LOGGING INDUSTRY RESEARCH ASSOCIATION
NEW ZEALAND

ISSN 0111-4743

TECHNICAL RELEASE

Vol. 6 No. 8 1984

LIRA COPYRIGHT 1984

LIFE AND PERFORMANCE OF PROTECTIVE HELMETS

A Report by C. Patricia Ward, Technical Editor, Standards Association of New Zealand

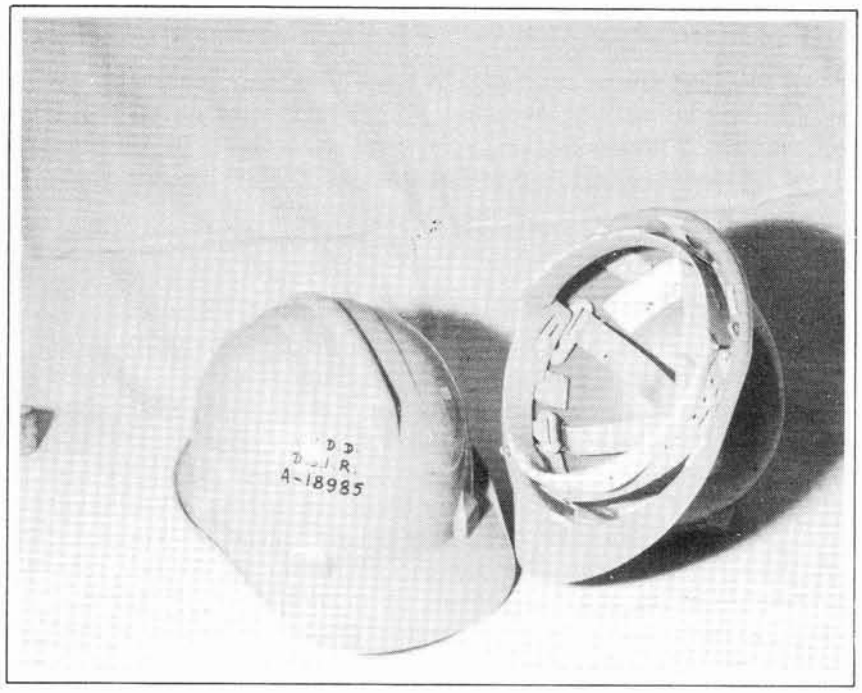

Fig. 1 - The shell and inner harness support system of an industrial safety helmet

INTRODUCTION

In New Zealand, protective helmets providing medium protection are used in a wide range of industries, from mining and quarrying to forestry and logging. How long do these helmets last and what effect does ultra-violet light, impact, solvents, heat, etc. have on the durability of them? These and other factors can all play an important part in the effectiveness of the protection provided by your helmet.

THE INDUSTRIAL SAFETY HELMET

The helmet consists of a shell and an inner harness support system as shown in Fig. 1. The outer shell of the helmet is made of smooth durable material which is not reinforced at any point, thus providing a uniform strength over the whole helmet. It may have an increase in shell thickness, ribs, or means for attaching the harness but extra reinforcement has not been added. The harness, which supports the helmet on the head, consists of a headband, a cradle and cushioning, and in some cases protective padding.

When purchasing a safety helmet, it is important that it should not only be comfortable but also have a correctly fitted harness. The clearance between the cradle, which rests on the wearer's head, and the crown of the safety helmet is most important.

The manufacturer of the helmet usually stipulates a recommended clearance and the person who issues, or sells, the helmet to the wearer should ensure correct fitting.

THE EFFECTS OF IMPACT ON A HELMET

A safety helmet for industrial use is designed to protect the wearer from injury from overhead falling objects, by absorbing energy. This is achieved by alteration of the shell shape, crushing of the protective padding (if provided) and stretching of the harness. The residual force of the impact is spread over the surface of the head, thus decreasing the chance of injury.

As produced in New Zealand, the industrial helmet is so designed that some of the energy is absorbed by deformation of the moulded shell, but the greater amount is absorbed by stretching the harness straps. Originally, the same type of shock absorption system was used in road helmets, and it has been retained on industrial helmets mainly because it is light and cool. It is considered by many to be a better means of shock absorption than the use of a shock absorbing liner.

The manner of testing these helmets in New Zealand is similar to overseas tests. A striker is allowed to fall from a height of 1000 mm on to the crown of the helmet shell, within a small radius, resulting in a fixed impact energy. The Department of Scientific and Industrial Research carries out these tests at low and high temperatures and under moist conditions.

HOW LONG ARE HELMETS EXPECTED TO LAST?

Under normal use, it is recommended that helmets be replaced after three years. This is because of the effect which sunlight may have on helmets made of plastics materials. This three-year period should be taken from the date of issue to the wearer, which may in some cases be considerably later than the date of manufacture, depending on consumer demand. Excessive discolouration of the shell, or weathering of the surface may indicate a loss of strength. Helmets which show signs of splitting or cracking or any other obvious defects should be replaced immediately. All components; shells, harnesses, headbands and accessories should be visually inspected on a regular basis for any signs of dents, cracks, penetration or other damage due to impact, rough treatment, or unauthorised alterations. Helmets with sound shells but with damaged or defective harness components should be withdrawn from service and the complete harness and cradle replaced.

THE EFFECTS OF ULTRA-VIOLET LIGHT ON PLASTICS

There is little evidence to suggest that ultra-violet light significantly weakens helmets in their first three years of life. This contention is supported by tests made over a period of four years on helmets which have been withdrawn from actual service conditions. It is considered unwise to store or place helmets near any window, in particular the rear window of a motor vehicle through which excessive heat can be generated. Under these circumstances, the plastics components of harnesses may deteriorate more rapidly and they should be regularly inspected and replaced where necessary.

WHY IS SPRAYPAINT HARMFUL TO PLASTICS?

Helmets made of plastics materials may be damaged and rendered ineffective when exposed to paint, without the damage being visible to the user. It is harmful to apply paint, oil, petrol and other hydrocarbon derivatives to helmets made of plastics materials, as the plastics may dissolve in some circumstances.

WHY YOU SHOULD NOT DRILL YOUR OWN HOLES FOR ATTACHING ANCILLARY EQUIPMENT

Any alteration to the shell of the helmet is to be avoided. For instance, drilling holes which may be additional to the existing ventilation holes may not only weaken the helmet, reduce the protection provided by the helmet, but also shorten its working life. It is also considered inadvisable to try to attach ancillary equipment especially if an alteration of this sort reduces the clearance between the shell and the wearer's head. It is the clearance between the top of the head and the shell which limits the shock absorption capability of the complete helmet.

CARE AND MAINTENANCE OF YOUR HELMET

The Standard Specification for industrial helmets (NZS 5806 : 1980) specifies performance requirements with no restriction on material or design. The majority of helmets are made of plastics of one sort or another which may be attacked by concentrated oxidising acids and are soluble in ketones, esters and some chlorinated hydrocarbons. The Standard contains a warning to this effect, and damage may be done to the helmet without the wearer noticing it. It is essential that the following points be remembered :

(1) It is not good practice to carry your helmet around in the back of a vehicle where it may be affected by petrol fumes, ultra-violet light, etc.

(2) The helmet should not be used for any other purpose other than that for which it was designed - do not use the helmet as a carrier for other equipment, liquids, tools, etc.

(3) If any adhesive or reflective tapes are to be added to a helmet, it would certainly be wise to determine whether the adhesive causes any degradation to the shell material.

(4) Aerosol sprays, such as insect repellants, may also damage the helmet and may render its protection ineffective, without the damage being visible to the user.

For these reasons, it is sound practice to inspect helmets, which are in regular use, for any signs of dents, cracking, alteration to texture or colour of the shell and for any weaknesses in the harness. This inspection should be carried out on a regular weekly basis. Shells which are split or cracked should be discarded immediately and any helmet which has been involved in an accident should be replaced.

CLEANING SAFETY HELMETS

Safety helmets should be cleaned regularly. Because of the nature of the helmet, it is very easy to clean and maintain it. Normal washing methods using warm water and soap are quite adequate. The harness may be removed from the shell for washing purposes. It is unwise to use solvents, abrasives or even very hot water on your helmet.

LIRA COMMENT

Helmets are an essential part of loggers' personal protective equipment and to be effective, they must be properly cared for and regularly replaced. This Technical Release was prompted by queries from wearers within the industry who were uncertain about the life and resilience of their helmets.

This Technical Release is the work of the author and is not the result of LIRA project work. LIRA publishes it in the interests of wider dissemination of knowledge in the industry. LIRA takes no responsibility for the accuracy of figures nor does it necessarily support or disagree with the opinions and conclusions shown.

For Further Information Contact: N.Z. LOGGING INDUSTRY RESEARCH ASSOC. INC.
P.O.Box 147,
ROTORUA, NEW ZEALAND. Phone 87-168