Respiratory protection safety guidelines

TLV MAK: It refers to the maximum concentration which is allowed to be present in ambient air on the assumption that it would not be harmful in terms of health for a daily work period of eight hours. Measurement is taken by using detector tubes or portable devices. Final result is obtainable only upon an analysis of the samples in a work hygiene Laboratory. The following table provides MAK values of some substances in terms of PPM (particles per million) or mg/m³ (milligram per cubic meter) on an illustrative basis.

According to ILO

<table>
<thead>
<tr>
<th>Substance</th>
<th>MAK Value (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl alcohol</td>
<td>1000</td>
</tr>
<tr>
<td>Ammonia</td>
<td>20</td>
</tr>
<tr>
<td>Benzene</td>
<td>25</td>
</tr>
<tr>
<td>Lead</td>
<td>0.15 mg/m³</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>5000</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>50</td>
</tr>
<tr>
<td>Ozone</td>
<td>0.1</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.01</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>5</td>
</tr>
<tr>
<td>Toluene</td>
<td>50</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>50</td>
</tr>
</tbody>
</table>

In the event that a hazardous substance is detected in the environment, improvement and protection measures must be applied. These measures must be treated under three groups – At source, in the environment and on employees.

A. Measures to be taken at source

This part deals with the measures to render any problematic factors hazardous for humans before their dissemination in the environment or prevent their dissemination in the environment.

1. Use of less hazardous or non-hazardous substances:
For instance, in case of use of toluene instead of benzene (benzyl), this would eliminate the risk for cancer in which case it would be highly difficult to attain MAK value, which is 200 ppm for toluene.

Gasoline is used by many workplaces to clean machinery parts. Kerosene or diesel oil may be used instead of this substance, which may lead to serious lead poisoning as well as fire risks. Employees mostly clean their hands with solvents such as thinner. However, it is much more cost effective and healthier to use soft soap mixed with fine

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wood chips instead of such substances, which would cause occupational skin and rheumatoid diseases.

2. Replacement of operations:
For instance, application of non-pneumatic gun technique instead of gun paint spreading plenty of paint and thinner in the work premises or use of brushes if the situation allows this would achieve savings on both paint and thinner volumes and at the same time, this could cause less pollution in the ambient air.

3. Application of wet methods:
This method, which is particularly helpful with suppression of dust before mixture with the ambient condition, proves very useful in the mining operations. For instance, regular supply of water into the operating point as part of boring operations and wetting any piles, which would be unloaded, with water would render the setting much healthier in terms of work hygiene.

4. Use of suitable aspiration system:
This method, which ensures that substances such as gas, dust and steam are extracted and discharged outside at source without release into the immediate setting, is unfortunately applied in many workplaces and it sometimes inflicts damages, rather than producing benefits. The system, which is used in this regard very extensively, involves fume hoods having natural or forced draught fume hoods; However, these systems, which are built without taking into account the properties and exit speed of such substances intended not to be mixed into the setting fail to prove useful and even in some cases, they develop a more intensive setting at the level of the noses of the employees, thus increasing risks in connection therewith. However, a lateral draught system to be applied to the operating point on the counter would radically solve this problem.

As a complementary part of all of these measures, an adequate and effective maintenance program must be implemented.

B- Measures to be taken in the workplace setting
✓ Workplace order, Cleanliness (GMP):

A disorderly workplace would reduce work efficiency and at the same time, it would also increase the risk of work accidents and substances such as wastes, scraps, etc., (like washing residues, cotton wastes / oakum, dust, etc.) which are generated as a result of work could negatively affect health.

C- General aspiration:
Aspirators, which are used in order to discharge polluted air in the workplace, may well cause damages failing to produce any benefits if they are not used consciously at appropriate locations as explained in the part, local aspiration. The first issue to be considered in this context is to ensure that there is effective ventilation of the level of air breathed by employees. Such aspirators, which are randomly installed on the
windows, ceilings or walls without calculation thereof, sometimes mix much more polluted air into the level of breathing. Therefore, lateral and bottom draughts must be provided if necessary. Another issue to be considered is that a general aspiration system must not have such a structure and output to weaken the effect of local aspiration systems.

**Dilution ventilation:**
As hazardous substances are discharged by means of local aspiration in settings such as entirely enclosed workshops and divisions on the one hand, necessary clean air must be supplied inside by means of another system on the other hand.

**Regular detector control:**
After the measures explained above as well as other appropriate measures are taken, the setting must be controlled by means of special detector cylinders or detection devices with respect to such substances or factors, which frequently cause problems, and thus, adequacy of the measures taken must be inspected and if required, new measures must be taken.

**D- Measures to be taken on the devices:**

**Training:**
Work Health and Work Safety training courses, which would be held on the subjects of specific risks to be faced by employees, methods of protection against them and methods of ensuring compliance with the measures taken and repeated at certain intervals, are the most effective and beneficial measure with respect to the measures in connection therewith.

**Rotation or team replacements:**
Risks may not be entirely mitigated in some types of work although any measures are introduced as may be required by the nature of work. In such cases, work may be maintained by such teams, which would be replaced in such periods to be determined depending on assessment that would be made by the experts.

**Personal dosimeters:**
Whether there is actually a risk of impact may be determined by means of instruments called dosimeters to be mounted on such employees working with x-ray radiation, radioactive isotopes or some special chemical agents in particular and necessary measures are then taken accordingly.

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Personal protective gears:

Personal protective gears such as goggles, masks, gloves, helmets, etc., are such tools which would be applied as a final solution but must be strictly used if necessary. Such tools would be actually beneficial if users would be provided with awareness on specific risks against which they could be effectively used as well as on duration and time of protection thereof.

Adequate personal control program:

Examination of employees upon their inception and subsequent periodical medical checkups ensure early identification of problems and introduction of necessary measures and provision of their treatment accordingly would mostly be lifesaving.

RESPIRATORY PROTECTION MASKS

✓ Approved respiratory protection aids having appropriate types would be used in such cases where pollutants such as gas, steam, dust, etc., which mix into the ambient atmosphere due to work done and material used in work areas and exceed the (TLV) levels recognized as non-hazardous for health, could not be adequately discharged

✓ From the setting by means of methods like natural or artificial ventilation and aspiration. It is obligatory to use them in the restricted areas.

✓ Air pollutants have a wide distribution ranging from less hazardous particles to highly hazardous toxic gases.

✓ Selection of appropriate protective gears for respiratory protection is very important. For instance, dust retaining filters may not respond to solvent steam, hazardous gases or deficiency of oxygen.

✓ Filter respiratory protective gears cleaning the pollutants in breathed air may never be used in such settings having an oxygen level of less than 19.5 %.

✓ Dust masks must be put on during the preform crushing operation.

✓ Considering the general risks in our facilities, 3 types of respiratory protection devices are capable of meeting our requirements. Care must be paid at time of purchasing respiratory protectors that they have CE mark.

✓ Maintenance free protective respiratory masks:

They are such masks which are generally called “paper masks” in Turkey and produced as per the European standards, EN 149 and EN 405. These masks are capable of retaining particles, gas and steam in the air before they get into

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the body through the respiratory system by covering the mouth, nose and jaw. They must be used during gun painting, wooden cutting and cleaning works generating dust and particles. When their filters are full, they are thrown away and replaced. They can provide necessary protection only when:

- They fully fit on the surface
- They have impermeability features (impermeability feature is provided by dual rubber and nose band)
- They are not already filled by particles and dust to the full extent
- They are not damaged due to excessive use
- They are produced in compliance with the standards, holding quality certificates

They are available in different types and to different specifications. Such rubber masks without brands, which are marketed with their feature as being washable, have no actual protective properties. They are such products which are produced in violation of standards and therefore, should not be used.

- Protective respiratory masks (with cartridge filters) requiring maintenance

- **They have two types:** half and full face masks. Half face masks are produced in compliance with the European standard, EN 140; they are such masks with replaceable cartridge filters, which provide protection against particles, gases and steam by covering the nose, mouth and jaw.

- **Full face masks,** which are produced in compliance with the European standard, EN 136, are similar to the half face masks. Their only difference is that they have extra parts protecting the face and eyes.

- Masks must fit on the face fully and be sturdy and impermeable so that they may provide necessary protection.
- In case of oxygen deficiency, masks may not be used against extremely hot or cold weather or against such substances which are not indicated on the filter cartridges.
- Considering the risks preset in our facilities, such filters, which are used as combined filters, are used.

- The protection period is approximately 35 minutes but the method of breathing in each case would have a significant part in determining the period.

- These filters may not be used against carbon monoxide or oxygen deficiency. The standard type filters are used in such settings where the toxic gas density is maximum 0.5 % by volume.

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✓ The cartridge filters are such material subject to limited operation life and they must be disposed upon expiry of their life periods. The front and rear plugs of the filter should not be opened while they are held up without operation; they must be opened only when the masks are put on for operation. Any cartridge filters the plugs of which are opened, which are used once become non-reusable because they contact air.

✓ The operation life of a filter is indicated as the expiration date on the filter. When a filter, the expiry date of which ends, is used, difficulty and perspiration start because breathing resistance increases in the particle filters. In case of gas and steam filters, users feel a different odor and taste.

✓ It is required that the masks have good adaptation to the face and impermeability features. Mask users must have no beards and moustaches because beards and moustaches would reduce impermeability between the masks and faces.

**NOTE:** Because emergency response must be provided by minimum two persons, masks and filters must be available in adequate quantities to meet requirements of two persons.

### Respiratory protectors (respirators) with air supply lines

In the case of respiratory protectors falling in this class, breathed air is sent to the user’s mask via a hose. The air sent must be supplied from a source, which is clean and continuously controllable.

Although there are several types of such respiratory protectors, the type suitable for our facilities is the type whereby the user carries the air to be breathed in the compressed cylinder on his back. These protectors cause movement limitation to some extent due to weight and structural reasons thereof. However, they offer a major advantage for use in such locations where there is oxygen deficiency. These protectors are generally used together with a full face mask and provide total insulation from the ambient atmosphere.

The cylinder respiratory protectors provide total respiratory protection in such settings where there is oxygen deficiency or toxic gases exist.

It is obligatory that users have training on operation and maintenance so that they may use respirators safely.

Users must undergo health checkups at certain intervals before and after they are enrolled into the training programs (such as respiratory functions testing) Certificates must be given to such users who have received respirator training and undergone health checkups. Certificate holders are authorized to use respirators for a period of 1 year. Certificates of those persons who have apparent changes in their face appearances and suffer respiratory or lung diseases in this period, are cancelled.

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workplace doctor carries out necessary controls about the health status of such staff using these devices and investigates if there are any drawbacks for such persons to continue using the respirators and provides feedback to users in connection therewith. Special clothes made from substances such as Tyvek, neoprene, etc., must be used together with respiratory protectors in such settings having a risk of chemical agents contaminating the skin.

*Maintenance of these devices is made by authorized companies.*

*Figure 1 SCBA*