hygiene Society. The Guideline concentrates on the data elements required when storing exposure data. The data elements presented are the minimum and should be stored minimally to ensure proper interpretation of results at present and in the future and definitions of the items used are given. The Guideline does *not* prescribe how the data should be stored, or which procedures need to be used to guarantee the quality of the recorded data elements.

Keywords Occupational Exposure Measurements, Working Environment, Data Elements

The work of the European Working Group on Exposure Databases has resulted in recommendations for "core information" to be gathered and stored with measurements of occupational

exposure to chemicals. These recommendations have been published in 1997.⁽¹⁾ One of the items for "future work," as mentioned by the European Working Group, was the stimulation of implementation of the recommendations in practice. Following the recommendations of the European Working Group on Exposure Databases a Dutch Occupational Hygiene Society Working Group on Storage of Data of Measurements of Occupational Exposure was formed. This Working Group has developed a Guideline defining the data elements minimally needed to ensure proper interpretation of results of personal exposure measurements, even after several years by another person. In contrast with the European Working Group, the Dutch Group did not have exchange of data as a goal, but, instead, focused on improvement of recording of data first for local, stand alone, quality reasons.

METHOD

To establish the present situation of data recording in the Netherlands, a small-scale telephone survey of practices in measurement and storage of data was done within the Dutch Society. The background of the working group members represented various points of views in The Netherlands, namely occupational health services, multinationals, a research institute, a university, and the labor inspectorate. Seven members of the group made phone calls to colleagues working in a different organization, and completed a questionnaire. The list of data elements, proposed by the European Working Group⁽¹⁾ was discussed in the Dutch working group to extract the data elements minimally needed for proper interpretation at present and in the future.

The results of the telephone survey and the draft guidance document were discussed with the occupational hygienists and other stakeholders (e.g., authorities, industry, labor unions, and occupational physicians) in a Society Meeting in March 1999. This meeting was used to gather ideas on the need and support for

a guidance document and to get input for improving the draft guidance document and for implementation of the Guideline. After this meeting, the Guideline was further developed and published by the Dutch Occupational Hygiene Society.

RESULTS

Results of the small-scale telephone survey were the following: More than 20 occupational hygienists from different companies, services and organizations responded. They reported that between 2 and more than 1000 measurements of personal exposure to chemicals were done each year by them or in their group, with a mean number on the order of a couple of dozens per year. The lowest value was reported for a very small occupational hygiene service that did not focus on companies that use chemical products. The highest values were reported for multinationals. External occupational hygiene services generally perform "worst case" measurements, supplemented by indicative measurements. Internal (company) services also do baseline sampling or (semi-) random sampling. All organiza-

tions, except research organizations, mainly do measurements to check compliance with occupational exposure limits. Indicative measurements or range finding and checking the effectiveness of (personal) control measures are other aims of measurements mentioned. The measurement strategy number of samples, duration of sampling period, depends to a large degree on the requirements and budget of the client.

Over 50 percent of the interviewees use a measurement record form; often this form is not a part of a quality system, the form is not always filled in completely and the content of the forms can be very diverse. Storage of data is mostly in paper archives: only internal company health services use databases.

A translation of the Guideline developed by the Dutch Working Group, taking into account the results of the telephone survey and the input of the Society Meeting on this subject, is attached (Appendix I). The data elements selected to contain the core information to ensure proper interpretation, now and in the future, of personal exposure measurements are summed up in Table I. The definitions of the terms used are stated in Table II.

TABLE I
Core data elements for storing measurement data of exposure to chemical substances

Category	Data element	Type/pick list
Company	Name	
	Location	
	Workplace	
Activity	Process	Free text or code
	Tasks	Free text or code
Product/substance Identification	Product	
	Name of measured substance	
	Substance code	
Determinants of exposure	Specification component	CAS no.; EINECS no.
	Exposure pattern during sampling period	Continuous, intermittent
	Pattern of technical control	Closed system/Local exhaust ventilation/ Separation/General ventilation/Other (free text)
	Identification code employee	
Measurement strategy	Respiratory protective device used	Yes/no
	Space	Confined space/inside/ outside
	Measurement strategy	
	Procedure of measurements	<i>Sampling:</i>
Date of sampling		
<i>Nature of sample:</i>		Single or duplicate (multiply) Serial or non-serial
<i>Sample times:</i>		24 hours clock
Sample duration		Minutes
Exposure times		Minutes
Sampling method		Description
<i>Analysis:</i>		
Analytical method		Description
Results		Measured concentration
	Unit	mg.m ⁻³ , ppm, fibers.ml ⁻¹
References	Reference of measurement report	

TABLE II
Definitions and examples of data elements

Data element	Definition	Example
Analytical method	A description (for example a code) of the analytical method	NIOSH method 4000 (toluene, passive sampling); NMAM 4th ed.
CAS no.	The identification number assigned by the Chemical Abstract Services	71-43-2 (benzene)
Closed system	The manufacturing/handling of the substance is taking place in a fully closed system	A reaction tank which does not emit substances
Confined space	A space where dangerous vapors or gases and a deficit of oxygen may occur, causing a risk of stupefaction	Tank, barrel, sewer
Continuous (exposure pattern)	It is assumed that no large variability in exposure concentrations occurs during sampling	A welder who performs more or less the same tasks for eight hours and is exposed to welding fumes.
EINECS no.	The number of the substance on the list of the European Index of Existing Chemical Substances	200-001-8 (formaldehyde)
Exposure pattern	The pattern of variability in exposure concentrations to the sampled substance	continuous/intermittent
Exposure time	Duration of exposure. The sample collected is supposed to be representative for this period. The exposure time is equal to or longer than the sampling time	400 minutes
Identification code employee	Codes of employees used for distinction of samples collected with several employees or with the same employee. A code is being used for privacy protection	5321
Inside	A space closed on all sides, but not confined	A regular workspace
Intermittent (exposure pattern)	It is assumed that exposure concentrations are variable during sampling	Exposure to welding fumes on several occasions during the day
Location	The visiting address of the company where the sampling takes place	Street 12, 1245 ZZ, Town city
Measured concentration	The amount of substance per volume unit air (average over the sample time)	29; also a unit should be mentioned.
Measurement strategy	A description on why and how samples are being collected, or a reference to a clear description	Every month on randomly chosen working days two samples to determine the probability of exceeding the OEL
Name	The name of the company where the sample is collected	Offset Splash ltd.
Name of measured substance	The most commonly used name of the substance	Acetone, respirable dust, mancozeb
Non-serial sample	The sample concerned is no part of a serial sampling (for example to approach the exposure during a day with several samples)	One personal sample collected during the full working day
Outside	Not inside or confined space	
Pattern of technical control	The (main) technical control measures which are used to prevent or decrease exposure to the substance. Non-effective technical controls will not be recorded or will be recorded with a remark on lack of effectiveness	Local exhaust ventilation, separation, general ventilation, use of dust free product in pellets, etc.

(Continued on next page)

TABLE II
Definitions and examples of data elements (*Continued*)

Data element	Definition	Example
Personal (type of sample)	The sampling is performed with a personal sampling device	A diffusion batch attached to the collar of the employee
Process	Series of manufacturing tasks relevant for the interpretation of the sample results	Bagging the polyethylene pellets
Product	Name of a product, chemical intermediate, or side product, from which the measured substance is derived. It is advised, if possible, also to record relevant information on the composition of the product. When measuring a solvent of paint, the percentage of the solvent in this paint is a relevant item	Eurocol 405 (contains 5% toluene), coaltar, welding fume (welded material:stainless steel), etc.
Reference of measuring report	A reference to the report (recorded electronically or on paper) in which more details of the sample are recorded.	Measurement form HM96-204
Respiratory protection device used	Have respiratory protection devices been used by the measured worker; if so, specify	Yes, a half facial mask during paint spraying
Sampling duration	The total period (minutes) the sample is collected, exclusive the periods the sampling is stopped	60 minutes
Sampling date	Date of the day the sample is collected (dd-mm-yyyy; when sampling around midnight the starting date)	03-08-1995
Sampling method	A description (for example a code) of the sampling method used	NVN 2948/2958, 1992 (toluene actively with Tenax tubes) MDHS 14, 1993 (respirable dust, GV filter in sampler with cyclone)
Sampling times	Start and stop times of sampling (24 hour clock)	11:22–15:15
Semi-personal sample	Sample collected with a non-personal sampler but as much as possible in the breathing zone of the worker	Sampling with a MIRAN near a person, holding the opening of the sampler in the breathing zone
Serial sample	The sample is part of a sequence (in separated time ranges) and the result of the sample can be used (with the other rserial samples) to calculate average exposure over eight hours or working day	One of the tree consecutive samples collected on the same employee in one shift.
Single sample	Not a duplicate sample	
Space	The type of room where the sample is collected or where the employee works during sampling	Confined space/inside/outside
Substance code	Clear identification of the sampled substance	Preferably CAS. no. or EINECS no.
Tasks	The activities carried out by the employee during the sampling period (description or code)	Weighing, grinding, filling, melting, etc.
Type of sample	The context of the sample in relation to other samples. A combination of possibilities should be addressed. Duplicate or serial samples should be recorded in such a way that the related samples can be easily traced back.	Single/duplicate/multiplicate Serial/non-serial
Unit	Unit in which the measured concentration is expressed.	ppm, mg.m ⁻³ , fibers.ml ⁻¹
Workplace	A specific place on the location where the sample has been taken	The bagging section of the pigment section The mix room of the paint factory The welding line

DISCUSSION

The results of the telephone survey were not representative statistically, but a good and consistent indication of the way occupational hygienists are recording the personal exposure measurement data in The Netherlands at the moment.

Conclusions of the telephone survey:

- The effort was relatively small, but the overall picture is consistent;
- A lot of measurements of personal exposure to chemicals are done in The Netherlands each year;
- Data gathering uses diverse strategies and formats;
- A variety of data elements is stored, but storage generally is on paper only;
- There is support and a need in The Netherlands for a guideline describing which data should be stored.

The core information for personal exposure measurements recommended in the Dutch Guideline is the result of the field experience of the members of the working group, the input from the Dutch Society of Occupational Hygienists, Dutch authorities, industry, labor unions, and occupational physicians. However, these recommended data elements will without any doubt be supplemented with other (locally) relevant data elements when implemented in practice.

The goal of the Guideline is to describe the minimum required data elements for proper interpretation of the results of personal exposure measurements, even after several years by another person. Using this approach one of the goals of the European Working Group, sharing and exchange of databases, was not addressed specifically, but if in the future the recommended selection of data elements is recorded (in an electronically stored database) this guideline will facilitate the possibility of the exchange of data.

RECOMMENDATIONS

The core information identified in the Dutch guideline should be recorded when personal exposure measurements in the working environment are reported. Storage of data in an electronic database has the advantage of rapid accessibility of the data.

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DEFINITIONS

In this guideline the following important terms are used:

Core data: the data that minimally should be recorded when collecting personal samples in the working environment so as to ensure a proper interpretation of these measurements currently and in the future.

Personal sampling: samples performed to determine the personal exposure of an employee by determining the concentration of a chemical substance in the breathing zone of that employee. Two sorts of measurements are included:

Personal Air Sampling: measurements using portable equipment on the person to be monitored;

Semi-Personal Air Sampling: measurements not performed with portable equipment, but sampling air from the breathing zone of the person to be monitored and as such resembles personal sampling.

REFERENCES

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APPENDIX I

RECORDING OF DATA OF INDIVIDUAL MEASUREMENTS OF OCCUPATIONAL EXPOSURE GUIDELINE OF THE DUTCH SOCIETY OF OCCUPATIONAL HYGIENE (OCTOBER 1999)

Summary

This Guideline of the Dutch Society of Occupational Hygiene describes the minimum data elements to be recorded when performing personal sampling in the working environment. The goal of the guideline is to ensure that the results of the personal sampling in the working environment are identified by core information and stay valid for proper interpretation in future. The guideline describes the “Best Knowledge” in the area of data element collection minimal needed for interpretation. It addresses mainly what data elements should be recorded as a minimum and only briefly indicates the way to record these. This guideline is based on the recommendations of the European Working Group on Exposure Databases.⁽¹⁾

Structure of the Guideline

In the guideline the following subjects are described:

- goal, application area, and target group;
- context;
- references;
- definitions (of the main notions); and
- explanation.

The data elements minimal needed for recording (core data) are displayed in Table I. In Table II definitions of several terms used in Table I are described.

Goal, Application Area, and Target Group

Goal

The goal of the guideline is to give guidance to the recording of minimal data elements concerning *personal sampling* in the working environment for proper interpretation of these samples now and in the future.

Application Area

The guideline is only applicable to the recording of data elements of personal sampling. These samples should be collected with a method guaranteeing that the sampling takes place in the breathing zone of the employee.

The guideline does not (or only briefly) prescribe(s):

- how data elements should be recorded;
- which procedures need to be used to guarantee the quality of the recorded data elements;
- who is responsible for, or owns the recorded data;
- who has access to the recorded data elements and how these should be shielded from abuse.

Target Group

The target group of the guideline is anybody who performs personal sampling in the working environment and/or interprets (such as occupational hygienists, occupational paramedics, health and safety professionals, safety officers, occupational physicians, and scientists).

Context

In The Netherlands there are hardly any regulations prescribing which data elements of sampling should be recorded and

archived. The Dutch Working Conditions Act (1998) requires determination of the nature, the scale, and duration of exposure to substances which may endanger the health of or are a nuisance to the employees (art. 4.2). Some regulations pertain to specific substances, like substances “toxic for fertility” (art. 4.13), carcinogens and carcinogenic processes (art. 4.14, 4.15, and 4.24), vinyl chloride monomer (art. 4.29 and 4.33), asbestos (art. 4.50 and 4.53), and lead (art. 4.67 and 4.69).

According to article 10 paragraph 3 of the European Council Directive 98/24/EC of 7 April 1998 (Chemical Agents Directive) health data and exposure data files should be kept (stored) in an appropriate form so as to ensure consultation at a later date, taking into account the medical secrecy status of the data. Furthermore, neither legal frame work nor the standard NEN EN 689 prescribe exactly which data elements should be recorded and archived concerning personal samples in the working environment.

The recording of sample data also adds value to the following issues:

- the employee wants to be sure his or her health will not be endangered during his working lifetime;
- the employer wants to ensure his or her legal obligation for the employees’ health and safety care has been performed properly and his liability is minimized; the scale of the liability could be determined by the level and quality of exposure;
- the Labor Inspectorate wants proof of an effective level of control;
- the Dutch Social Economic Advisory Board (SER) needs high-quality data when deciding on which standards are socially acceptable and financially or technically obtainable;
- risk assessments in a European framework need well documented exposure data;
- epidemiologists and risk analysts use exposure data for determining dose-response relations.