Guidelines for personal exposure monitoring of chemicals: Part V

Expert Division of Occupational Hygiene & Ergonomics, the Japan Society for Occupational Health, “The Committee for Personal Exposure Monitoring”
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Abstract: This Document, “Guidelines for personal exposure monitoring of chemicals” (“this Guideline”), has been prepared by “The Committee for Personal Exposure Monitoring” (“the Committee”) of the Expert Division of Occupational Hygiene & Ergonomics, Japan Society for Occupational Health. Considering the background of the growing importance of personal exposure monitoring in risk assessment and the need to prepare for the introduction of monitoring using personal samplers from an administrative perspective in recent years, the Committee was organized in November 2012. The Committee has prepared this Guideline as a “practical guideline” for personal exposure monitoring, so as to offer proposals and recommendations to the members of the Japan Society for Occupational Health and to society in general. The scope of this Guideline covers all chemical substances and all related workplaces regarded as targets for general assessment and the management of risk. It thus is not to be considered to comment on legal regulations and methodology. The main text provides the basic methods and concepts of personal exposure monitoring, while 31 “Appendices” are provided in this Guideline throughout the series; technical descriptions, statistical bases, and actual workplace examples are provided in these appendices, to assist better understanding. The personal exposure monitoring described as per this Guideline is equivalent to an “expert-centered basic method to reasonably proceed with the assessment and management of risk at workplaces.” It is considered that practicing and expanding on this method will significantly contribute in reforming the overall framework of occupational hygiene management in Japan.
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Key words: Chemicals, Control, Exposure monitoring, Occupational hygiene, Risk assessment, Workplace

Chapter 2: Method for Personal Exposure Monitoring

7. Reporting

In general, a monitoring report shall be submitted by a risk assessment supervisor to the manager of the workplace. The contents of such a report include the purpose and method of monitoring, the measurement results, the assessment and evaluation of the results, a recommendation for control measures, and a proposal for control measures. While it is true that in neither Europe nor the USA is a report format specifically formulated or in circulation, each enterprise or consultant does sometimes
measure has been carried out, necessary action shall be
implemented. If they have not been implemented, the super-
visor would urge or assist the personnel responsible to
implement them. If any "changes" occur in a workplace after the control
measures (steps 1 to 9 in Fig. 2.1) would enhance workplace management. The management of change allows war-
ranty of good safety even when the interval of reassess-
ment and monitoring is not kept constant but is rather ex-
tended (please refer to the next section). On the other
hand, in the case of statutory Working Environment
Measurement, if management of change is not actively
considered, it can be interpreted that periodic measure-
ment (for example every six months) is required without
exception. The concept of this "management of change"
has also now become widespread in Japan. The "Guide-
lines for investigating dangerousness or toxicity due to
chemical substances (Guideline No. 2, March 30, 2006)"
also specifies "when changing equipment, raw materials,
work methods, and work procedures" as one of the imple-
mentation timing involved in "investigating dangerous-
ness or toxicity."

8. Follow-up (implementation of control measures, reass-
essment, and monitoring)

8-1  Execution and verification of control measures, and
management of change

The responsibility of implementation of the control
measures lies with the manager. In order to ensure the im-
plementation of the planned control measures, it is effec-
tive to incorporate the recommendations from the risk as-
essment supervisor into the existing mechanisms of a
business establishment (such as the safety and health
committee and the occupational and health management
system [if operated]), and to observe until the control
measures are completed.

Following the issuance of the report, after a correct in-
terval, the risk assessment supervisor shall verify whether
or not the control measures recommended have been im-
plemented. If they have not been implemented, the super-
visor would urge or assist the personnel responsible to
implement them.

If any "changes" occur in a workplace after the control
measures have been carried out, necessary action shall be
taken based upon the changes. This is referred to as
"management of change." Management of change is a
procedure in which the risks (here exposure) associated
with changes, such as changes in the chemical substances
used, introduction of new substances, modification of
equipment, or changes in the process or procedure, are re-
assessed and the necessary actions are taken. The overall
responsibility for the management of change, that is the
supervision of changes as well as the execution and com-
pletion of the assessment and management of risks associ-
ated with the changes, lies with the manager (eventually
an employer). A risk assessment supervisor should always
receive information on changes from the manager, and, in
the case of any changes occurring, the supervisor shall
perform reassessment and monitoring as well as addi-
tional control measures from an expert point of view.

Such repetition of the personal exposure monitoring proc-
ess (steps 1 to 9 in Fig. 2.1) would enhance workplace
management. The management of change allows war-
ranty of good safety even when the interval of reassess-
ment and monitoring is not kept constant but is rather ex-
tended (please refer to the next section). On the other
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ness or toxicity."

8-2  Reassessment and monitoring

After proceeding with the overall process of personal
exposure monitoring and implementation of the control
measures (steps 1 to 8, and the first half of step 9 of Fig.
2.1), after a certain interval, a risk assessment supervisor
shall reassess the workplace in order to verify whether or
not any changes have arisen in the exposure condition and
also whether the control measures recommended are ef-
fectively maintained.

Here, "reassessment" and "re-monitoring" are defined
separately. The definition of reassessment is that a risk as-
essment supervisor would inspect a workplace, conduct a
hearing with the manager, and re-estimate the exposure
of SEGs and compare with the previous results. The in-
spection and hearing shall be similar to the (initial) "basic
characterization of workplace." The definition of re-
monitoring, on the other hand, is to perform additional
measurements as necessary. Reassessment is performed
initially, and the necessity for re-monitoring is determined
based on the results. If performed, the results of reassess-
In general, reassessment and re-monitoring shall be performed periodically. Their frequency would vary according to the control class determined at the time of the previous assessment based upon the results of exposure monitoring as well as other factors. Specific examples of this approach are shown in Table 2.9. For the control classes 3, 2B, or 2A, the basic frequency for reassessment and re-monitoring shall be six months. For the control classes 1C, 1B, or 1A, the basic frequency for reassessment shall be six months to two years according to the control class, while that for re-monitoring shall be six months. For the control classes 3 or 2B, it is considered inappropriate simply to conduct “reassessment and monitoring after six months.” The exception may include a special situation in which reassessment and monitoring after six months are performed in order to verify the appropriateness of the conditions, when large-scale, time-consuming equipment measures are planned, and the work is required to progress by the temporary wearing of respiratory protective equipment.

Although the interval of monitoring may be reduced for the relatively “bad” control classes (classes 3, 2B, 2A), frequent monitoring is not the primary purpose of control, or it is not a penalty for a bad work environment. If there are reasons for high exposure, the frequent monitoring would not improve the work area in any way. In other words, exposure reduction measures shall be implemented prior to spending energy for re-monitoring that leaves the bad control situation. In this sense, it is advisable to study the possibility of the introduction of new or additional control measures at the time of reassessment. At the same time, the current risk reduction measure shall be verified and thoroughly implemented. These include maintenance of the local exhaust ventilation equipment and proper control of the respiratory protective equipment if it is indispensable (appropriate protection factor for exposure, replacement frequency of absorption tubes, fit test of respirator, etc.).

Reassessment and re-monitoring have a range of modifiable frequency (the frequencies provided in parentheses in Table 2.9). For the control classes 1B or 1A, the range for reassessment can be extended up to three years, re-monitoring for up to three to five years. These ranges may be set as follows: to set “the next reassessment after ‘a’ years,” and re-monitoring after “b” years” at the time of initial (or previous) assessment and monitoring; to set “the next reassessment after ‘a’ years” and to determine the necessity for monitoring depending on the result of reassessment after ‘a’ years.

Table 2.9 also shows basic intervals, while the ranges of modifiable frequency according to conditions are given in parentheses. When the frequency changes for any reason, it shall be documented in a clear manner. Depending on the particular situations, new intervals (longer or shorter) may be set as exceptions. With the above mechanism, undesirable situations, such as if a specified monitoring is continuously performed even when the “first control class” has continued for many years, which occurs frequently in Working Environment Measurement, can be avoided.

In the case of control classes 3 or 2B, in which risk reduction measures are required (Table 2.3), control measures shall be implemented as soon as possible. In this case, reassessment or re-monitoring shall be performed soon after the implementation of the control measures. As mentioned above, the frequency for subsequent reassessment and re-monitoring shall be determined. In other words, for control classes 3 or 2B, it is considered inappropriate to conduct “reassessment and monitoring after six months.” The exception may include a special situation in which reassessment and monitoring after six months are performed in order to verify the appropriateness of the conditions, when large-scale, time-consuming equipment measures are planned, and the work is required to progress by the temporary wearing of respiratory protective equipment.

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Such “decision of frequency” shall be determined by a risk assessment supervisor through overall consideration of the future exposure risk of an SEG on the basis of the following factors 1) and 2) (Table 2.10):
In order to ensure appropriate judgment, experienced and highly skilled risk assessment supervisors are particularly required. If, however, they have inadequate experience and skill levels, it is recommended that the basic frequency (outside the parentheses) in Table 2.9 be followed. The frequency can be flexibly determined once the supervisor gains experience. Additional explanations on the overall judgment for 1) and 2) above are provided in the appendix (please refer to Appendix 23).

Table 2.9 shows the frequencies of reassessment and monitoring for eight hours (one shift) exposure. It does not show the frequencies for exposure for a short duration task. In the case of a short duration task, it is difficult to determine the frequencies of reassessment and monitoring due to such additional factors such as work hours and the task frequency. It is based upon the principle that the lesser the control class, the higher the frequency becomes. A risk assessment supervisor shall make an appropriate judgment.

9. Actual Personal Exposure Monitoring

The following appendices indicate several model examples for personal exposure monitoring that have been performed in actual workplaces according to the procedure contained in this Guideline (please refer to Appendices 24 to 28):

Appendix 24: Eight-hour monitoring (test work, organic solvent)
Appendix 25: Eight-hour monitoring (painting work, organic solvent)
Appendix 26: Eight-hour monitoring (production of vinyl chloride compounds, lead particles)
Appendix 27: Short term monitoring (sampling work, chemical substances)
Appendix 28: Short term monitoring (tank truck loading work, gasoline, monitoring more than 15 minutes).

Table 2.10. Factors for judgment in determining the frequency of reassessment and monitoring

<table>
<thead>
<tr>
<th>Factors for judgment</th>
<th>Typical contents</th>
</tr>
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<tbody>
<tr>
<td>1) Initial (previous) control class</td>
<td>-</td>
</tr>
<tr>
<td>2) Factors related to exposure risk</td>
<td>Toxicity (carcinogenicity), occupational exposure limit, etc.</td>
</tr>
<tr>
<td>(i) Degree of toxicity of substances to be handled</td>
<td>Level of skill and experience of risk assessment supervisor</td>
</tr>
<tr>
<td>(ii) Reliability of control class (*)</td>
<td>Measurement accuracy (number of samples, monitoring duration)</td>
</tr>
<tr>
<td></td>
<td>Number of times of past monitoring (accumulation of data)</td>
</tr>
<tr>
<td></td>
<td>Quality and quantity of referred alternatives (results of similar SEG)</td>
</tr>
<tr>
<td></td>
<td>Effectiveness of equipment measures (local exhaust ventilation equipment, etc.)</td>
</tr>
<tr>
<td></td>
<td>Amount of substances to be handled (trace amounts)</td>
</tr>
<tr>
<td></td>
<td>Volatility of substances to be handled (very low), etc.</td>
</tr>
</tbody>
</table>

*Includes the reliability of: the control class determined previously, the results of the current assessment and monitoring, and the fact that the control class will be continued in future.
Conflicts of interest: None declared

Supplementary material: This article contains supplementary material (Appendix), which is available in the online version (doi: 10.1539/joh.2018-0060-RA)