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Ergonomic case studies from meat processing plants in Australia RPDA.209

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MEAT & LIVESTOCK
AUSTRALIA

Ergonomic Best Practice Case Studies

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Acknowledgments

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In particular, we would also like to thank Robyn Vale (AMIEU), Violeta Espinas (MRC), Margie Mahon (MRC), John Salter (Metro Meats) and Des Archie (Q Meats) for their professional support throughout this program.

1.0 BACKGROUND INFORMATION

Manual handling and Occupational Overuse Syndrome (OOS) injuries are significant compensable injuries in terms of frequency and severity in the meat industry in Australia.[1]

Figure A outlines the profile of injury/disease rates (occurrences per 1,000 wage and salary earners) for the Meat Processing Industry compared to other industry sectors. Figure B is a pie chart which illustrates the nature of compensated injury/diseases within the Meat Processing Industry in Australia in 1994-95.

FIGURE A

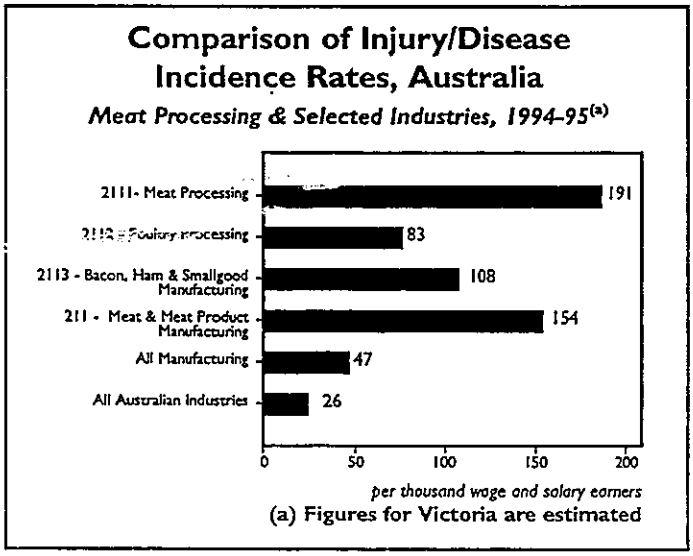
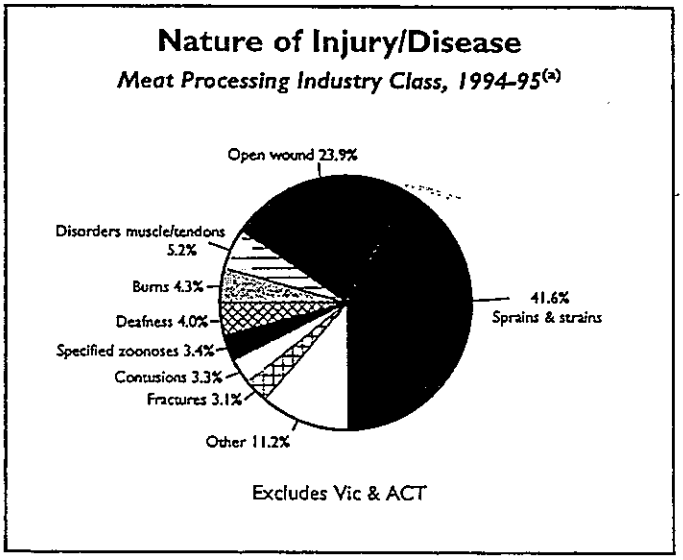


FIGURE B



In addition to the compensation, litigation and other costs associated with these injuries, there is a significant human cost associated with the injuries that are sustained by people at work.

The Meat Research Corporation has conducted an Occupational Health and Safety Best Practice Program (OHSBPP) to develop a range of injury and disease preventative strategies for Meat Processing Plants in Australia. A range of innovative and often very simple risk control solutions have been developed in the OHSBPP at the individual abattoir locations.

Whilst these solutions have contributed to the reduction of injury risk at the individual sites, there is potentially significant value in applying these ideas to similar processes at other plants.

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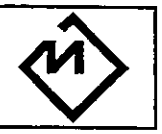
1. *Worksafe Statistical Update, Australian Meat Industry 1995*
2. *An MRC funded project to examine task analysis of meat processing tasks to developed new methods of risk control is due for completion in September 1998. Contact David Nery on (08) 8239 1517 for more details.*



This report represents a compilation of the risk control strategies which have been developed through the OHSBBP and also through other initiatives which may have been derived outside of that process. These risk control strategies have been principally in relation to developing engineering controls as a primary form of eliminating or redesigning processes that are hazardous.

The case studies in this report provide value in terms of them being industry specific and highlight critical solutions that are often very easy to implement in workplace designs. This report is a summary of existing work practices, and so to some extent, it is not a report of leading edge research and development, but rather a compilation of very practical solutions that can be easily implemented to improve the day to day safety of work operations.[2]

2.0 ABOUT THE PROJECT

This report has been developed to assist in developing risk control solutions, principally for manual handling hazards, which occur within the meat industry in Australia. Initially a survey was sent to 253 organisations in Australia to advertise our intention to visit participating sites to examine occupational health and safety initiatives in the meat industry in Australia. From the results of the survey and through industry consultation the following sites participated in the compilation of case studies;

• Oakey Abattoir	Oakey, Queensland
• Q Meat	Brisbane, Queensland
• Sunland Meats	Landsborough, Queensland
• South Burnett Meatworks	Murgon, Queensland
• Kilcoy Abattoir	Garbutt, Queensland
• Killarney Abattoir	Killarney, Queensland
• Q Meat	Toowoomba, Queensland
• Metro Meats	Noarlunga, South Australia (now closed)
• Metro Meats	Murray Bridge, South Australia
• Mid Coast Meat Company	Macksville, New South Wales
• Bunge Meats	Corowa, New South Wales
• MC Herd Meatworks	Geelong, Victoria
• Port Meat Company	Port Melbourne, Victoria
• Hardwicks Meat	Kyneton, Victoria
• George Chapmans	Nairne, South Australia

[1] *Worksafe Statistical Update, Australian Meat Industry 1995*

[2] *An MRC funded project to examine task analysis of meat processing tasks to developed new methods of risk control is due for completion in September 1998. Contact David Nery on (08) 8239 1517 for more details.*

3.0 STRUCTURE OF THIS REPORT

This report contains the following sections:

- *Introductory Section:*

  Outlining the process and outcomes for this project.
- *Case Studies:*

  29 Case Studies which outline the hazards and risk control solutions for each case.
- *Appendices:*
  - **Appendix A** - A hazard management process which has been implemented at some of the sites that were visited.
  - **Appendix B** - A list of common manual handling injuries, symptoms and causes. Developed by David Nery to assist with training in the area of manual handling hazard management.
  - **Appendix C** - A glossary of medical terms to assist with reading and discussing manual handling and related information.

4.0 STRUCTURE OF THE INDIVIDUAL CASE STUDIES

The case studies contain the following information.

- Work Area: This refers to where the case study was derived from. It is quite possible that many aspects of the case study may apply to different areas of the industry.
- **Task:** This identifies the task which was being performed in the case study.
- **Hazards:** A summary of hazards that were associated with the task before the risk control solution(s) was implemented.
- **Risk Control Solution:**

  A summary of the risk control solution that has been implemented to control the hazards associated with the task which is depicted in the figure for each case.

5.0 AN APPROACH WHICH COULD BE TAKEN TO MANUAL HANDLING MANAGEMENT

This report also provides an outline of the hazard management approach which can be undertaken to assist people implement effective and enduring health and safety improvements in their workplace in relation to manual handling hazard management. A range of different strategies were adopted by different plants and therefore, the process which is included in this report is a generic process of hazard management and may need to be adapted to particular circumstances or operating environments in each individual plant.

6.0 FUTURE DEVELOPMENTS

This report provides an opportunity to capture the diversity of ergonomic strategies which have been implemented in various Meat Processing Plants around Australia. The next stage is to analyse existing tasks and to develop some guidelines in relation to safe work processes and work methods of future work tasks. Another project being sponsored by the Meat Research Corporation which is due for completion in September 1998, is to undertake an analysis of work tasks to examine the manual handling exertions which are undertaken in these tasks and make recommendations in relation to future developments for improvements in the safety of these tasks.

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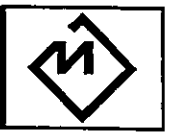
[1] *Worksafe Statistical Update, Australian Meat Industry 1995*

[2] *An MRC funded project to examine task analysis of meat processing tasks to developed new methods of risk control is due for completion in September 1998. Contact David Nery on (08) 8239 1517 for more details.*



ERGONOMIC BEST PRACTICE CASE STUDIES

The Australian Meat Industry, Occupational Health and Safety Best Practice Project. 29 Ergonomic Best Practice Case studies from Meat Processing Plants in Australia.

CASE STUDY 1 - LAUNDRY BIN DESIGN

WORK AREA:	Red Meat - Meat Processing
TASK:	Putting clothes into and out of laundry bin.
HAZARDS:	Bending into bin to collect clothes (particularly when the bin is empty which means bending to the bottom of the bin) can cause added stress to the spine with extended bending and over reaching into the bin.
RISK CONTROL SOLUTIONS:	• Insert a scissor base to the bin (refer to Figure 2). • This scissor base increases the height of the base as clothes are removed, so it eliminates bending. The example is Figure 2, Cost approximately $1,000.

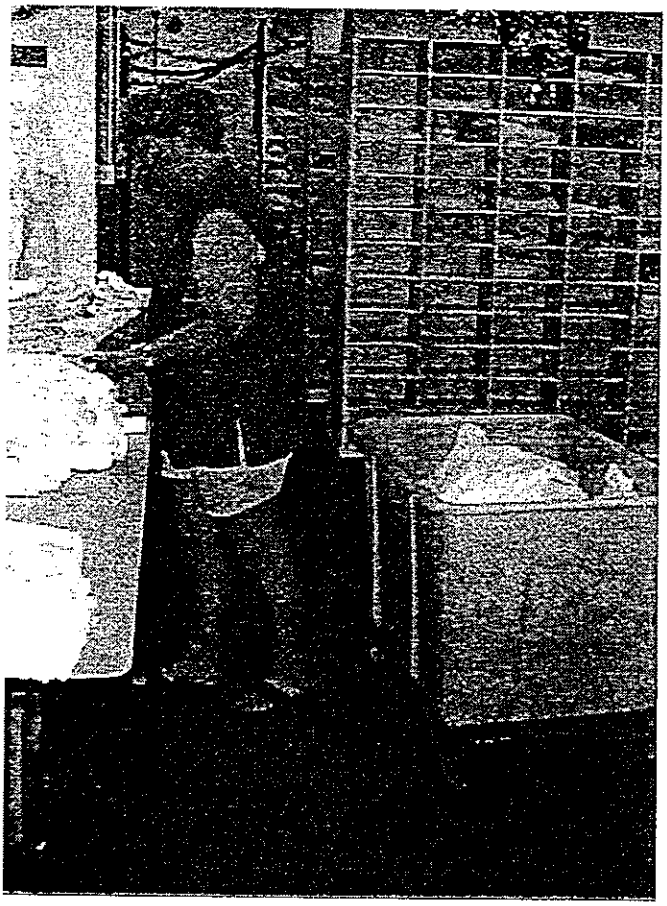
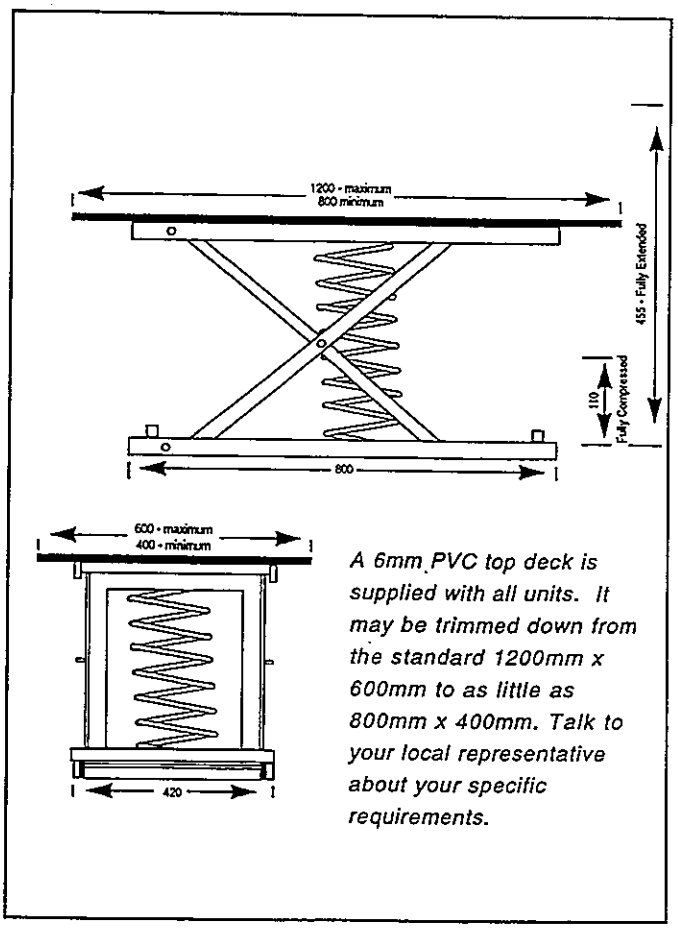


FIGURE 1: CLOTHES IN THE DIRTY LAUNDRY BIN.



A 6mm PVC top deck is supplied with all units. It may be trimmed down from the standard 1200mm x 600mm to as little as 800mm x 400mm. Talk to your local representative about your specific requirements.

FIGURE 2: A SCISSOR LIFT DEVICE FOR THE LAUNDRY BIN

Figure 1 taken at Q Meat, Brisbane • Figure 2 courtesy of Adelaide Merchandising

CASE STUDY 2 - GRAVITY CHUTE DESIGN

WORK AREA:	Red Meat - Meat Processing
TASK:	Washing the product.
HAZARDS:	This task involved filling a 35kg tub and then carrying it to the washing area from the processing line, repetitive manual handling, which may increase risk of fatigue and injury.
RISK CONTROL SOLUTIONS:	➸ Introduce a gravity chute between processing line and washing area which are joined by a mutual wall. Carrying is eliminated as product drops out of chute right next to the washing area and product is then washed (refer Figure 3). After washing, product is placed in a trolley and pushed to next stage in process.

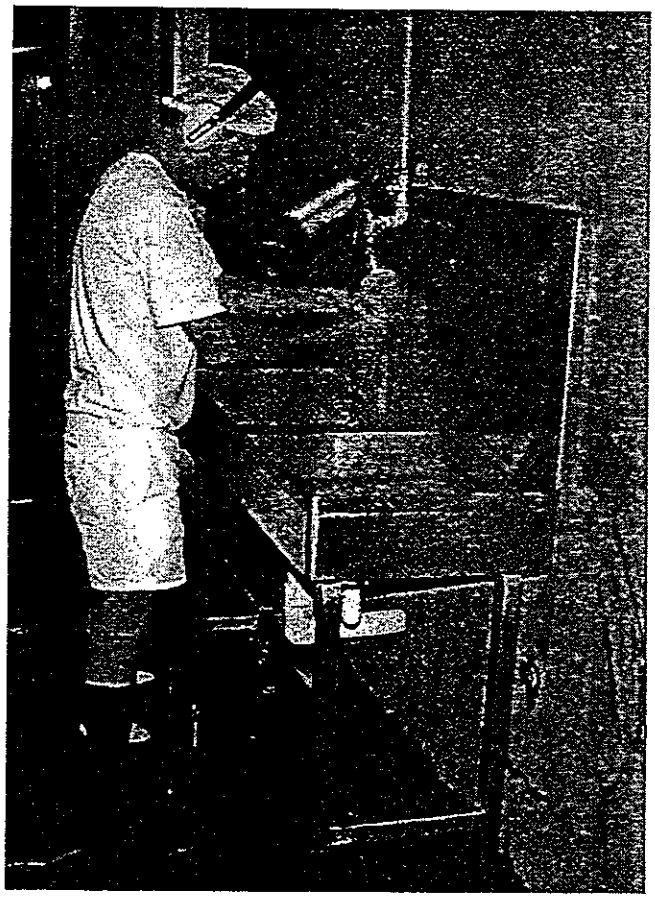


FIGURE 3: WASHING PRODUCT IN OFFAL AREA, GRAVITY CHUTE IN THE BACKGROUND.

Figure 3 taken at Q Meat, Brisbane

CASE STUDY 3 - LIFTING EQUIPMENT

WORK AREA:	Red Meat - Meat Processing
TASK:	Tripe Washing Machine.
HAZARDS:	Prior to implementing the design illustrated in Figure 4, this task required walking up steps to a level of 3m high with a 20kg container to pour the contents into machine 8-10 times per shift. Risks of injury through repetitive lifting and carrying or slipping on the ladder.
RISK CONTROL SOLUTIONS:	➪ Block and tackle which is electrically operated, lifts the bin directly into the tripe washing machine. A larger bin reduces the frequency of pouring. The elimination of the manual pouring reduces the risk of injury. Approximate cost of lifting device $2,000.

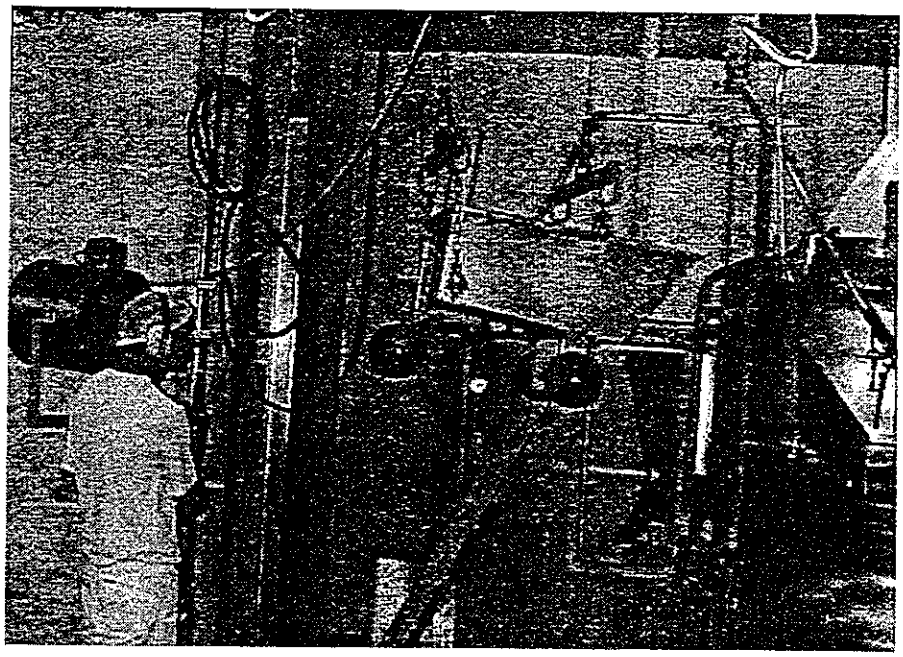


FIGURE 4: THE CONTENTS OF THE BIN BEING AUTOMATICALLY POURED INTO THE TRIPE WASHING MACHINE

Figure 4 taken at Q Meat, Brisbane

CASE STUDY 4 - HIDE TRIMMING WORKSTATION

WORK AREA:	Red Meat - Meat Processing
TASK:	Trimming Hide.
HAZARDS:	Prior to change, lifting heavy hides which are large, hard to grip, hard to manoeuvre and lifted 500 times per day with old design.
RISK CONTROL SOLUTIONS:	➥ Hides delivered in a water chute so limited pushing or pulling as hide slides on reduced friction wet chute. Ears trimmed, and hide processed. A working height of 900m improves working height and limits bending. Hide not manually lifted into delivery bin, simply pushed off end of bath tray and it falls through a hole in the floor into a storage container below. *(Refer to figure below).*

FIGURE 5: THE HIDE SLIDING FROM THE INSPECTION TABLE.

Figure 5 taken at Q Meat, Brisbane

CASE STUDY 5 - CARCASS TURNING EQUIPMENT

WORK AREA:	Red Meat - Meat Processing
TASK:	Turning Carcasses on the line for washing. When carcasses are cut in half in old method they were turned manually so they are all facing the same way.
HAZARDS:	Repetitive turning of carcass. Manually working above shoulder height with limited variety in muscle / joint movement. Can increase the risk of overuse injury.
RISK CONTROL SOLUTIONS:	• Protruding bars will turn carcass so spine is facing towards the back. If spine is already in that position, the carcass slides past. Simple design eliminates the need for manual turning. Also more efficient use of water as all carcasses facing the same way, so water jets can concentrate majority of spray on the inside. Approximate cost $1,500.

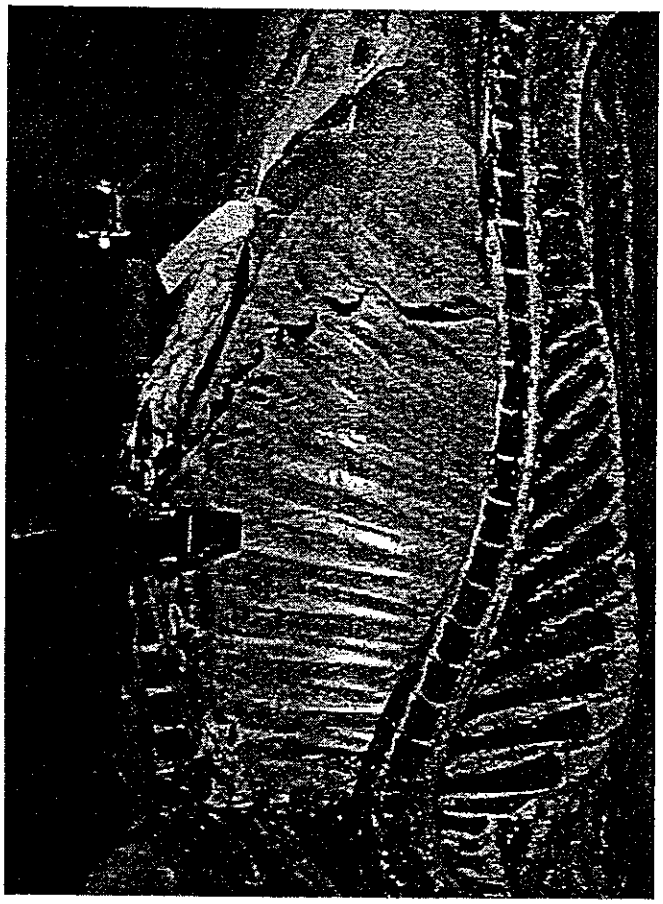


FIGURE 6: CARCASS BEING TURNED ON THE LINE.

Figure 6 taken at Q Meat, Brisbane

CASE STUDY 6 - WHIZZARD KNIFE

WORK AREA:	Red Meat - Kill Floor
TASK:	Cutting the fat from the carcass.
HAZARDS:	With non powered knife, it required increased repetition of movements to complete task often with increased grip strength requirement. In some cases this can increase the risk of Occupational Overuse Syndrome.
RISK CONTROL SOLUTIONS:	➸ Whizzard Knife (pictured below) can reduce the frequency of cuts to complete task. With correct handle diameter and padding, it reduces transmittability of vibration and reduces grip strength required to hold knife. Both these factors will reduce the risk of Occupational Overuse Syndrome. ➸ Training in correct use of knife is essential for providing skills and safe use of this tool. Cost of knife approximately $3,000 - $5,000 depending on design.

FIGURE 7: OPERATOR HOLDING A WHIZZARD KNIFE

Figure 7 taken at Q Meat, Brisbane

CASE STUDY 7 - TUB TROLLEY DESIGN

WORK AREA:	Red Meat - Meat Processing
TASK:	Moving Trolley with tubs placed on top.
HAZARDS:	Prior to use of trolley there would be a lot of repetitive lifting of 10 - 15kg tubs. Increases the risk of manual handling fatigue and injury.
RISK CONTROL SOLUTIONS:	➪ Trolley designed to eliminate carrying and significantly reduce lifting of product. Trolley height lower than conveyor that the tub is taken from, and higher than conveyor it is going onto. Therefore, always lowering tubs not lifting. If conveyors are the same height, make trolley approximately the same height to get tubs onto/off trolley. Trolley has larger centre wheel for reduced effort when pushing. Small end wheels on trolley give it high manouverability and easy to turn in limited space. Approximate cost of trolley (made in house) $220.00 per trolley.

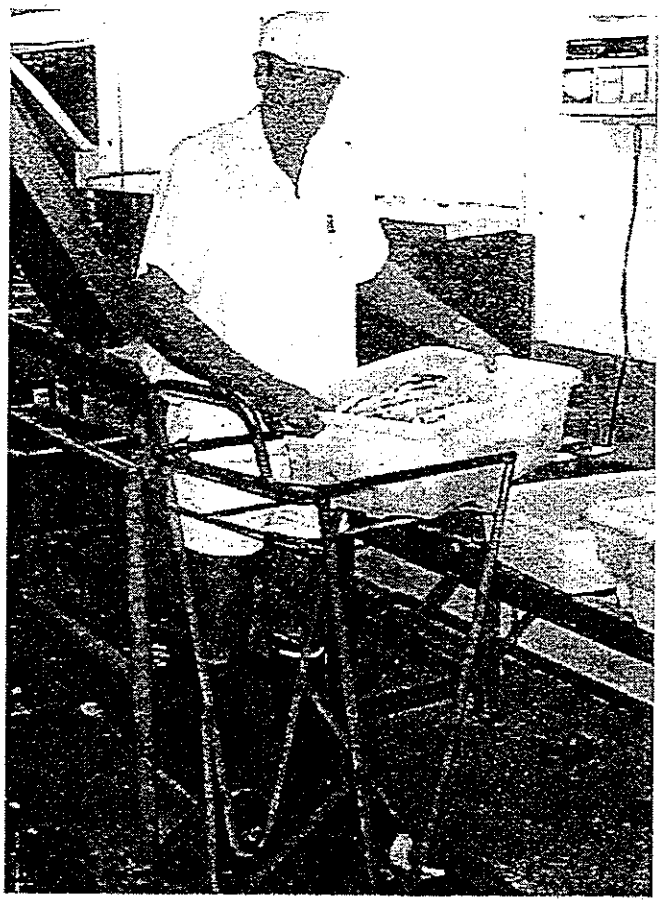


FIGURE 8: TUB CARRYING TROLLEY

Figure 8 taken at Q Meat, Brisbane

CASE STUDY 8 - TUB LIFTING DEVICE

WORK AREA:	Red Meat - Meat Processing
TASK:	Carrying tubs from one conveyor to another.
HAZARDS:	Repetitive manual handling including walking with load down stairs. Up to 500 times per day. Risk of manual handling injury and slipping with load when walking down stairs. *(Old method illustrated in Figure 9).*
RISK CONTROL SOLUTIONS:	➨ Proposed solution illustrated in Figure 10. The operator puts the tub on a tray on the upper level. A push button activates an air cylinder which carries the tub down to ground height, then it is slid onto a trolley. Walking up and down stairs, and lifting and carrying the tubs is eliminated. The moving parts on the cylinder are also guarded in accordance with AS4024-1. Cost of unit (made in house) approximately $500.00.

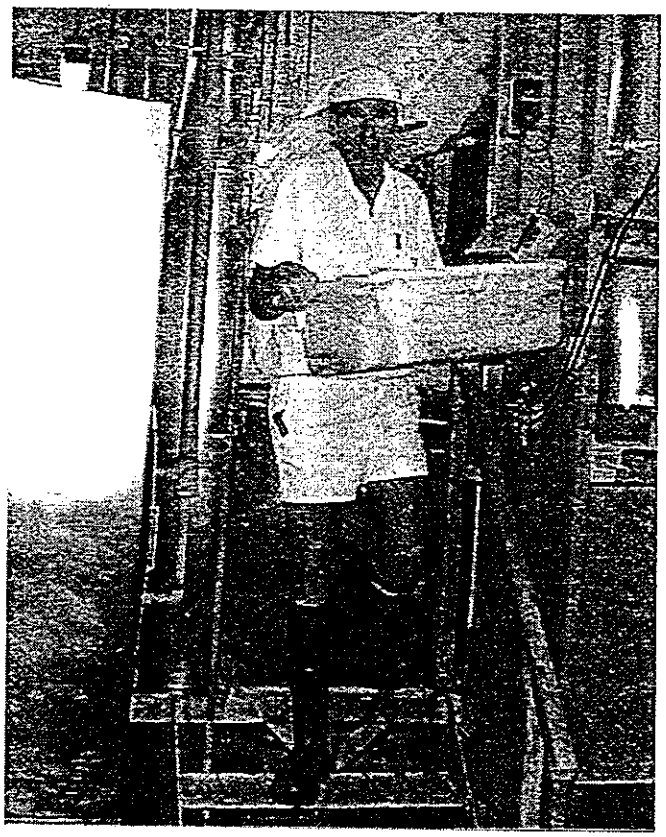


FIGURE 9: CARRYING TUBS DOWN STAIRS. THE "OLD METHOD".

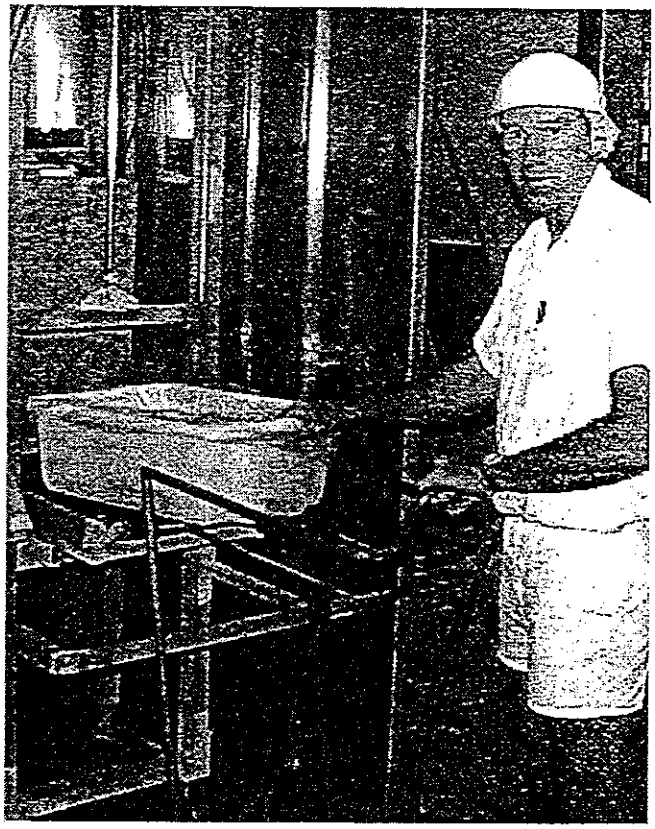


FIGURE 10: AIR CYLINDER CARRIES TUB DOWN TO GROUND HEIGHT WITH NO MANUAL LIFTING OR NEED TO WALK DOWN THE STAIRS.

Figures 9 & 10 taken at Q Meat, Brisbane

CASE STUDY 9 - STUNNING DEVICE

WORK AREA:	White Meat - Kill Floor
TASK:	Stunning Pig
HAZARDS:	Having different sized pigs moving about can cause over reaching and twisting by the operator to stun animal. Made worse by additional load of holding stunning device.
RISK CONTROL SOLUTIONS:	• Variations in pig size controlled more effectively by V shape delivery conveyor. Makes positioning stunning device easier. Stunning unit counter balanced overhead so operator is not supporting the weight of the unit. Improved working posture and reduced manual handling. Anti-fatigue mat for operator also reduces fatigue. Costs for counter balance Unit - $200.00 and Mat-$150.00. Gun and Conveyor vary according to design.

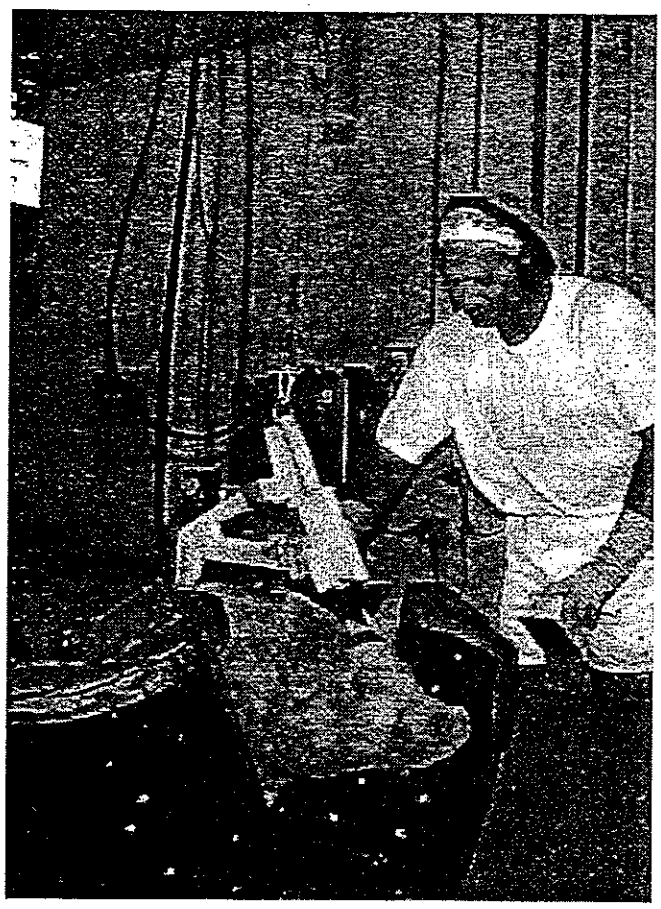


FIGURE 11: STUNNING A PIG

Figure 11 taken at Q Meat, Brisbane

CASE STUDY 10 - STICKING THE PIG

WORK AREA:	White Meat - Kill Floor
TASK:	Sticking the Pig.
HAZARDS:	Previous method (not pictured) of having animal hang vertically often meant over reaching above shoulder height (for some people) to stick animal.
RISK CONTROL SOLUTIONS:	➸ Roller bed system illustrated in Figure 12. Having animal flat on surface means improved working height (approx 850mm) irrespective of how long pig is. If pig moves or kicks, less chance of operator getting hit (refer to picture). Less transmission of blood to operator as animal is away from operator, compared to vertical hanging method. Controlled flow and position of animal also has resulted in reduced risk of cutting operator when sticking. Cost depends on design of roller bed system.

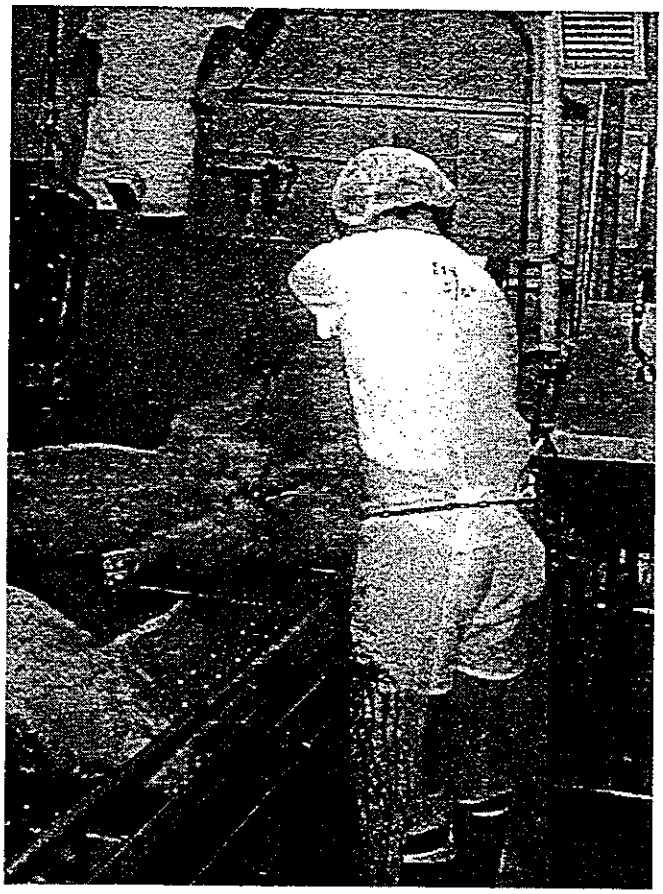


FIGURE 12: STICKING PIG ON KILL FLOOR

Figure 12 taken at Q Meat, Brisbane

CASE STUDY 11 - SHACKLING THE PIG

WORK AREA:	White Meat - Kill Floor
TASK:	Shackling animal.
HAZARDS:	Being kicked by the animal or manual handling to overreach and grasp animal to shackle (old method not pictured).
RISK CONTROL SOLUTIONS:	• Having an elevated horizontal surface (approx 850mm) eliminates much of the bending and over reaching required in this task. In this case it is easier to slide animal to reposition it to get leg shackled. Do not have to support weight of animal when shackling, reduces risk of injury during task. Cost of roller bed depends on design adopted.

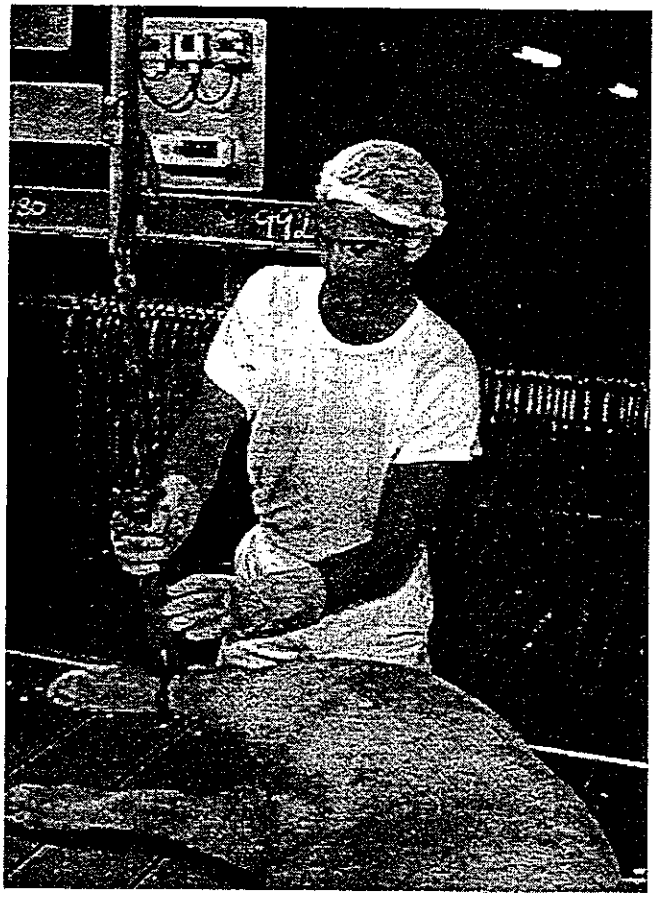


FIGURE 13: SHACKLING THE PIG

Figure 13 taken at Q Meat, Brisbane

CASE STUDY 12 - CIRCULAR RACE

WORK AREA:	Red Meat - Meat Processing
TASK:	Herding animals along race.
HAZARDS:	Extended walking and movement of cattle with some risk of falling, or operator being knocked by animal as well as generating muscular heat.
RISK CONTROL SOLUTIONS:	➸ Circular race. Requires less area. Undercover, the animals herded by moving mechanical arm circulating within race. Reduces need for operators to stand and walk at ground level. Reduces heat stress and general fatigue for operators. Cost depends on dimensions and construction of the race.

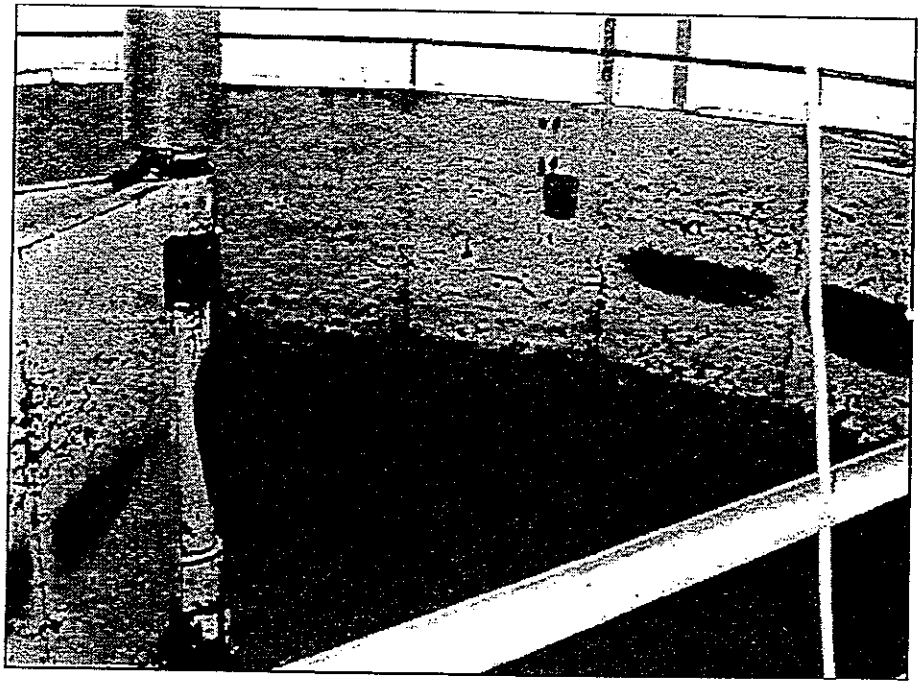


FIGURE 14: CIRCULAR RACE AREA.

Figure 14 taken at South Burnett Meat Works, Queensland

CASE STUDY 13 - HEAD LIFTING DEVICE

WORK AREA:	Red Meat - Kill Floor
TASK:	Lifting head off animal and onto a rail.
HAZARDS:	Weight and size of heads, particularly larger bull heads, generally means this task should not be performed by a single person manual lift.
RISK CONTROL SOLUTIONS:	➾ An air cylinder lowers a hook to the height of the animal's head. ➾ The hook is secured to the head and with the head detached the air cylinder brings the animal's head up to a height where it can be hooked onto an adjacent rail (refer to fig 16). There is no weight bearing with lifting of the head, so the risk of injury is decreased for this task. Approximate cost, $500 (fitted in house).

FIGURE 15: INITIAL CONNECTION POINT OF THE HOOK ON THE ANIMALS HEAD.

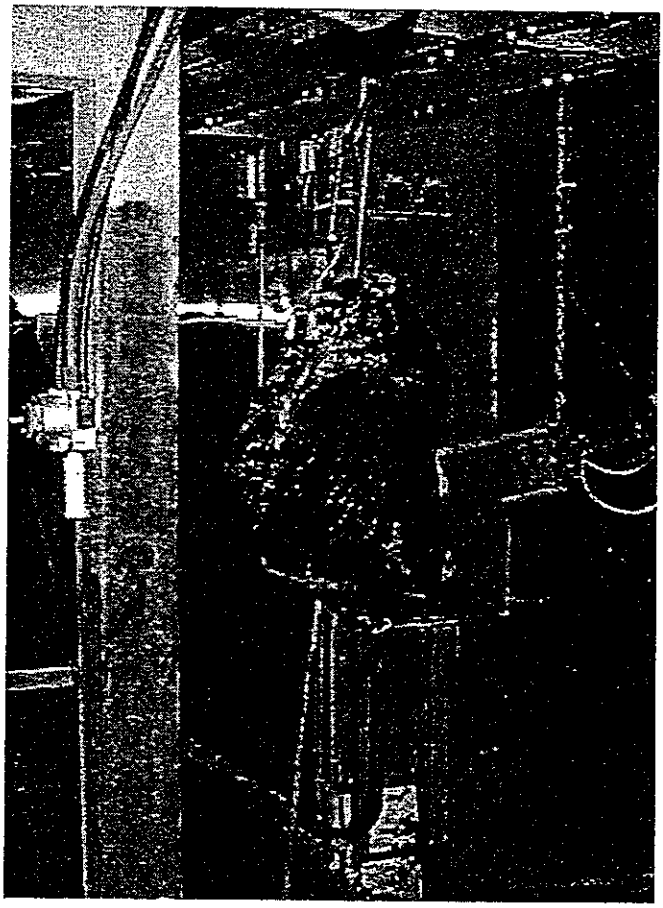


FIGURE 16: HEAD ON A HOOK ON ANOTHER RAIL.

Figures 15 & 16 taken at South Burnett Meat Works, Queensland

CASE STUDY 14 - JAW BREAKING MACHINE

WORK AREA:	Red Meat - Meat Processing
TASK:	Jaw Breaking Tasks.
HAZARDS:	The manual handling effort in jaw breaking is significant without mechanical assistance. There is also a significant risk of cuts in this situation.
RISK CONTROL SOLUTIONS:	• The air cylinder is attached to a hook which is secured over the jaw. As tension is applied through a hook being mechanically lowered, the jaw is broken. This eliminates excessive manual handling and increases the control of the operator in cutting, so risks of cutting and manual handling injuries are decreased. Approximate cost of machine is $3,000.

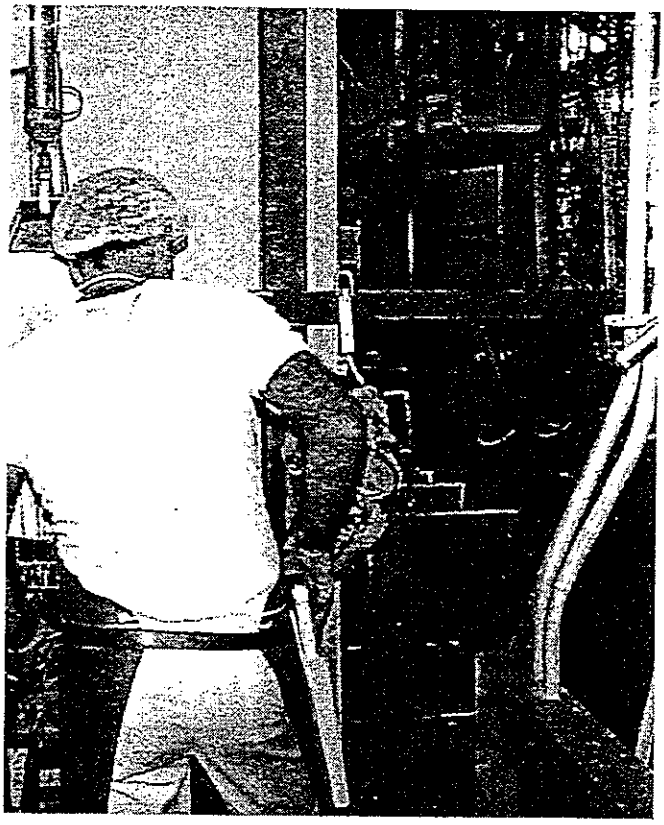


FIGURE 17: ANIMAL HEAD BROUGHT TO JAW BREAKING MACHINE ON RAIL. GOOD LAYOUT DESIGN, RATHER THAN DOUBLE HANDLING USING TUBS.

FIGURE 18: JAW BREAKING MACHINE

Figures 17 & 18 taken at South Burnett Meatworks, Queensland

CASE STUDY 15 - MECHANICAL HOOK FOR BONING

WORK AREA:	Red Meat - Meat Processing
TASK:	Using a Mechanical hook to expose cutting area during boning task.
HAZARDS:	If manual hook is used often, shoulder, elbow, wrist and lower back complaints increase through manual effort of pulling down on carcass with hook whilst cutting.
RISK CONTROL SOLUTIONS:	• A mechanical hook pulls the attached part of carcass down. This eliminates much of the jarring and "ripping" action of the operators when using the manual hook. It leaves the operator more balanced and in control of cutting task. Approximate cost $2,000.

FIGURE 19: USING THE MECHANICAL HOOK AND KNIFE DURING BONING.

FIGURE 20: USING THE MECHANICAL HOOK AND KNIFE DURING BONING

Figures 19 & 20 taken at South Burnett Meatworks, Queensland

CASE STUDY 16 - GANBRELS

WORK AREA:	Lambs - Kill Floor
TASK:	Inserting the ganbrels into the hind hocks of the animal.
HAZARDS:	With a flat edge on the ganbrel there is more gripping and pushing effort, to push it into the animal. This can increase muscular tension, strain and general risk of occupational overuse syndrome for the operator in some situations.
RISK CONTROL SOLUTIONS:	➨ Putting a 45 degree angle on the end of the ganbrels requires less effort for the operator to push it through the leg of the lamb. This is a frequent task (up to 4000 times per day). The risk of injury can be reduced with this small change.

FIGURE 21: THE GANBREL BEING INSERTED INTO THE HOCK OF THE ANIMAL.

FIGURE 22: THE ANGLED EDGE OF THE GANBREL MAKES IT EASIER TO PUSH INTO THE HOCK OF THE ANIMAL.

Figures 21 & 22 taken at MC herds Meatworks, Victoria

CASE STUDY 17 - CRADLE USED WHEN CUTTING ANIMALS THROAT

WORK AREA:	Red Meat - Kill Floor
TASK:	Sticking the cattle.
HAZARDS:	When animal falls out of knocking box sometimes requires manual handling/moving animal to get into position for cutting the throat.
RISK CONTROL SOLUTIONS:	• Cradle (pictured) supports animal in a position to cut its throat. Less movement of animal means reduced risk of injury for operator being kicked by animal and less manual handling of animal which again reduces risk of injury. Cradle good for hygiene as easy to clean and less risk of contamination of animal on work surface. Approximate cost varies according to design.

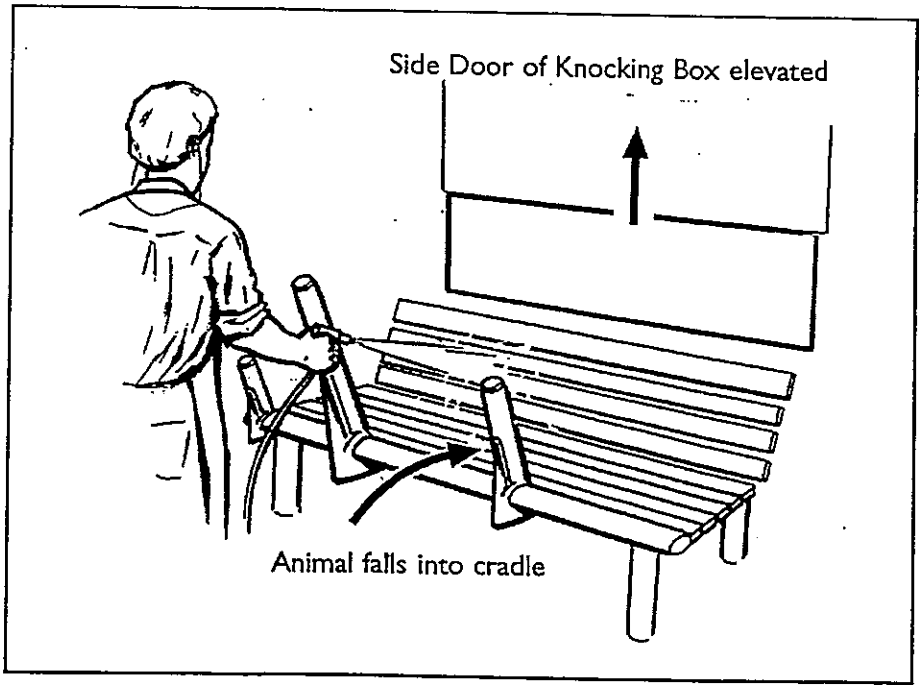


FIGURE 23: CRADLE WHICH IS USED TO SUPPORT ANIMAL AS IT FALLS FROM KNOCKING BOX.

Figure 23 taken at MC Herds Meats, Victoria

CASE STUDY 18 - KNOCKING BOX

WORK AREA:	Red Meat - Kill Floor
TASK:	Stunning the animal in the knocking box.
HAZARDS:	Old method - no shoulder head restraint for animal in knocking box. Operator often bends over to reach the animal. Also some risk of hitting arm against animal and knocking box.
RISK CONTROL SOLUTIONS:	➥ Restraining head (vertical bars) Figure 24 and Figure 26 and elevating head and neck (front angled ledge) Figure 24, puts animals head into good position for stunning. Rear ram operates lever to push animal forward. Improves operators' working posture and restrains all sizes of animals in the box.

FIGURE 24: ANIMAL IN KNOCKING BOX ABOUT TO BE STUNNED.

Figure 24 taken at MC Herds Meatworks, Victoria

- KNOCKING BOX -

Continued

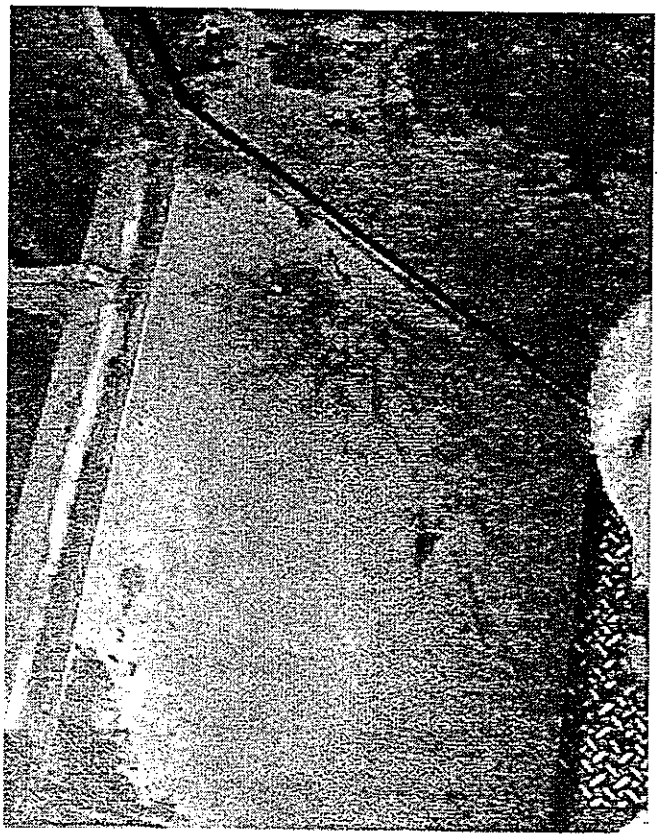


FIGURE 25: A REAR FLAP TO BRING THE ANIMAL FORWARD IN KNOCKING BOX.

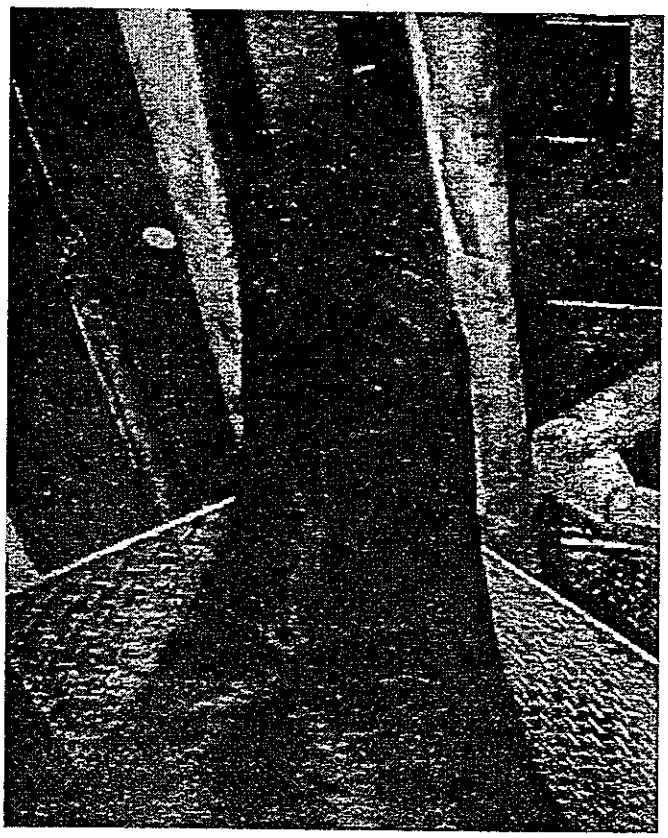


FIGURE 26: ALTERNATIVE DESIGN OF A RAM AROUND ANIMALS NECK/SHOULDERS WOULD SECURE HEAD IN POSITION FOR STUNNING.

- The flap in Figure 25 is operated on a hydraulic ram activated by a push button by operator doing stunning. It pushes animal forwards and precedes the neck restraint securing the animals position before stunning.

Figures 25 & 26 taken at Hardwicks Meatworks, Victoria

CASE STUDY 19 - HOOK TRANSFER ON REAR LEG

WORK AREA:	White Meat - Kill Floor
TASK:	Transferring hook on rear leg of the sheep.
HAZARDS:	Old Method required manually hooking one leg and manually lifting the sheep approximately 400mm from the operator's chest to above shoulder height in many cases. Stress on neck, arms, shoulder, back for some operators.
RISK CONTROL SOLUTIONS:	➾ This lifting is eliminated by a foot operated air ram which lowers to secure leg by the hook. Push foot pedal and mechanically lifted up to rail height where hook is secured. Lifting is eliminated from job. Approximate cost $1,600.

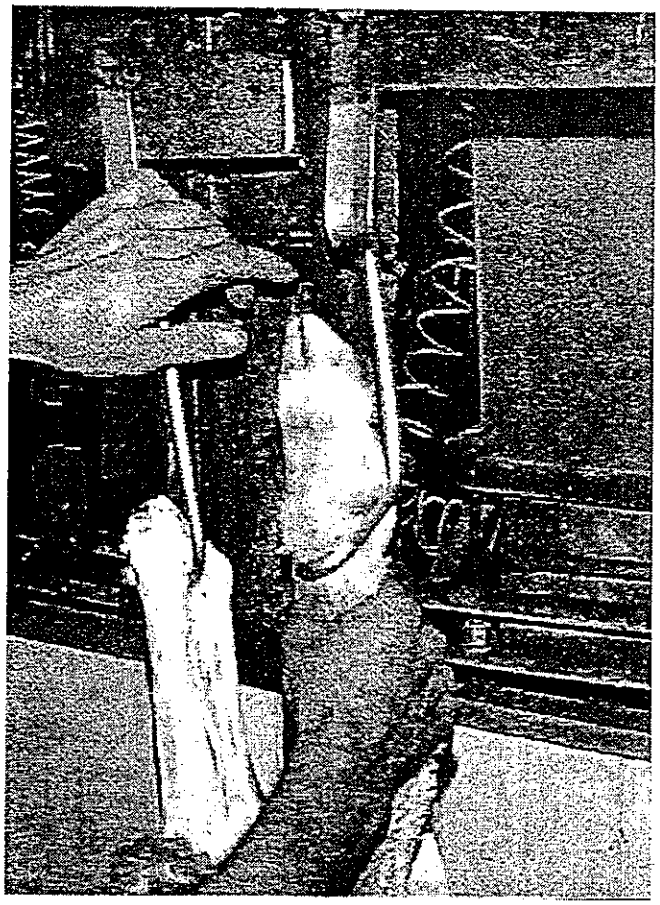


FIGURE 27: THE LEG OF THE SHEEP (LEFT) BEING LIFTED UP TO THE RAIL BY MECHANICAL LIFTER.

Figure 27 taken at Hardwicks Meatworks, Victoria

CASE STUDY 20 - ROLLER CONVEYOR SYSTEM

WORK AREA:	White Meat - Meat Processing
TASK:	Moving carcass along the conveyor.
HAZARDS:	Changing direction of movement of a carton on a roller conveyor can involve additional pushing and pulling effort from operator as carton is moved.
RISK CONTROL SOLUTIONS:	➸ *Figure 28* illustrates the marbled surface which can be used to move a carton through a change in direction of 90 degrees. In this case this moves the cartons from one inertia roller conveyor to another. The introduction of this, significantly reduces the manual handling involved in the task. Approximate cost of the marbled conveyor is $1,500 per metre. ➸ **Flexible Roller Systems:** On occasions, cartons in the load out area and in box making rooms, will need to be moved on conveyors. These areas may need to be used for other activities during the shift. The conveyor in Figure 28 allows for the flexibility of being extended when pushing cartons around the room. When not in use, the conveyor can be recoiled to a length less than 20% of its extended length. These conveyors cost approximately $2,000 for a three metre conveyor.

FIGURE 28: THE CARTONS BEING MOVED OVER THE MARBLED CONVEYOR SURFACE.

Figures 28 taken at Metro Meats, Murray Bridge, SA.

CASE STUDY 21 - WEIGH STATION

WORK AREA:	White Meat - Kill Floor
TASK:	Weigh Station.
HAZARDS:	Standing for prolonged periods on the kill floor in static work positions can be fatiguing.
RISK CONTROL SOLUTIONS:	➾ Provided the operator can safely reach the carcass to stamp it and read the computer (all within 560mm arc from chair), the operator could sit down. The chair pictured below has a galvanised frame and polyurethane seat so it meets hygiene requirements and ergonomic design. Chair costs approximately $500.00 available from Flexliner Australia.

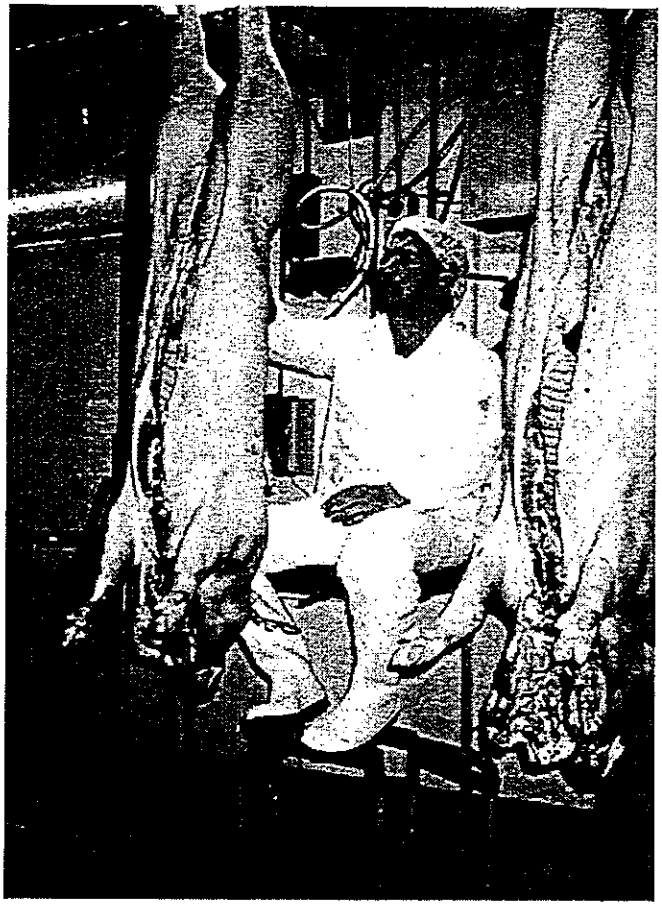


FIGURE 29: SEATED OPERATOR PERFORMING WEIGHING TASK.

Figure 29 taken at Bunge Meats, NSW

CASE STUDY 22 - TONGUE CLEANING MACHINE

WORK AREA:	White Meat - Kill Floor
TASK:	Cleaning the animal tongues.
HAZARDS:	There is often "double handling" by putting tongues in a dump bin on the kill floor and then transporting them to the second area for cleaning.
RISK CONTROL SOLUTIONS:	➾ Cleaning the tongues in the rotating cleaning machine at the point where they are removed from the animal, eliminates a lot of double handling. The easy to clean rotating mechanism which has the drum exposed is illustrated in the Figure 30. Normally the side panel is in place during operation. Cost of the machine varies according to its processing volume and dimensions. Manufactured on site by Meat Processing Plants Maintenance Team.

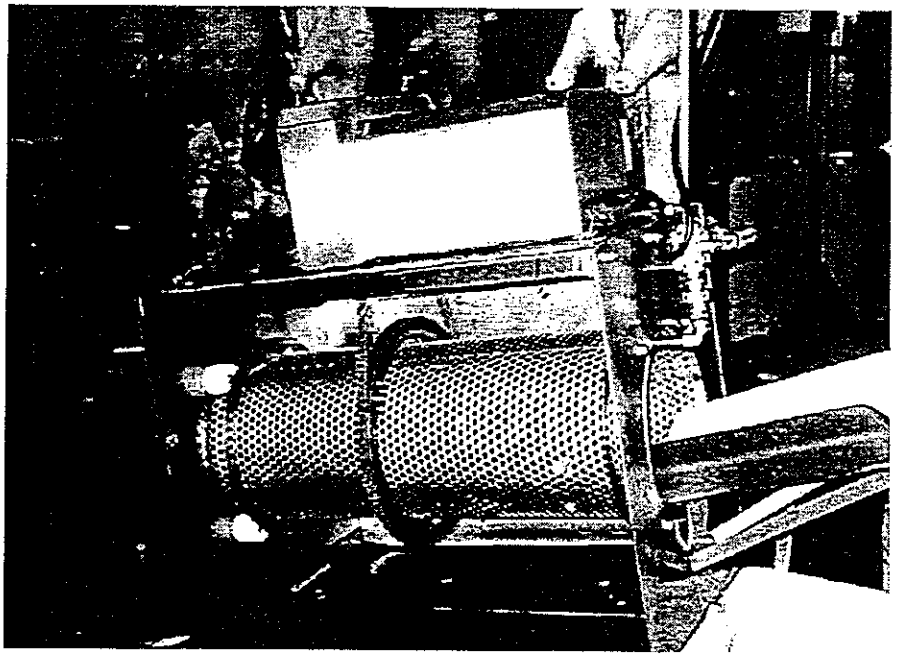


FIGURE 30: THE TONGUE CLEANING DRUM MACHINE

Figure 30 taken at Bunge Meats, NSW

CASE STUDY 23 - ELEVATED WORK SURFACE

WORK AREA:	White Meat - Kill Floor
TASK:	Kill Floor - Meat processing.
HAZARDS:	Working above shoulder height can, in many cases increase the risk of fatigue and injury. Increasing the working height, through provision of a platform is one of the most common approaches to controlling this hazard.
RISK CONTROL SOLUTIONS:	➸ If a platform is provided, there should be a step if the platform is more than 300mm high (AS1657). A highlighted colour (yellow) and a grip surface on the floor will reduce risks of trips and falls. A kick board around the edge of the platform will provide more control from slipping. Anti fatigue matting for the operator to stand on will also reduce risk of static muscle fatigue and general body strain when standing on the platform.

FIGURE 31: AN OPERATOR ON THE PIG KILL FLOOR

Figure 31 taken at Bunge Meats, NSW

CASE STUDY 24 - NYLON ROLLERS

WORK AREA:	White Meat - Meat Processing
TASK:	Design of Rollers.
HAZARDS:	Additional push/pull effort by operators to push carcass with poor rollers on the rail particularly with poorly designed and maintained gates.
RISK CONTROL SOLUTIONS:	The use of nylon rollers has the following safety and hygiene benefits. • It is not metal on metal so there can be a noise reduction. • Not having metal on metal means there is no metal filings contaminating the meat product. • The design of the rollers in the figures below moves over rails more easily. Therefore, reducing pushing pulling force by operators and reducing the risk of manual handling related fatigue and injury.

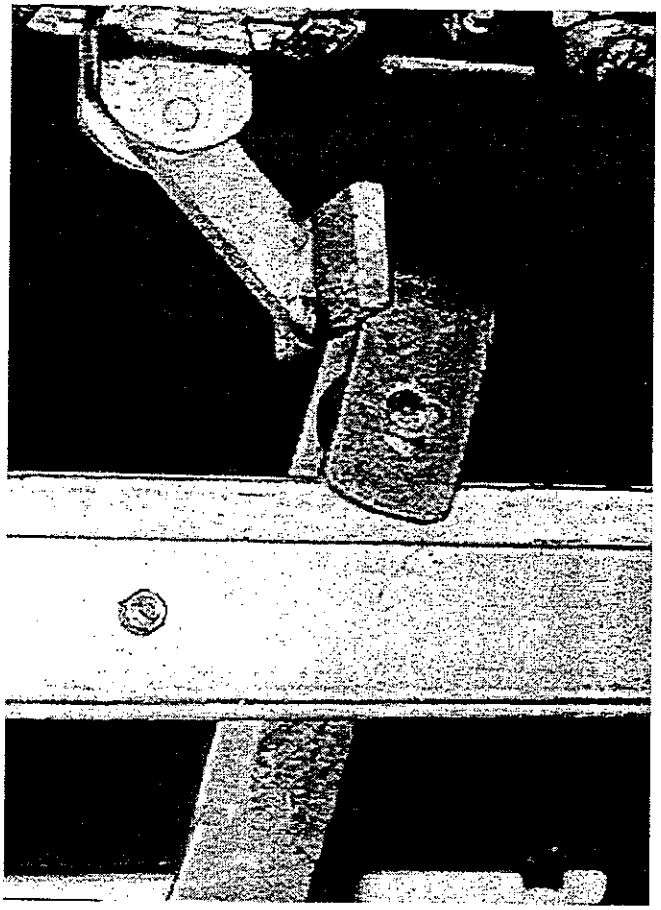


FIGURE 32: ROLLERS ON RAILS

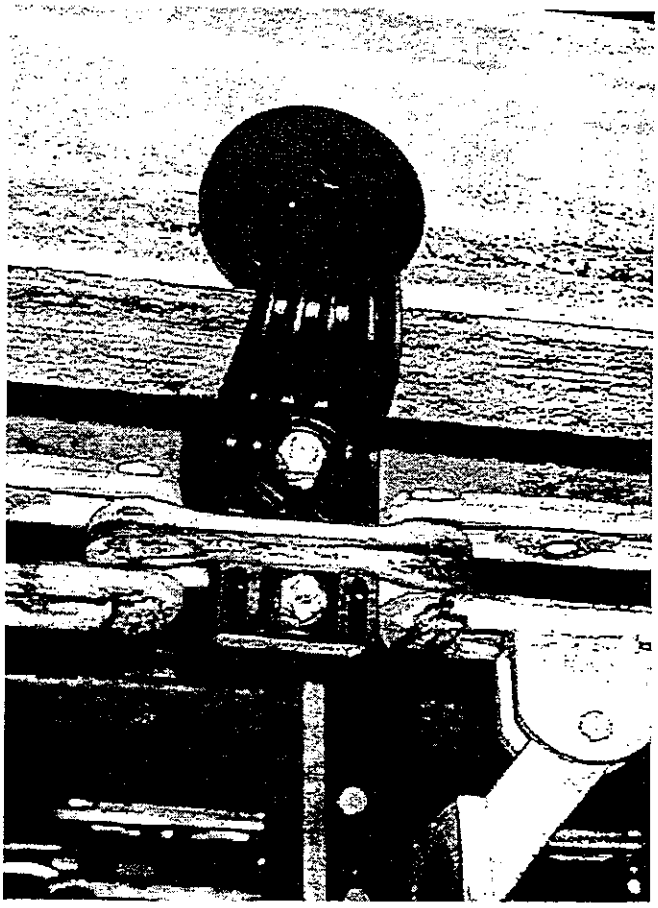


FIGURE 33: ROLLERS ON RAILS

Figures 32 & 33 taken at Bunge Meats, NSW

CASE STUDY 25 - TRANSPORT BINS

WORK AREA:	White Meat - Meat Processing
TASK:	Transporting meat product within the processing plant.
HAZARDS:	Repetitive manual handling of moving product to different locations within the plant.
RISK CONTROL SOLUTIONS:	➾ Dump Bins should not be over filled, this requires too much manual handling to move the bins. They should have large wheels on them. (Refer to figure 35). Having the large nylon wheels makes less noise than metal and they are easier to push, thus reducing the manual handling, for moving the bins. Approximate cost $600.

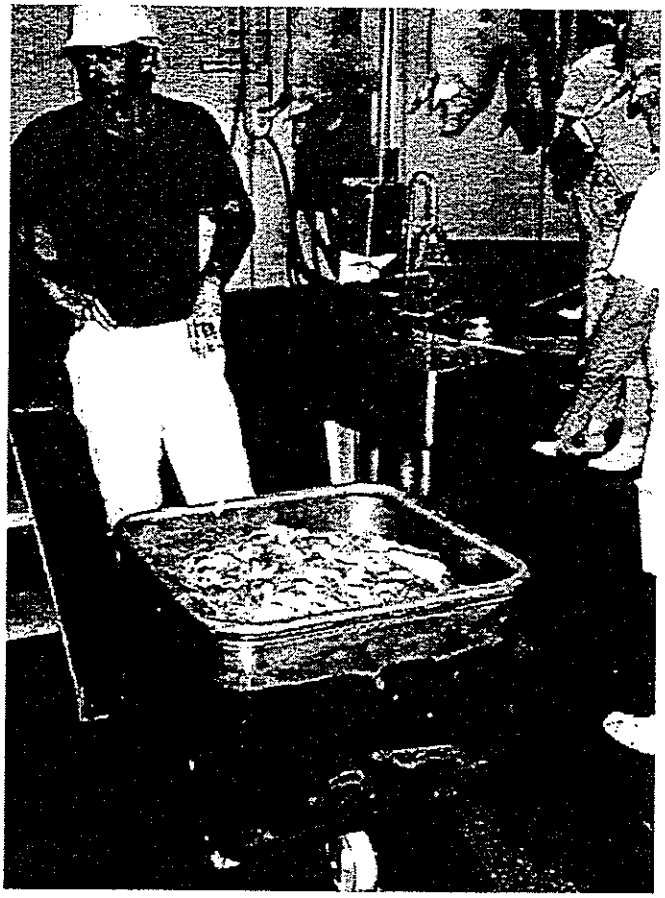


FIGURE 34: DUMP BIN 1

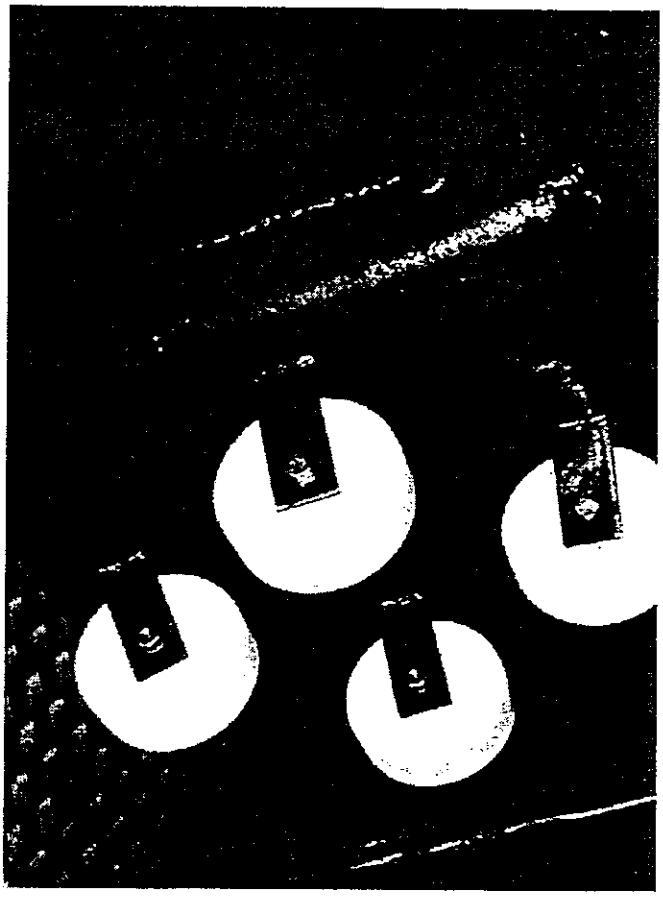


FIGURE 35: LARGER NYLON WHEELS MAKES IT EASIER TO PUSH THE BIN

Figures 34 & 35 taken at Bunge Meats, NSW

CASE STUDY 26 - GAS CYLINDER

WORK AREA:	Red Meat - Meat Processing
TASK:	Carrying Gas Cylinders around the plant for maintenance work.
HAZARDS:	Rolling or lifting gas Cylinders has presented significant manual handling challenges because of the shape, weight and difficulty in getting a grip on the Cylinder.
RISK CONTROL SOLUTIONS:	➸ The trolley in the figure below has one Cylinder in front of another. This makes it easier to get through doors and between plants compared to having them next to each other. Large air filled wheels also makes manouvering the trolley easier. The length of the trolley gives some leverage and significantly reduces the manual handling of moving the cylinders manually.

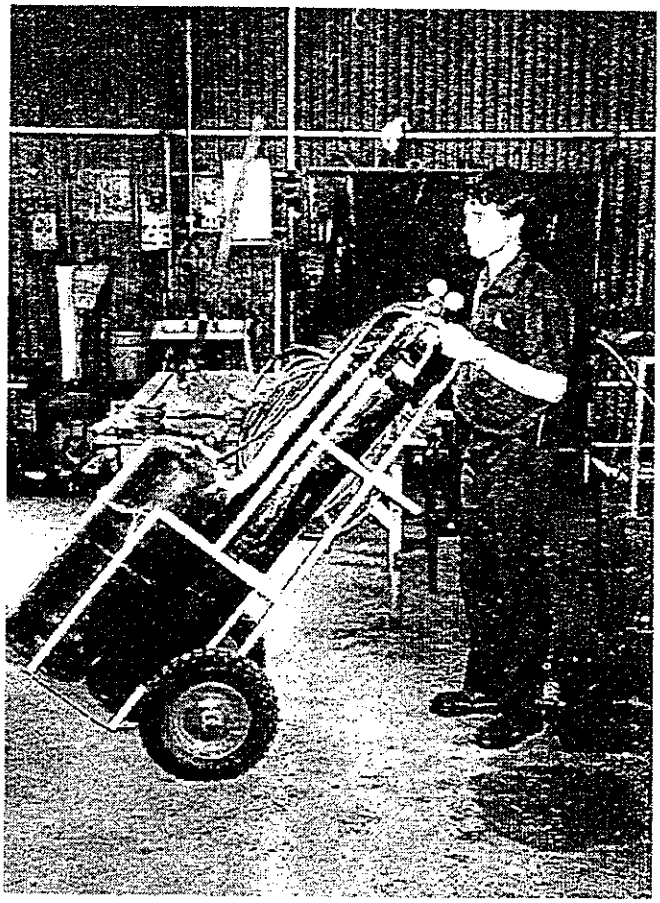
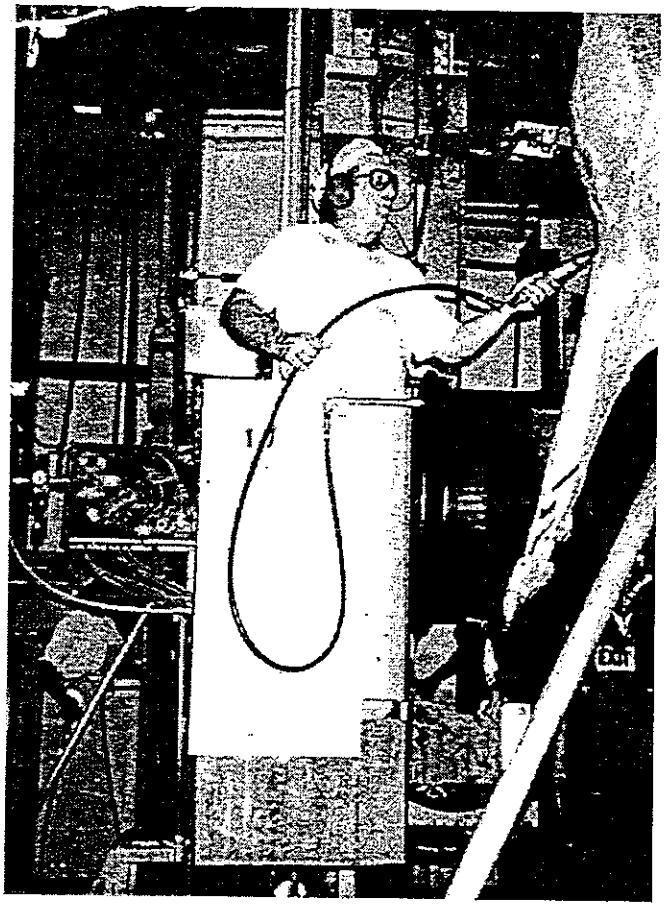


FIGURE 35: TROLLEY FOR GETTING CYLINDERS

Figure 35 taken at Q Meat, Toowoomba, QLD

CASE STUDY 27 - TRIMMING KNIVES

WORK AREA:	Red Meat - Kill Floor
TASK:	Downward Hide Puller. Hand held air knives used to trim carcass during downward hide pulling.
HAZARDS:	The Power lead for the tool in Figure 37 below comes from behind the cubicle. It causes the lead to get caught and pulls the trimmer out of the operator's hand and leads to cuts.
RISK CONTROL SOLUTIONS:	➸ Figure 36 has the power lead directed from the front of the cubicle. Less chance of lead getting caught and ripped out of operator's hand. This has been shown to reduce the risk of cuts during the task.



FIGURES 36 & 37: TRIMMING THE CARCASS WHILST HIDE BEING PULLED OFF.

Figures 36 & 37 taken at Q Meat, Brisbane, QLD

CASE STUDY 28 - BONING ROOM TABLE

WORK AREA:	White Meat - Meat Processing
TASK:	Design of boning tables.
HAZARDS:	One size does not fit all! Figure 38 shows two operators working at a fixed working height. The taller operator has to "slouch" when standing which may increase strain in the neck and lower back if this position is sustained for prolonged periods of time.
RISK CONTROL SOLUTIONS:	➾ Having adjustment in the height of the tables and equipment can reduce poor operating postures.

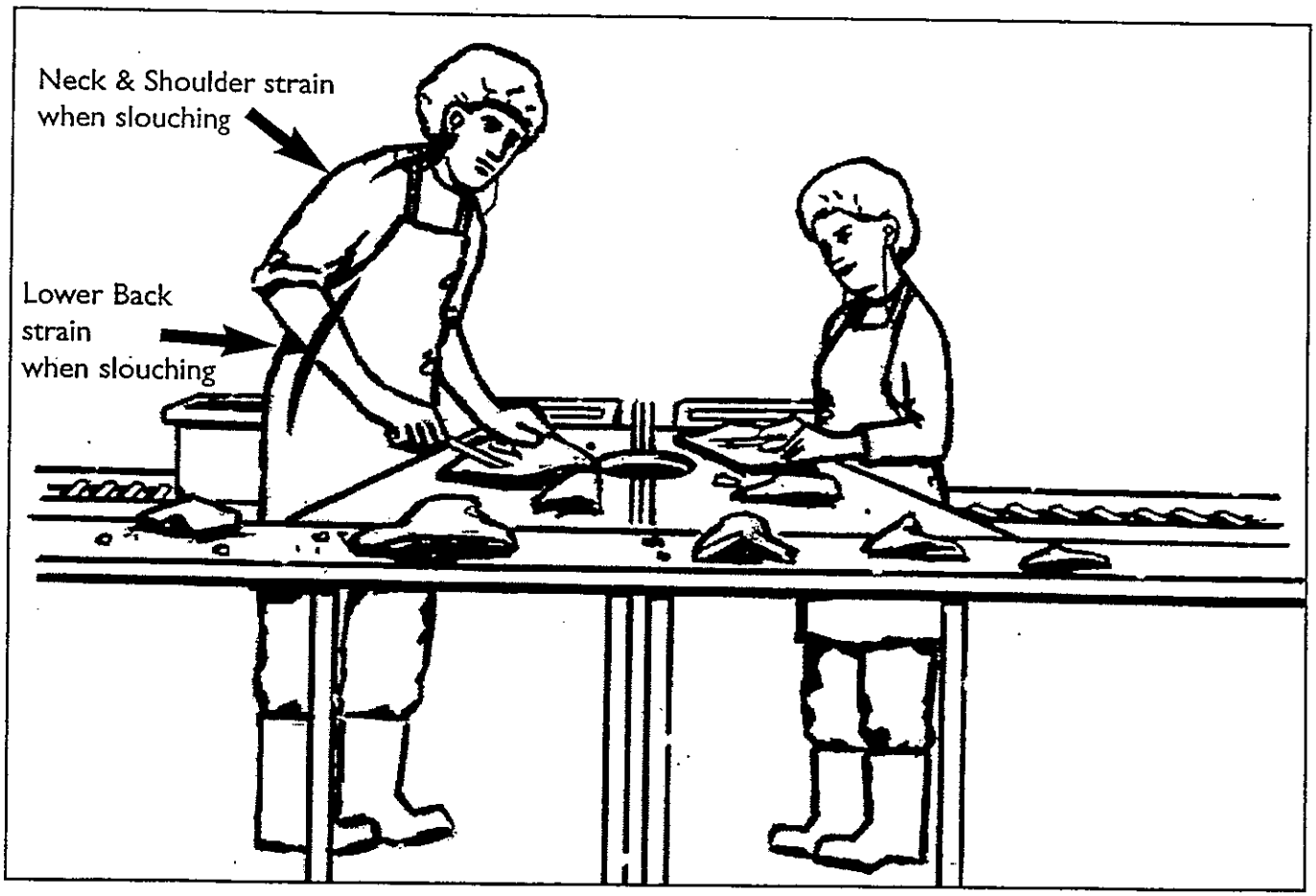


FIGURE 38: TWO OPERATORS WORKING AT A BONING TABLE. [1]

[1] *Figure 38 & 39 derived from design principles applies to workstations at Metro Meats Noarlunga, SA (now closed) and Metro Meats, Murray Bridge, SA.*

- BONING ROOM LAYOUT -

The advantage of having the workstation layout in Figure 39 is that each operator changes the height of the table depending on their own height. As Figure 40 illustrates, an adjustable height table allows for the operator to have the table 3 - 5 cm below standing elbow height which for light boning or trimming tasks is often a comfortable position. For more physically demanding boning tasks, the work should be slightly lower so the operator can use their body weight for a mechanical advantage.

Figure 39 has a boning, area layout with the following ergonomic design benefits:

- Adjustable table height for operators.
- A chute in the centre of the table to throw off cuts. The chute goes to a table the floor below the boning room, thus eliminating the need for a trolley.
- A roller conveyor next to the table where meat can be put straight into a carton.
- Easy reach to the conveyor to grasp meat.
- A hinge system in the roller conveyor so the operator can lift a 1 metre section of the rollers up, when leaving the processing area.

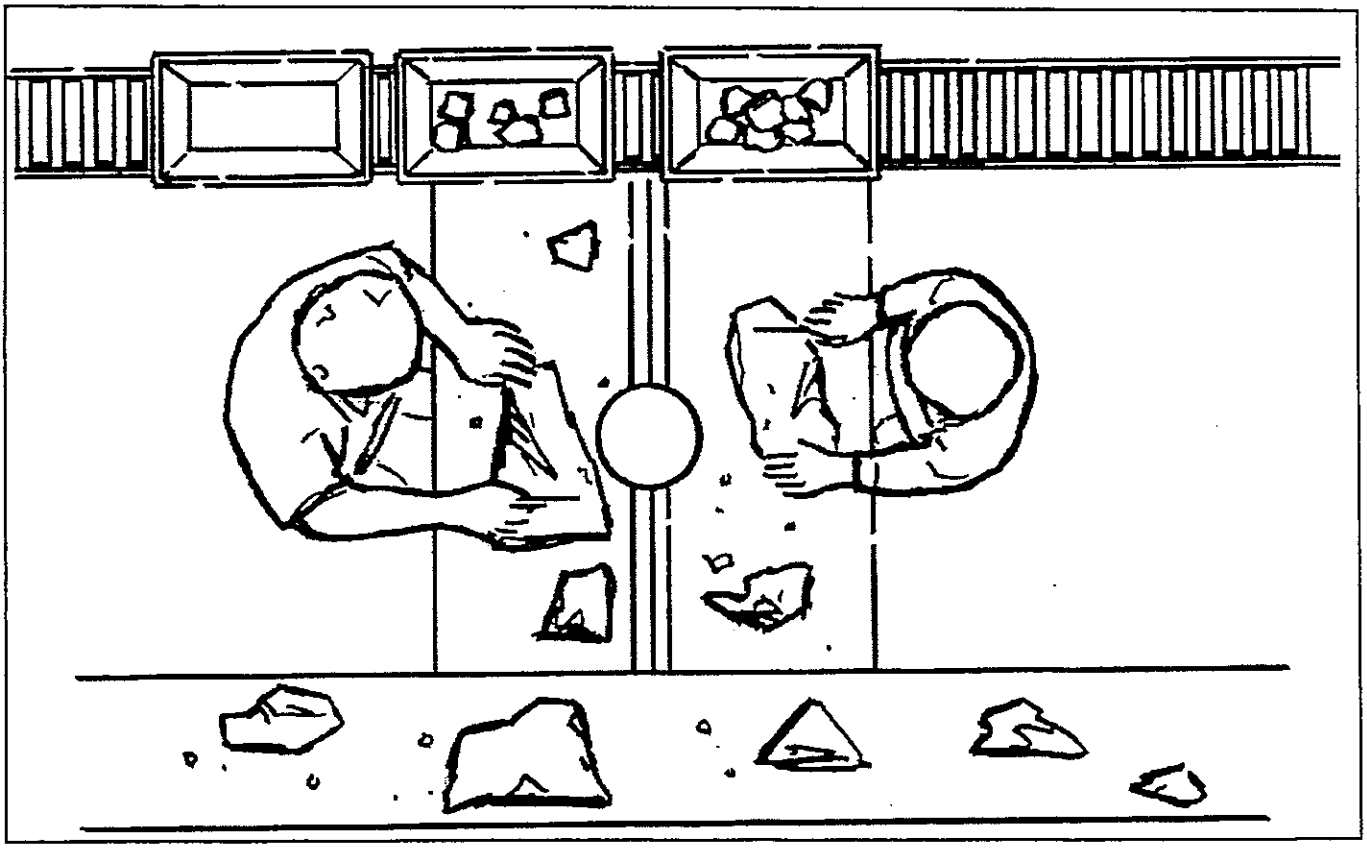


FIGURE 39: BONING ROOM LAYOUT

- BONING ROOM LAYOUT -

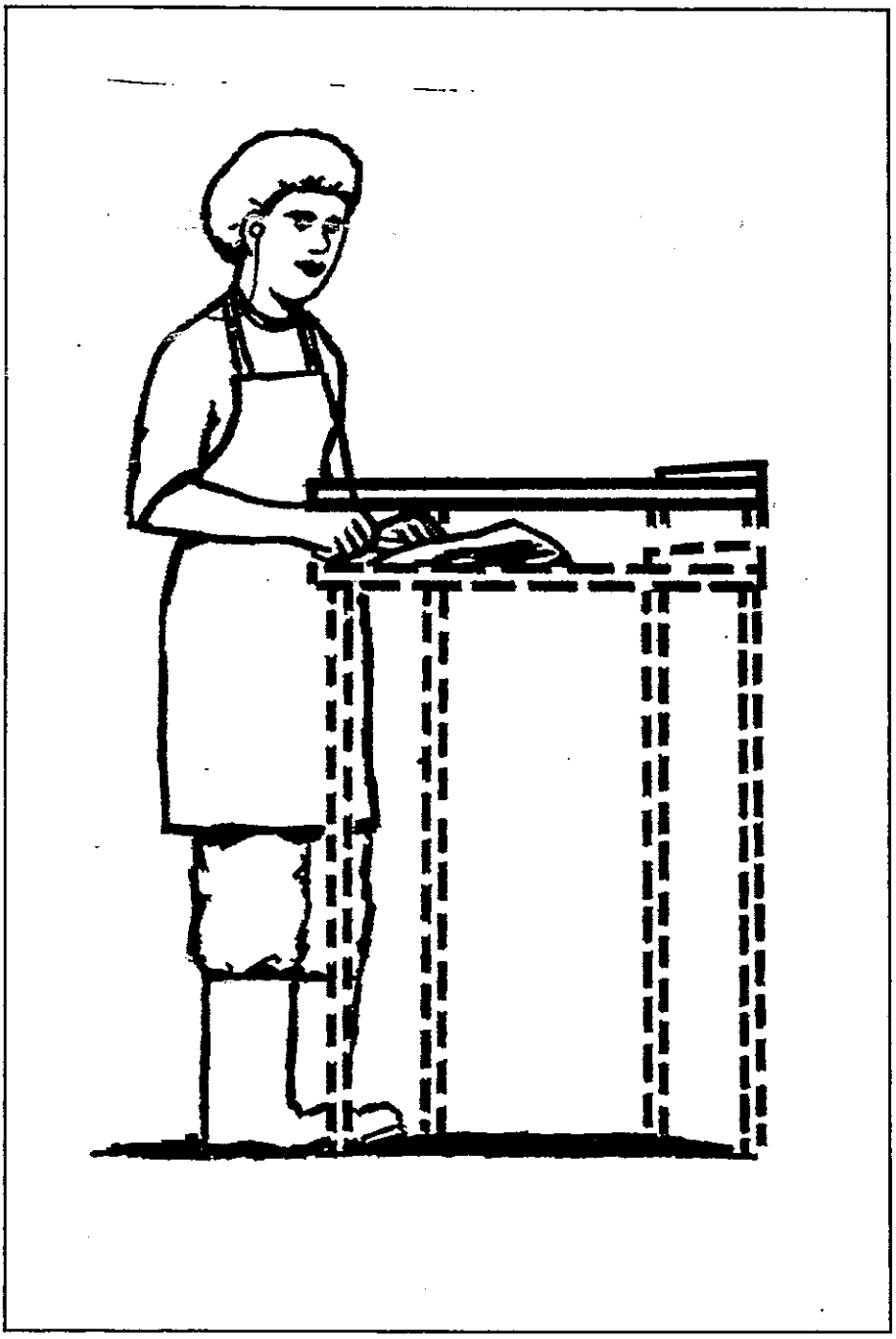


FIGURE 40: OPERATOR WORKING AT A BONING TABLE (THE DOTTED LINES INDICATE A VARIABLE HEIGHT WORKING SURFACE).

A lock in mechanism (like a bike saddle) allows for the height of table to be adjusted (all 4 legs height changed) and tilted (back and front legs different height).

CASE STUDY 29 - LOAD OUT AREA

WORK AREA:	White Meat - Meat Processing
TASK:	Loading cartons.
HAZARDS:	Repetitive lifting of cartons. Lifting from ground height up to above head height. Extreme range of movement, repetitive work with heavy cartons.
RISK CONTROL SOLUTIONS:	➸ Ram on a forklift eliminates manual handling. Forklift lifts load on pallet into container. Ram them pushes the stack of boxes off pallet into the container. Manual handling eliminated and task made more efficient as only forklift driver required and task performed quicker.

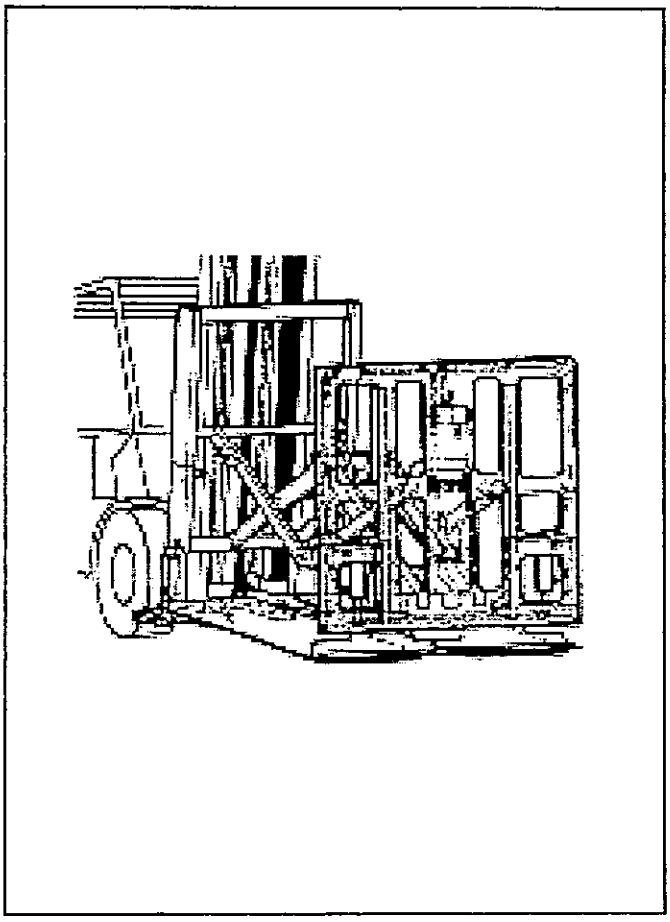


FIGURE 41: RAM OPERATED SYSTEM FOR MECHANICALLY UNLOADING CARTONS

Figure 41 Courtesy of Crown Forklifts.

Appendix A

MANUAL HANDLING HAZARD PROCESS

A generic manual handling hazard management process which could be adopted by many sites to develop a risk control program.

MANUAL HANDLING HAZARD MANAGEMENT PROCESS

The object of this section is to outline the manual handling hazard management process within the Meat Processing Industry.

The flow chart in Table 1 summarises the key stages to be completed for this hazard management process.

Table 1: Manual Handling Hazard Management Procedure

	Activity	Responsibility
	Manual Handling Risk assessment form.(Eg. State Manual Handling Code of Practice or Company Risk Assessment Form.	*Hazard Management Team*
1.	Complete risk identification for each task (consultation, observation and injury statistics).	Each department to provide the resources for the appropriate persons to complete the hazard management audits.
	Assess risk score for each risk identified.	
	Develop manual handing risk control methods.	
2.	Implement risk control methods.	Department managers through delegated Supervisors, Employees and Occupational Health & Safety Representatives.
3.	Implement Training.	Department Superintendent through external/internal training providers in consultation with Safety Department.
4.	Keep records (for at least seven years).	Department Administration - Manual Handling hazard audit register to be completed, updated and presented of the safety meetings.
5.	Evaluate success of controls and identify new manual handling hazards.	Department Superintendent / Department OH&S Committee

Manual Handling Hazard Process

• **IMPLEMENT CONTROLS (REFERENCE TO THE APPROPRIATE PARTS OF THE RELEVANT STATE CODE OF PRACTICE IS ESSENTIAL).**	
1. ***Elimination*** All unnecessary manual handling should be eliminated. (eg; use a chute to transfer load rather than carry).	Department Supervisor or delegate to Supervisors and Employees.
2. ***Substitution*** Heavy, awkward objects and loads can be replaced by smaller units. (eg; limit load in dump bins).	As above
3. ***Engineering*** Mechanical aids, devices, platforms, fork lifts, conveyors, trolleys, lifts, cranes and hoists should be made available and used whenever necessary.	As above
Changes and modifications to workrooms, area or stations can be made. (eg; use roller conveyors rather than manually lifting).	As above
• **IMPLEMENT TRAINING**	
1. ***Induction*** All new employees and contract staff must be made aware of this Company Safety policy and procedure and any Job Safety Procedures (JSP) relevant to their work.	Supervisors
All employees should attend training which includes: - Risk identification, assessment and control. - Anatomy and manual handling injuries. - Responsibilities of management and employees. - Principles of safe manual handling. - Safety policy and procedure. - Job Safety Procedures (JSP) - Fitness and Health.	Department Superintendent through internal and external Training Providers.
All employees must apply any training provided and comply with any reasonable instruction given in connection with this procedure.	All Employees
• **KEEP RECORDS**	
1. ***Training*** All training records must be kept for 7 years.	Department Administration.
2. ***Risk identification assess and control.*** All risk identification questionnaires, risk assessment scores and control action sheets must be kept for 5 years.	As above

Appendix B

MUSCULOSKELETAL CHART

This chart is aimed at providing basic information about common manual handling injuries and information about causation factors and signs and symptoms.

Musculoskeletal Injuries Chart

INJURY / DISORDER	SIGNS AND SYMPTOMS	TYPICAL CAUSES WITH EXAMPLE
Back Injuries		
• Strains, sprains of muscles, ligaments. • Pressure on disc between vertebrae. • Bulge or tear of outer disc fibres. • Wear and tear of facet joints. • Other disorders.	• Pain in the back or referred pain down the leg. • Restricted movement of back. • Additional signs, symptoms dependent on type of disorder.	• Manual lifting and handling eg; repetitive lifting in load out areas. • Awkward back posture eg; retrieving parts from a bin • Prolonged static back postures eg: boning on tables that are too low • Whole-body vibration eg; mobile equipment operator sitting in a vibrating vehicle.
Bursitis		
• Inflammation of the bursa (sac) found around some joints, causing an increase in the fluid within the bursa.	• Pain, swelling at the site of disorder. • Pain in the affected area when the joint is moved.	• Force and repetitive movement, eg; kneeling for prolonged periods during maintenance work.
Carpal Tunnel Syndrome		
• Pressure on the nerve that passes through the carpal tunnel.	• Tingling, pain and numbness in the thumb and fingers, especially at night.	• Repetitive work, eg; entering data into a computer using awkward wrist postures. • Repetitive wrist movements and use of force, eg; mechanical repairing vehicles. • Work requiring force using awkward wrist postures, eg; using power tools.
Chrondromalacia Patellae		
(Kneecap)	• Pain behind kneecap, soreness and grating especially when going up and down stairs. • Disabling pain may persist for years. • Mostly affects younger adults.	• Repetitive climbing of stairs, or prolonged crouching.
De Quervain's Syndrome		
(Thumb)	• Discomfort over the anatomical snuff box and over the thumb's extensor tendons at the wrist. • Majority of cases occur in people over 30 years old.	• Poor knife design or extended range of wrist movement with a power grip (ie; repeated ulnar deviation with a power grip).

NB: Musculoskeletal Injuries Chart • Chart adapted from Industrial Accident Prevention Association - Manual Handling Guide. IAPA - Toronto

Musculoskeletal Injuries Chart

INJURY / DISORDER	SIGNS AND SYMPTOMS	TYPICAL CAUSES WITH EXAMPLE
Epicondylitis		
• Inflammation of the area at the elbow where the tendon attaches to bone, eg: tennis elbow and golfers elbow.	• Pain and swelling at the site of the disorder and when using the hand and arm.	• Repetitive extension and flexion of the elbow with rotation of the forearm - often requiring additional force, eg; meat cutters and spray gun operators.
Muscle Strains		
• Tears in fibres of muscles and/or tendons.	• Local pain and swelling • Decreased ability to use muscle.	• Overuse of muscles, eg; construction workers repeatedly handling materials and supplies.
Painful Arc Syndrome		
"Frozen Shoulder"	• Continuous and spontaneous pain both day and night with virtually no movement of the shoulder.	• Injection of cortico-steroids. • Sometimes surgery.
Rotator Cuff Syndrome		
	• Pain, swelling, tenderness, redness of area around tendon.	• Prolonged work above shoulder height, eg; working on a chain that is too high ie; a kill floor.
Tendonitis		
• Inflammation of tendons and of tendon-muscle junctions.	• Pain, swelling, tenderness, redness on area around tendon.	• Repetitive movement of the arm and shoulder with the arm in an awkward posture, eg; repairing or installing overhead lighting.
Tenosynovitis		
• Inflammation of tendon sheath.	• Aching, tenderness, swelling, pain and difficulty using part affected.	• Repetitive work, eg; light assembly tasks or food processing. • Can be brought on by sudden increases in work load or by introduction of new process.
Trigger Finger		
• Inflammation of tendons and/or sheaths of the affected finger (s) usually the index finger.	• Difficulty moving the finger with or without pain.	• Repetitive work often requiring forceful exertions of one or more fingers, eg; operating power tools that require one finger to operate the trigger mechanism.

NB: Musculoskeletal Injuries Chart • Chart adapted from Industrial Accident Prevention Association - Manual Handling Guide. IAPA - Toronto

Musculoskeletal Injuries Chart

INJURY / DISORDER	SIGNS AND SYMPTOMS	TYPICAL CAUSES WITH EXAMPLE
White Finger Disease		
• Reduced blood circulation in finger tips (can lead to nerve damage)	• Pale white skin and pain around finger tips.	• Repetitive use of vibrating tools often used in a cold environment, eg; sustained grip on tools with a power grip where it is cold and there is some vibration.

Appendix C

GLOSSARY OF MEDICAL TERMS

A Glossary of Medical Terms to assist with clarifying terminology often found in manual handling and ergonomics material.

Glossary of Medical Terms

Acute Injury

An injury which is the result of a single incident (eg, a broken arm).

Anthropometry

The study and measurement of the physical dimensions (size) of the human body.

Biomechanics

The study of the forces required to manually lift, lower, push, pull or carry objects or people and the effects of these forces on the body.

Bursa

A very thin, fluid-filled sac that helps reduce friction where tendons rub against bones, ligaments and other tendons or where bones come close to the surface of the skin.

Bursitis

A swelling of a bursa.

Carbon Dioxide

A waste gas formed in the tissues and eliminated by the lungs.

Cardiovascular System

The system of the body that includes the heat and blood vessels (veins and arteries).

Carpal Tunnel

A tunnel, formed by the carpal bones of the hand and a tough fibrous band, through which nerves, tendons and blood vessels run to and from the hand.

Carpal Tunnel Syndrome

A swelling within the carpal tunnel that puts pressure on the median nerve.

Cartilage

A smooth, gristle-like connective tissue that surrounds joint surfaces.

Chronic Injury/Disease

An injury or condition that persists for a long period of time or that shows little change or extremely slow progression over a long period of time.

Cumulative Trauma Disorder (also referred to as "Occupational Overuse Syndrome")

An injury or condition which develops over a period of time as a result of ongoing exposure to risk factors associated with a specific injury or disease; musculoskeletal injuries that appear to be work related and develop over time.

Cumulative: Increasing in amount by one addition after another.

Trauma: Bodily injury from mechanical stress.

Disorder: Physical aliments or abnormal conditions.

Degenerative Disc Disease

Degeneration of the vertebral discs due to wear and tear or the aging process.

Design/Redesign

See "Ergonomics"

Discs

See "Vertebral Disc"

Dynamic Muscle Work

The alternating contraction and relaxation of the muscles that cause movement.

Epicondylitis

Inflammation of the area around the elbow joint.

Ergonomics

The science of people at work which places the human as a central figure in the interrelationships between people, their work, the tools and equipment used, and the environment in which the work is performed.

Facet Joints

Joints formed by the vertebrae in the back.

Force (Forceful Exertions)

The amount of work which the body must exert in order to perform a particular action.

Ganglion Cysts

A disorder of the tendon sheath or joint capsule, which causes a nodule filled with fluid or semi solid material to develop.

Herniated Disc

A back injury in which some of the jelly-like centre of the vertebral disc protrudes through small tears in the tough outer shell of the disc.

Inflammation

A response of a particular part of the body to injury that may be characterised by pain, heat, swelling and loss of function.

Injury Severity Rate

A number that relates total days lost due to compensable injuries to the total hours worked during a specific period.

Glossary of Medical Terms

Joints:
The site where two or more bones (eg; at the shoulders, elbows, wrists, fingers, hips, knees and ankles) meet.

Ligaments
Strong rope-like fibres that bind joints together.

Median Nerve
The nerve passing through the carpal tunnel that supplies some of the muscles of the hand with sensation and power.

Musculoskeletal Injuries
Injuries to the system of muscles, tendons, ligaments, joints, bones and related structures in the human body.

Musculoskeletal System
The system of the body that includes the skeleton (bones), muscles, tendons, ligaments and joints that gives the body form and enables it to move and exert muscular force.

Occupational Cervico-Brachial Disorder
See "Cumulative Trauma Disorder".

Overuse Injuries
See "Cumulative Trauma Disorder".

Repetitive Motion Disorder
See "Cumulative Trauma Disorder".

Repetitive Strain Injury
See "Cumulative Trauma Disorder"

Risk Factors
General characteristics of work that increase the likelihood of physical harm to the worker; one or more risk factors may be present in any job.

Static Muscle Work
A prolonged state of muscle contraction used to hold a steady position.

Sprain
An injury caused by the overuse of muscles or tendons.

Synovial Fluid
A fluid that supplies nutrients which lubricates the cartilage inside the joints.

Tendonitis
Inflammation of the tendon.

Tendon Sheath
Narrow bands that attach muscles to the bones.

Tenosynovitis
Inflammation of the tendon and its sheath.

Trigger Finger
An injury of the finger causing the tendon sheath to become thick, making it hard to move the finger.

Vertebrae
The 33 bones that make up the spine.

Vertebral Disc
The structure that separates each pair of vertebrae, gives the spine flexibility and absorbs shock, made up of a tough, elastic-like outer shell and a jelly-like centre.

White Finger Disease
A constriction of the blood vessels in the hand as a result of prolonged exposure to cold temperatures and vibration.