SAFETY GUIDELINE SG-SH-4-0-1

NOISE AT THE WORKPLACE
1 INTRODUCTION

1.1 Purpose and scope

Safety Guidelines provide detailed instructions as to the implementation of a CERN Safety Rule. Compliance with a Safety Guideline provides a presumption of conformity with the associated CERN Safety Rule. Unless a CERN Safety Rule stipulates it to be binding, deviation from a Safety Guideline is permitted but requires a demonstration to the HSE Unit by the Department or Large Experiment concerned that compliance with the relevant CERN Safety Rule is maintained.

This Safety Guideline provides guidance as to the implementation of General Safety Instruction "Protection of Workers against Noise" (hereafter GSI-SH-4) in particular with regard to the evaluation of the Noise exposure risk of Workers and Noise control.

1.2 Risks linked to Noise exposure

Exposure to Noise above a given threshold can damage a person’s hearing. The exposure and action limits and the associated actions defined in GSI-SH-4 are primarily designed to prevent this risk.

Exposure to Noise can however also cause other adverse health effects, such as nervousness, increased blood pressure or sleeplessness. Certain Noise levels, can affect concentration, hinder verbal exchange or prevent Workers from perceiving warning signs. This is why Noise control is important.

Finally, it should be noted that sensitivity to noise can vary amongst individuals. An individual Worker can feel an auditory discomfort at a noise level that does not disturb the majority of his/her co-Workers.

Below you will find a scale of Noise levels with their associated risks and actions.
2 EVALUATION OF NOISE EXPOSURE

2.1 Evaluation of Noise exposure risk at the workstation

According to article 2.2.1 of GSI-SH-4 each Worker together with his/her Supervisor shall check regularly whether there is a risk of exposure to Noise at the workstation. This check should be carried out at least once per year and be recorded in the form OHS-0-0-3.

2.1.1 Risk of Noise exposure limits being reached

The Worker and his/her Supervisor must in particular check whether there is a risk of any exposure- or action limit, as defined in article 3 of GSI-SH-4, being reached or exceeded. There are a number of elements that can help Workers or Supervisors in this task. The figure in section 1.2 gives an indication of activities where action limits may be reached.

Furthermore, according to article 3.2 of GSI-SH-4, Organic units responsible for premises where action limits for Noise are reached or exceeded must put into place appropriate signage, amongst other actions.

Examples of such signage are given below:

The Daily Exposure Level of Workers posted in premises where such signage is present should be systematically calculated (cf. section 2.1.3).

The HSE Unit has further established a map with qualitative Noise risk levels in CERN buildings. The map is available on the GIS Portal at https://gis.cern.ch

It was established based on a screening method proposed by the INRS (Institut National de Recherche et de Sécurité) called "oral communication test" where the risk level is estimated based on the possibility of two people being able to orally communicate.

The risk levels are divided into 4 categories:

<table>
<thead>
<tr>
<th>Level</th>
<th>Risk</th>
<th>Comments</th>
<th>Corresponding colour on GIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Definite risk level</td>
<td>Corresponding possible noise level &gt; 80 db(A)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Uncertain risk level</td>
<td>Somewhere in between Level 0 and 2</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>No risk</td>
<td>Corresponding possible noise level &lt; 80 db(A)</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Risk not assessed</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

1 To access it: Click on the "Data" tab -> "Thematic Map" -> "Safety Management" -> "Noise Risk"
For premises where the risk level is 1, Noise measurements should be performed at the workstation to determine the exact Noise exposure level.

For a Worker posted in a building where the risk level has been estimated at 2, the Daily Exposure Level shall systematically be calculated (cf. section 2.1.3).

Should you as Worker or Supervisor have any doubt as to the Noise exposure risk to which yourself or your supervisee may be exposed, please contact the HSE Unit for assistance.

2.1.2 Recommended Noise Exposure values

The recommended values for Noise exposure at the workstation depend on the activity and are defined in article 4.1 of GSI-SH-4. They are reproduced below for convenience:

<table>
<thead>
<tr>
<th>Activity type</th>
<th>Values in dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial 2</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>Office work or production work similar to office work, monitoring work, control rooms or workstations in a room with IT servers</td>
<td>&lt; 55</td>
</tr>
</tbody>
</table>

The values above shall take account of all Immissions at the workstation, except for communication associated with the workstation itself (e.g. telephone, conversations, etc.).

For highly complex activity requiring particular concentration, such as mechanical manipulation with high precision, detector assembly or research it is recommended to decrease the values above by 10 dB(A).

Compliance with the recommended values above will normally ensure a satisfactory work environment for their activity for the Workers concerned.

Exceeding these values will not cause any damage to the hearing of the Workers concerned as long as the exposures limits and associated actions, as defined in article 3 of GSI-SH-4, are respected. It may however cause some discomfort to the Workers and reduce their effectiveness.

Auditory discomfort expressed by a Worker shall be addressed as far as reasonably possible, preferably by technical or organisational Noise reduction measures or, if these cannot be implemented, by the use of personal protective equipment (PPE). The HSE Unit may carry out Noise measurements at the workstation of the Worker concerned at his/her or the supervisor’s request. Please note that auditory discomfort should be addressed even where Worker is posted at a workstation where the recommended values are respected.

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2 Activities of industrial nature are considered where the predominant noise sources come from the use of machinery and/or process infrastructures.
2.1.3 Evaluation of the daily exposure

When a Worker is posted at a workstation where there is a risk of a Noise exposure- or action limit being reached, the Daily Exposure Level of the Worker concerned shall be evaluated by using Safety Form SF-SH-4-01. SF-SH-4-01 is based on a methodology recognised in particular in France, Switzerland and the UK. The methodology provides an equivalent 8 hour Daily Exposure Level based on the environment of the workstation.

The estimation shall only consider Noise sources associated with the workstation. Exposure during lunch breaks or activities not directly related to the work (such as listening to music) are not taken into account.

Please note that the noise levels do not take into account the use of PPE.

Calculation method:
Noise exposure is calculated based on the integral of the A-weighted quadratic sound pressure as a function of time:

\[ E_{AT} = \int_{0}^{T} p_A(t)^2 dt \quad [Pa^2 \cdot h] \]

Assuming a reference period of 8h and a corresponding sound pressure (equivalent noise level during that period), the noise exposure can be expressed by:

\[ E_{AT} = 0.32 \cdot 10^{-8} \times \frac{T}{8} \times 10^{0.1 \times L_{eq,8}} \quad [Pa^2 \cdot h] \]

Figure 1 illustrates the set of values ranging from 15 minutes to 8 hours of exposure time to a certain noise level. The colour code (green, orange, red) corresponds to the different action levels mentioned in article 3.1.2 & 3.2.1 of GSI-SH-4³.

³ Green – no action; Orange – article 3.1.2.1 & 3.2.1.1 of GSI-SH-4; Red – article 3.1.2.2 & 3.2.1.2 of GSI-SH-4
Some examples of Daily Exposure Level calculations are given below:

**Example 1 – Morning task**

Worker subject to a noise level of 86 dB(A) during 3 hours

- Equivalent (8h) daily exposure level = 81.7 dB(A)
Example 2 – 8h/day work
Worker subject to:
- Noise level of 79 dB(A) during 30 minutes
- Noise level of 86 dB(A) during 3 hours
- Noise level of 81 dB(A) during 30 minutes
- Noise level of 75 dB(A) during 4 hours
  ➢ Equivalent (8h) daily exposure level = 82.5 dB(A)

Example 3 - 10h/day work
Worker subject to:
- Noise level of 86 dB(A) during 3 hours and 30 minutes
- Noise level of 80 dB(A) during 30 minutes
- Noise level of 76 dB(A) during 4 hours
- Noise level of 87 dB(A) during 2 hours
  ➢ Equivalent (8h) daily exposure level = 85.1 dB(A)
3 **NOISE CONTROL**

GSI-SH-4 encourages Noise control. To this end Organic units conceiving and building new Installations, modifying existing ones or purchasing equipment or bringing equipment on site shall evaluate the impact in terms of Noise exposure related to these operations and take all reasonable measures to minimize it. The impact in terms of Noise exposure shall be evaluated for all premises and Workers that can be affected, taking account of their activities.

For the optimization of Noise levels in a new Installations existing Noise sources in the surroundings shall be taken into account.

To achieve the recommended Noise levels defined in article 4.1 of GSI-SH-4 the following Background Noise levels should be considered:

<table>
<thead>
<tr>
<th>Type of room</th>
<th>Noise level dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference rooms</td>
<td>30 to 35</td>
</tr>
<tr>
<td>Classrooms</td>
<td>30 to 40</td>
</tr>
<tr>
<td>Individual officers</td>
<td>30 to 40</td>
</tr>
<tr>
<td>Multi-person offices</td>
<td>35 to 45</td>
</tr>
<tr>
<td>Laboratories</td>
<td>35 to 50</td>
</tr>
<tr>
<td>Control rooms</td>
<td>35 to 55</td>
</tr>
<tr>
<td>Industrial workplaces</td>
<td>65 to 70</td>
</tr>
</tbody>
</table>

4 **NOISE MEASUREMENTS**

Noise measurements are carried out upon request by the HSE Unit. They can also be carried out by an specialised company or by a competent person.

Certified class 1 sound meters shall be used for the measurements. The sound metres must be checked or calibrated at least once every 2 years by an accredited company.

The measurement methods to be used are defined on a case-by-case basis by the HSE Unit. They relate primarily to operational conditions, i.e. the position of the sound meter, the operating mode of the equipment (off, low/nominal/full power), the distance of the sound meter from the source or sources, etc.