

Guidelines on the selection and use of



Cut resistant gloves

in the meat industry

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Preface

These guidelines have been developed by the SA Meat Industry OHS Committee to provide practical guidance on the use of cut resistant gloves in the South Australian meat processing industry.

Guidelines are advisory documents to help employers comply with their 'Duty of Care' under the SA Occupational Health, Safety and Welfare Act, 1986, and the OHSW Regulations, 1995. These guidelines provide advice to those with responsibilities in the meat industry who need to ensure they meet their legal obligations to provide safe systems of work and safe plant and equipment.

The guidelines should be considered an important source of information and advice, and a useful starting point for consultation between employers, employees and their representatives, and glove suppliers. As part of the risk assessment process, the guidelines will be useful in selecting and evaluating which gloves are appropriate for each workplace and situation.





Introduction

The incidence of serious laceration injuries to the hand and arm, as well as amputations, are major occupational health and safety concerns for the meat industry in South Australia. The livestock processing class of the meat industry is the worst performing industry group in South Australia in terms of workers compensation costs paid per payroll.

This guideline has been developed as a result of a 'SAfer Industries' project, funded by the WorkCover Corporation Grants Scheme. The project has involved:

- a review of literature relating to the use of cut resistant gloves by meat workers
- a survey of all meatworks in South Australia to determine the current use, and feedback, on gloves worn by meatworkers
- discussions with AQIS and meat hygiene technical experts to ensure microbiological standards for meat are maintained when cut resistant gloves are worn
- a six month field trial of three brands of cut resistant gloves involving meat workers from five meat works in South Australia
- surveys administered to participating meat workers trialling the gloves after two weeks, three months and six months of use
- a review of workplace diaries detailing performance issues, wear and tear, as well as cleaning and comfort issues.

These guidelines have been developed to assist meat workers and their managers select and use the appropriate cut resistant gloves to suit the needs of the industry.

The postal survey relating to the wearing of cut resistant gloves was sent in May 1999 to every meat works in South Australia.

It was evident from the results that currently:

- over 50% of meatworkers wear no form of cut resistant gloves at all
- the chain mesh glove is the most commonly used form of hand protection. The survey revealed that around 40% of meatworkers wear the chain mesh glove on their non knife hand.
- the remaining 10% who wear gloves, use a cut resistant fibre glove on their non knife hand
- less than 5% of meatworkers wear a cut resistant fibre glove on their knife hand

It was evident from the results that currently:

Wearing of disposable rubber gloves was found in most meat works where constantly washing of the knife in 82 degrees Celsius water was required. It was also found that a number of people dipped their glove into the 82 degrees Celsius water as well, thereby aiming to avoid cross contamination as required by AS 4461/1997, "Australian Standard for hygienic production of meat for human consumption (2nd ed)". However this is not a practice that is recommended as the hot water can easily burn the hand, particularly if there is a small hole in the rubber glove.

- the chain mesh glove, whilst seen to add protection from knife cuts was generally disliked by meatworkers due to:-
 - poor comfort and fit to the range of male / female hand sizes
 - poorly fitting finger tips resulting in lack of grip sensitivity with fingers
 - mesh gets cold, and chills the hand in 10°C temperature controlled work rooms
 - cleaning of hair, meat and bone fragments difficult from mesh
 - weight of glove causes hand / arm fatigue, particularly when worn with full mesh forearm guard
- resistance to wearing cut resistant fibre gloves is greater amongst experienced meatworkers who have previously not worn any glove
- initial concern towards wearing a glove on knife hand was due to a perceived reduction of grip strength and dexterity on knife handle.



Laceration injury profile

The WorkCover Corporation database (1996/99) indicates that nearly 30% of claims in the meat industry were hand and wrist lacerations. (figure 1)

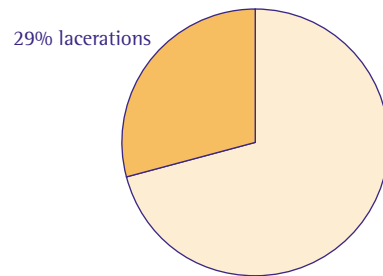


figure 1: SA WorkCover Corporation Claims in the meat industry (1996-1999)

In terms of agency of incident, over the same period of time, knives accounted for nearly 30% of all WorkCover claims in the meat industry. (figure 2)

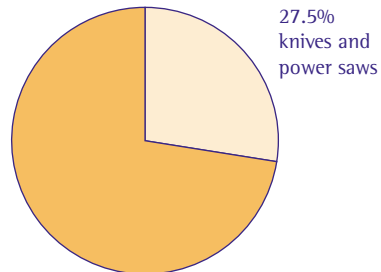


figure 2: Agency of injuries (1996-1999)

These knife lacerations account for around 25% of all workers compensation costs to the industry, with sprains and strains accounting for over 50% of costs.

These lacerations included:

- cuts to the non knife hand and forearm
- 'run through' lacerations i.e. knife hand slides over edge of knife grip across razor sharp knife blade



Amputations of fingers / joints were also reported in the database.

Case study data indicated days lost from knife cuts are extended when infection is identified.

NB. No glove should be worn when operating a bandsaw, as gloves can get trapped in the teeth of the saw and drag the hand in. Bandsaws should be guarded.

AQIS and food hygiene

The Quality Assurance processes in the meat industry require strict meat handling procedures to control microbiological levels and ensure meat quality. The 'Australian Standard for hygienic production of meat for human consumption (2nd edition)' (AS4461-1997) sets standards relating to meat processing procedures for export and domestic meat works.

Previous attempts to introduce cut resistant fibre gloves failed due to problems in cleaning the gloves, and unacceptable microbiological levels. Research conducted by the CSIRO and Australian Meat Technologies Pty Ltd has enabled AQIS to approve two fibres as acceptable for use in temperature controlled areas of meatworks. These fibres are:

- Kevlar
- Spectra.

It is still necessary for strict cleaning controls to be followed, and microbiological checks to be undertaken.

The product at export sites has not been found to be contaminated by fibres from cut resistant gloves.

Disposable water resistant gloves are still required to be worn over the cut resistant fibre gloves in slaughtering and dressing areas where cross contamination between carcasses is possible.



In those situations, where a chain mesh glove is used, a rubber glove is worn underneath.

Cut resistant fibre gloves can be worn without water resistant gloves over them in temperature controlled boning rooms.

Details relating to standards for glove use can be found in AS4461-1997 'Australian Standard for hygienic production of meat for human consumption (2nd edition)'.

Task Requirements

An ergonomic assessment of gloves is based on the profile of people using the gloves, and the tasks they perform. In the meat industry, knives are used in all the various stages of processing. Operators who use the knives present with the full range of hand sizes of the Australian adult population.

Knife hand

In most instances, meat workers use their dominant hand with the knife. However, there are a number of cuts where they are required to change the knife to their non dominant hand. This particularly occurs in the slaughtering processes. These cuts present problems due to the wearing of a thick cut resistant fibre or chain mesh glove on the non dominant hand, limiting the ability to grip the knife.

The force exerted via the knife in a cut is determined by:

- temperature of the meat / fat
- posture of the wrist / arm
- sharpness of the knife blade
- length and duration of cuts (Meat Research Corporation, 1990).

The grip onto the knife handle can directly reduce the ability to sustain consistent force exertion. Hence, the wearing of a glove on the knife hand may reduce the ability to grip the knife securely.

The incidence of over use injuries to the hand / wrist / arm in the knife hand has been of ongoing concern. The potential for the glove to increase or decrease the probability of such injuries is also an area of concern and needs further research.

Non knife hand

The non knife hand is more commonly in contact with the meat, as the knife performs the particular cuts. In slaughtering, the fingers can grip the meat being cut or hold a hook or forceps which help tension the meat during the cutting process. The grips adopted range from fine finger control required to separate tissue to full hand grips as required in holding segments of meat.

The majority of laceration and stab injuries occur to the non knife hand and forearm. Hence, the chain mesh glove has traditionally been worn to protect this arm. This is due to the close proximity of the knife blade to the non knife hand as the cuts are being performed.



Due to the AS 4461-1997 requirements, in non-refrigerated areas a water resistant glove must be worn under the chain mesh glove to enable frequent immersion of the knife into water. A water resistant glove can also be worn under a chain mesh glove in temperature controlled rooms to help keep the hand dry and warm from the cold conductive chain mesh.

Glove selection



An international literature review was conducted to identify commercially available cut resistant gloves that contained either of the approved fibres i.e. Kevlar or Spectra.

Three brands of gloves were evaluated in the field trials. These were:

- Ansell
- Polar Bear
- Whizzard Handguard / Liteguard

Each brand supplied a range of hand sizes in a thick knit for use on the non knife hand and a thin knit for the knife hand.

The gloves are available from the main suppliers of protective clothing to the Australian meat industry. The prices for each glove range from \$12 to \$25 depending on brand and style. Additional costs are required for the disposable rubber gloves.

By comparison, the cost for a mesh glove is between \$120 - \$150.

It was found that each meat worker requires up to three cut resistant fibre gloves per hand.

These are for:

- glove in use
- dirty glove being washed
- clean glove drying.

It is not in the scope of these guidelines to be prescriptive in the selection of particular brands of gloves due to the limited number of trials and duration of testing.



Benefits of cut resistant gloves

Wearing a thin cut resistant glove on the knife hand and a thick cut resistant or mesh glove on the non knife hand can reduce lacerations by up to 80%.¹

The major benefits found from wearing cut resistant fibre gloves include:

1. The gloves offer increased protection from knife cuts when worn on both the knife hand and non knife hand, compared with wearing no gloves at all.
2. Wearing a thin cut resistant glove on the knife hand will particularly reduce 'run through' lacerations on the knife hand (pictured at right).
3. These gloves keep the hands warm in cold work environments and when handling cold/wet meat.
4. The gloves offer a better fit to the hands and are more comfortable than the chain mesh gloves.
5. As pictured below rubber gloves can be worn under the mesh glove, or over the thin cut resistant gloves.
6. Changing of knife between hands is relatively easy with cut resistant gloves but impossible with a chain mesh glove.
7. Cut resistant gloves allow improved dexterity of finger tips as opposed to using a chain mesh glove.
8. Reduced weight of glove, compared to chain mesh, reduces tiredness of hand and arm.
9. Once accustomed to the glove, the grip of knife handle not diminished by wearing of thin cut resistant glove.
10. Cleaning of gloves to comply with AS 4461-1997 maintained by following manufacturers instructions.
11. Purchase cost of individual glove cheaper than chain mesh glove.



¹ Source: Data from five participating SA meatworks over nine month period and data from two major abattoirs in Queensland and New South Wales.

Problems with current designs

The following cautions are offered to users of these gloves, and have been directed to the glove manufacturers for future design improvements.

1. Operators who trialled the gloves found that the range of sizes did not match the anthropometric measurements of their hand sizes.
2. The thickness of the larger glove is not compatible for wearing a rubber glove over the cut resistant glove.
3. The gloves are not stab resistant.
4. The knit of the gloves is easily damaged by sharp bones e.g. kangaroo.
5. The wrist band of the gloves stretch from washing, and become loose after 3-5 months of regular laundering.
6. The seam of the fabric at the finger tips reduces tactile control when handling meat tissue.
7. It is not as easy to quickly remove cut resistant glove compared to chain mesh glove if a small cut in rubber glove allows 82°C water to make contact with fingers.
8. Need to purchase, name and process, multiple gloves per worker due to washing and drying requirements.
9. Matter can gather in fingertips during laundering even when turned inside out.
10. Only light coloured gloves are acceptable under AS 4461-1997 'Australian Standard for hygienic production of meat for human consumption (2nd edition)!'.



Future challenges

The introduction of cut resistant gloves into South Australian meat works should be promoted particularly where no form of mesh glove or other protective gloves are worn. In particular, the thin cut resistant glove should be worn on the knife hand to significantly reduce 'run through' lacerations.

Further research will be required to assess the long term effects of wearing gloves on occupational overuse injuries for both the knife and non knife hands. The warmth retained in the hand by the cut resistant glove should assist in injury prevention. However, any tendency to increase grip strength onto the knife handle may increase injury risks.

The need to wear the cut resistant glove in conjunction with an impervious rubber glove in many knife tasks requires the manufacturers to design gloves to enable these to fit comfortably together, or to design an impervious cut resistant fibre glove. Manufacturers also need to validate their glove sizes to reflect current research on anthropometry of hand sizes. Ergonomic issues relating to finger dexterity and swapping the knife between hands require future consideration. Performance issues relating to cleaning and deterioration of the gloves from wear needs attention in future design enhancements.

Evaluation of other initiatives to reduce lacerations from knives is required. This includes the use of forceps, tweezers and hooks to grip meat tissue, rather than using fingers in trim areas. It also includes alternative knife handle designs to reduce the chance of 'run through' injuries.

While there are knives with guards designed to reduce run throughs, they need further evaluation. Further research would be helpful to evaluate recent knife releases from Germany. Other knives also offer features that may reduce injuries.



Traditional boning knife



Alternative knife handle design – boning knife



Alternative knife handle design – skinning knife

Sources of information

Additional sources of information can be obtained from:

The SA Meat Industry OHS Website

www.workcover.com/safer/meat.html

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Meat industry protective clothing suppliers including:-

Ansell
Hepworths
Protector Safety

