Personal Protective Equipment – Head Protection

1. INTRODUCTION

Protecting employees from workplace hazards is of paramount importance wherein employers are mandated in Local Order 61/1991, Article 38.4 to “Take every precaution necessary for the protection of the worker and ensure his safety from occupational illness or potential work accident”.

Thus, Dubai Municipality developed this technical guideline with the primary aim of protecting the employees from foreseeable head injuries ranging from bruise, impairment or in worst cases fatality.

Employers must properly identify hazards and be proactive in ensuring that safe systems of work are properly implemented, reviewed and revised as needed to reduce workplace hazards. Provision of safety helmets provides the last line of defence in protecting the employees head from impact and penetration hazards as well as from electrical shock and burn hazards.

Proper selection of the type of safety helmets should be considered based on the work type activity and risks at work. Selected safety helmet shall conform to international standards, be adjustable and comfortable to the user. Employees are required to use the provided head protection diligently while on work as directed by the employer or if any of the following hazards are present:

- Falling objects or debris from above that might strike the head.
- Presence of fixed objects and equipment that may bump or hit the head.
- Working around or below machines, conveyor belts or processes carrying parts or materials that might fall
- Possibility of accidental head contact with exposed energized conductors and other electrical hazards.

The use of safety helmet is always regarded as the last resort in risk control measures wherein elimination or minimizing the risks are considered first. Safety helmets do not prevent head injury accidents but only reduce the amount of force from an impact blow and cannot provide complete head protection against severe impact and penetration.
2. SCOPE

This technical guideline, shall apply to all commercial and industrial establishments, public or government institutions, including construction-related project sites in the emirate of Dubai.

This document provides guidance on proper selection, physical requirements, use, training, care, maintenance and replacement of safety helmets and does not cover bump caps, fire fighting helmets or head protection devices used in recreational activities.

3. DEFINITION

Accessories
A device intended to be mounted on or used with safety helmets.

Chin Strap
A strap which fits under the chin to help secure the helmet on the head.

Cradle
The parts of the harness which makes physical contact with the wearer’s head, excluding the other assembly of the harness such as the headband and nape strap.

Harness
The complete assembly which absorbs the kinetic energy during the impact and used to maintain a helmet in correct wearing position on the wearer’s head, exclusive of a chin strap or other retention device.

Headband
The part of the harness completely or partly surrounding the head above the eyes at approximately the largest horizontal circumference of the head.

Nape Strap
The adjustable strap located at the back of the head or the nape of the wearer to secure the helmet in place.
Safety Helmet
A type of Personal Protective Equipment (PPE) primarily intended to provide limited protection to the upper part of the wearer’s head against injury from impact, flying objects or electric shock.

Shell
The hard, smoothly finished material that provides the general outer form of the safety helmet.

4. GUIDELINES

A. Hazard Identification and Risk Assessment

The employer shall carry out hazard identification and risk assessment to identify the hazards which may result to head injury and evaluate the likelihood and severity of the injury associated with each hazard taking into account the adequacy of any existing controls.

Having completed a risk assessment and having taken account of existing controls, the organization should be able to determine whether existing controls are adequate or need improvement, or if new controls are required.

If new or improved controls are required, selection should be determined by the principle of the hierarchy of hazard controls which includes elimination or minimization through engineering, administrative and personal protective equipment controls.

Hazard identification should be conducted by a person(s) with competence in relevant hazard identification methodologies and techniques and appropriate knowledge of the work activity.

B. Safety Helmet Selection Criteria and Procedures

If the identified risks are still not eliminated or reduced to an acceptable level, the next step is to ensure that a suitable safety helmet is provided by the employer to the employees to further reduce the risks. Employers shall develop procedures in selecting suitable head protection wherein the helmets will offer the desired protection and comfort and not to create additional safety problems. Throughout the process of selection the following factors are needed to be accounted:
• **Anticipated potential hazards**

Workplace potential head injury hazards may come from different sources such as falling objects or debris, striking protruded objects such as scaffolds or beams, struck by swinging objects, exposed electrical conductors, etc. It is therefore important to select the appropriate type of safety helmet that will provide the necessary level of protection from anticipated potential hazards.

• **Appropriate accessories provided**

Selected safety helmet shall be compatible with other personal protective equipment such as eye, face, ear and respiratory protective equipment. Utmost attention should be observed that any additional helmet accessories and attachments are compatible to the safety helmet. Safety helmets shall not be modified or changed to fit other PPE's and other accessories unless written advice from the manufacturer has been sought.

Helmets selected for the workplace should be suitable for the actual working environment and whenever possible, will not hinder the work to be done. For example, safety helmets shall be fitted with head lamps for low lighting conditions.

• **Comfort and Fitness**

When in use, selected safety helmets shall be comfortable as possible since the wearer may use it for long periods of time. Head protection shall be made of lightweight material without compromising design strength. Level of comfort is also improved by selecting helmets offering stability and balance, helmets provided with sweatbands, etc.

Safety helmet should be fit by selecting the right shell size for the wearer and an easily adjustable headband, nape and chin strap.

• **Color and Visibility**

Different shades of color have different heat absorption and reflective properties. Select safety helmets with lighter color since it provides better heat reflection and good visibility. White colored helmets are suitable for outdoor work environment and poor lighting condition.
In work areas wherein maximum conspicuity is required such as tunneling activities, the color of the helmet should be noticeable against the background or at least part of the surface of the helmet is reflective. Usual high visibility colors are fluorescent yellow-green, fluorescent orange-red or fluorescent red.

C. Conformance with International/UAE Standards

Employers should purchase safety helmets from manufacturers or traders which has a valid conformity certificate for personal protective equipment products from Emirates Authority for Standardization and Metrology (ESMA). This technical guideline also considers the following conformity standards in the selection of suitable safety helmets:

- European Standard – Industrial safety helmets (EN 397:2012)
- European Standard – High performance industrial helmets (EN 14052:2012)
- American National Standard Institute (ANSI) – For industrial head protection (ANSI Z89.1:2014)

Safety helmets meeting the above standards were tested to meet the above minimum conformance standards on performance/test requirements, impact, penetration, shock absorption, flame resistance, electrical insulation, and various working temperature, etc. Each type of safety helmet is provided with specifications to suit the work activity and work environment.

Head protection devices under European Standards must meet the requirements of EN 397:2012 for industrial safety helmets and EN 14052:2012 for high performance industrial helmet.

Industrial safety helmet standard EN 397:2012 provides the most common and basic form of protection intended primarily to provide protection to the wearer against falling objects and is not intended to provide protection against off crown impacts. Mandatory requirements meeting this standard include flame resistant properties. In addition to the mandatory requirements the helmets may have shock absorption properties at very low temperatures and very high temperatures, have electrical insulation properties, have lateral deformation properties and provide protection against molten metal splash.

EN 14052:2012 standard for high performance industrial helmet are developed for workplaces such as mining and construction wherein the foreseeable risks of head injuries are so high that the
industrial safety helmets meeting the requirements of EN 397:2012 are not sufficient to provide a suitable degree of protection. Safety helmets meeting EN 14052:2012 standard offers greater protection from falling objects, protection from off crown impacts and protection from penetration by a flat blade striker. The helmet has the same flame resistant properties of industrial safety helmet and offers the same optional protection against other risks with the exception of lateral deformation.

Protective helmets under ANSI standard Z89.1-2014 are categorized by impact type and electrical class. All safety helmets shall comply with either Type I or Type II impact requirements and are further classified in compliance with Class G, Class E or Class C electrical requirements. Succeeding information details the types and classes of safety helmets meeting ANSI Z89.1-2014 requirements.

Safety helmets are divided into two categories: Type I and Type II

<table>
<thead>
<tr>
<th>Type</th>
<th>Impact Protection</th>
<th>Example of Impact</th>
<th>Inside view of Safety Helmet (for illustration purposes only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Designed to reduce the force of impact from a blow only to the top of the head</td>
<td>Fall of handheld tools such as hammer or nail gun from above</td>
<td><img src="image" alt="Inside view of Safety Helmet" /></td>
</tr>
<tr>
<td>Type II</td>
<td>Designed to reduce the force of impact resulting from a blow to the top or sides of the head</td>
<td>Contact with a side corner of an equipment</td>
<td><img src="image" alt="Inside view of Safety Helmet" /></td>
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</table>
Safety helmets are further classified based on electrical protection.

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class G</td>
<td>Used for general service. Provides impact protection (Type I or Type II) and</td>
</tr>
<tr>
<td>(General)</td>
<td>intended to reduce the danger of contact with low voltage conductors.</td>
</tr>
<tr>
<td></td>
<td>Samples for testing shall be proof tested at 2,200 volts (phase to ground).</td>
</tr>
<tr>
<td>Class E</td>
<td>Used for utility service. Provides impact protection (Type I or Type II) and</td>
</tr>
<tr>
<td>(Electrical)</td>
<td>intended to reduce the danger of contact with higher voltage conductors.</td>
</tr>
<tr>
<td></td>
<td>Samples for testing shall be proof tested at 20,000 volts (phase to ground).</td>
</tr>
<tr>
<td>Class C</td>
<td>Used for general service and made of conductive material such as aluminum.</td>
</tr>
<tr>
<td>(Conductive)</td>
<td>Provides impact protection (Type I or Type II) only and are not suitable in</td>
</tr>
<tr>
<td></td>
<td>providing protection during inadvertent contact with electrical hazards.</td>
</tr>
</tbody>
</table>

Note: Voltage indicated in Class G and Class E are not intended as an indication of the voltage at which the safety helmet protects the wearer and voltage protection is limited to the head only, and does not account for voltage protection allocated to the user as a whole.

Employers may select suitable safety helmet based on conducted risk assessment for their workplace in accordance with the above ANSI or EN standards.

**D. Safe Systems of Work**

Employers are required to implement safe systems of work in every work site which includes information, training, instruction and supervision. Safe systems of work must be properly communicated to all stakeholders detailing potential hazards, duties and responsibilities, procedures and guidelines. Ensure that workers are properly supervised in the proper and diligent use of safety helmets.

Safety management systems shall be properly reviewed and revised to assess effectiveness and suitability of existing control measures and use of safety helmets.
E. Safety Helmet Physical Requirements

Safety helmets shall provide protection to the wearer from impact and penetration damage and shall be designed that it will not fracture when struck nor the force of the blow will not be transferred to the worker’s skull immediately below the point of impact.

Employers must ensure to provide adequate and appropriate safety helmets to workers and must ensure strict observance of safety helmets’ mandatory use in construction sites, excavation work, mine, quarry, overhead crane operation, electrical operation, boiler/furnace operation, low structure/pipes/beam work areas, warehouses, plant where there is exposure to chemicals, solvents or any other operational areas where there is a risk of head injury.

The aforementioned workplaces or areas shall be identified as “Safety Helmet” area and notices shall be displayed

The helmet shall comprise of at least a shell and a harness

The helmet should be made from materials of durable quality, i.e. their characteristics should not undergo appreciable alteration under the influence of ageing or of circumstances of use to which the helmet is normally subjected (exposure to sun, rain, cold, dust, vibrations, skin contact, effects of sweat or of products applied to the skin or hair).

Hard shell of safety helmets made of metal and other conductive fittings shall not be used in places where contact with electricity is likely to be present

The shell should have uniform strength as possible and should not be specially reinforced at any point which also includes the gradual increase in the thickness of the shell or ribs or means for attaching the accessories or harness, but does exclude other highly localized reinforcement.

The shell should cover the upper part of the head and extend down to at least the level of the upper edge of the headband at the front of the helmet.

Head protectors should be as light as possible without compromising design strength and efficiency. The external surface of the shell should be smoothly finished and parts of the helmet, which is in
contact or potential contact with the wearer, should not have sharp protruding edges, its accessories or attachment devices, presence of which will likely cause injury to the wearer.

Materials which are known to be likely to cause skin irritation or any adverse effect on health shall not be used for parts of the helmet that come into contact with the skin. Advice should be sought before use for the suitability of material(s) not in common use.

Any adjustable or removable part of the helmet for the purpose of replacement shall be designed and manufactured to facilitate adjustment, removal and attachment without the use of tools by the wearer.

Safety helmets provided with any adjustment provision shall be designed and manufactured to avoid incorrect or wrong adjustment without the wearer's knowledge or attention under the foreseeable conditions of use.

Safety helmets' harness shall include a headband and nape strap.

The headband or the nape straps' length shall be designed to have incremental adjustments of not more than 5 mm.

For improved comfort, the cradle, if fitted, should be made from textile tapes. This material also affords optimum accommodation of the shape of the wearer's head, and is more acceptable with regard to perspiration and irritation.

The design of the helmet should provide for maximal adjustment of the harness within the shell, in order to optimize wearer comfort.

Any device fitted to head protectors should be designed that it will not cause any injury to the wearer in the event of an accident. In particular, there should be no metallic or other rigid projections on the inside of the helmet such as might cause injury.

Stitching (used to secure the harness to the shell) shall be protected against abrasion.
If provided, a sweatband shall cover the inner front surface of the headband for a length of not less than 100 mm each side of the center of the forehead. Flexible measuring tape or device shall be used to measure the length along a line 10 mm ±1 mm above the lower edge of the headband. The sweatband shall have a width not less than that of the headband over the length which it covers.

The shell or the headband shall be provided with a chin strap or with a provision of attaching one. Any chin strap supplied with the helmet shall be not less than 10 mm wide when untensioned and shall be attached either to the shell or to the headband.

For helmets provided with holes for ventilation purposes, the total area of such holes in the helmets' shell shall be not less than 150 mm² and not more than 450 mm².

Where ventilation holes are provided, it should be noted that ventilation may be improved when fresh air is able to enter the helmet around its lower edge and to exit thru the holes located in the upper one third of the shell.

For the fixing of helmet accessories, specified in the information accompanying the helmet, the required fixing devices, or appropriate holes in the helmet shell, shall be provided by the helmet manufacturer.

F. Safety Helmet Instructions and Markings

Every head protection equipment shall be provided with manufacturer’s instructions indicating proper use, method of fitting and adjustment, guidelines for care and maintenance, etc.

Employer must ensure that every user must be informed of the instructions and that employees must adhere to the specified manufacturer’s instructions on the use, fitting, care, maintenance and other guidelines for safety helmets.

Each safety helmet claimed to comply with the requirements of the following standards shall bear permanent markings, molded or impressed stating the following information:

- Number of safety helmet standard such as EN 397:2012, EN 14052:2012 or ANSI Z89.1:2014;
• Name or identification mark of the manufacturer;
• Date of manufacture;
• Type of helmet followed by optional criteria markings (marking to be provided on both the shell and the harness);
• The approximate head size range (marking to be provided on both the shell and the harness);
• Abbreviation for the material of the shell in accordance with ISO 472 for EN standards (For example, ABS, PC, HDPE, etc.).

G. Training

Employers are required to provide training for employees and even visitors. Records of any training including induction and tool box talks shall be properly kept for at least five (5) years and be made readily available to Dubai Municipality OHS inspectors and other regulatory agencies for review and demonstrate compliance with pertinent UAE and DM regulations.

Scope of training may include risks of head injuries in the workplace, preventive measures, legal obligations, when to use safety helmets, proper use, fitting and care, safe practices and replacement, etc.

Trainers must inform users that the use of safety helmet is always regarded as the last resort in risk control measures wherein elimination or minimizing the risks are considered first. Safety helmets do not prevent head injury accidents but only reduce the amount of force from an impact blow and cannot provide complete head protection against severe impact and penetration.

H. Safe Use Provisions

Safety helmets should be checked before use and kept free from any defects such as abrasions, scrapes and nicks and should not be dropped, thrown or used as supports.

All damaged safety helmets shall be discontinued from use and shall be handed over to a responsible person for replacement and marked as defective for disposal.
Helmets shall be properly worn and adjusted to fit the size of the user’s head for adequate protection. Follow the manufacturer’s instructions for proper use and fitting procedures.

Safety helmet components and accessories shall undergo visual inspection before use to verify presence of cracks, dents, penetration, and any damage due to impact, rough treatment, or wear that might decrease the level of protection originally provided. Head protection equipment with damaged, defective or worn parts should not be used and removed from service.

Cautiousness shall be observed if shells are to be painted, since some paints and thinners may attack and damage the shell and reduce protection. The manufacturer of head protection equipment shall be consulted with regard to paints or cleaning materials.

Extreme care in the selection and installation of accessories shall be exercised since the level of protection may be adversely affected due to the addition or introduction of accessories to the helmet. Thus, ensure that any accessories are compatible with the helmet thru communicating with the helmet or accessory manufacturer for compatibility information.

Helmet shall not be altered or modified (e.g. cut, drill, glue, etc.) to fit or accept accessories unless securing permission to do so from the helmet manufacturer. Helmet decorations such as paints, stickers, etc. should not be used to cover or hide burns, cracks, dents, non-manufactured holes, other penetrations, or other damages.

Caution should be taken when marking or decorating helmets rated for electrical protection. Metallic based markers such as some reflective tapes, metal foil labels or metal foil hot stamps should be applied only with the helmet manufacturer’s authorization.

Chin straps shall be used in windy work conditions or job activities involving frequent bending or looking upward or downward.

Workers or other individuals with long hair shall wear hair nets and protective caps to protect hair from coming into contact with moving parts of the machinery or being lifted into moving belts or rolls that develop heavy charges of electricity.
I. Care, Maintenance and Replacement

Safety helmets shall be properly stored in areas not exposed to direct sunlight, excessive heat and humidity. Long term exposure to harsh environmental conditions can cause degradation that will adversely affect the degree of protection provided (e.g. Safety helmet should not be stored or carried on the rear window shelf of a vehicle due to exposure to direct sunlight and excessive heat and the helmet might become a hazardous impactor in case of emergency stop or accident.)

Storage area for safety helmets and other personal protective equipment should be kept clean and dry and protected from exposure to workplace contaminants when not in use. Users shall be responsible in returning safety helmets to storage areas when not in use.

Regular cleaning shall be carried out to safety helmets and accessories to remove dirt, oils, and other contaminants in accordance with manufacturer’s instructions. Helmets are generally cleaned using water and soap. Use of solvents for cleaning is not recommended as it may damage or deteriorate the shell.

Under normal circumstances, safety helmet service life is usually 2 to 3 years. Prolonged exposure to ultra-violet rays (sunlight), excessive wear and tear and exposure to chemicals may reduce the life span of helmets. Thus replacement should be done at intervals not longer than 2 years.

Safety helmets are not repairable. All helmets subjected to severe impact regardless of service life and whether there is presence or absence of physical defect shall be immediately replaced and discontinued from use.

5. REFERENCES

European Standard – Industrial safety helmets (EN 397:2012)

European Standard – High performance industrial helmets (EN 14052:2012)

American National Standard Institute (ANSI) – For industrial head protection (ANSI Z89.1:2014)
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