Health and Safety Guidance Notes for the Meat Industry

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British Meat Processors Association

Contents

These Guidance Notes have been prepared by representatives of the BMPA and following organisations in consultation with the Health and Safety Executive and published on their behalf by BMPA

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An Introduction to Health and Safety in the Meat Industry

Meeting the demands of the seemingly ever increasing legal requirements affecting the meat industry can seem an overwhelming task. Health and safety requirements may seem the last straw, especially for small companies. However, with the help available in these guidance notes the task is made easier and companies can reduce costs by getting to grips with health and safety.

In a typical year the meat industry reports about 200 major injuries and 3,000 other reportable injuries to employees. These figures take no account of the under-reporting known to exist or of the many other injuries where time off work is less than 3 days. These figures put the meat industry amongst the worst performing sectors of the food industry, which itself is one of the worst performing sectors of the manufacturing industry generally. For example, in 1991 an employee in the slaughtering sector was 10 times more likely to be injured than the average person at work.

Apart from pain and suffering, legal consequences, and problems with enforcement authorities, the losses these accidents represent must be enormous. Studies in other industries by the Health and Safety Executive (HSE) have shown that accidents are a major cost to organisations. For example, a creamery employing around 300 people lost almost £250,000 in 3 months when the true cost of all accidents were known. In a similar study, a transport company's losses amounted to 37% of their annual profits. The HSE/Meat Trades Joint Working Party is where inspectors from the HSE Food Section and representatives of the industry trade associations, trade unions and others get together to identify the health and safety issues the meat industry needs to face and prepare guidance on what can be done. Guidance notes have been produced for over 20 years and contain a large amount of useful material.

In recent times the health and safety legal framework has changed significantly and the emphasis has now moved from specific requirements to assessment of risk and the setting of goals. While this makes the law simpler, it makes it more difficult for employers to know exactly when they have done enough to meet the law's requirements, both in practical and management terms.

For this reason, some guidance notes of a different style have been prepared. These do not concentrate on technical matters but help employers in the meat industry adapt to the new legal framework. The guidance on risk assessment is designed to complement HSE and Food and Drink Federation guidance. Identifying significant risks and priorities is important. Some kinds of accidents such as slips, trips and falls or knife injuries have long dominated the statistics and the numbers still stubbornly refuse to come down. It is now recognised that active management of safety can successfully reduce these numbers. In essence, organisations which succeed do so by identifying hazards, risks and priorities, planning and setting performance standards; and then actively measuring performance against these standards. Of course, there are many other factors such as clear communication, understanding and access to information. Much of this is now an explicit requirement of the Management of Health and Safety at Work Regulations. Against this background of risk assessment, setting priorities and performance standards, new guidance notes will be prepared or reviewed to ensure that useful material exists for all significant risks. These will set out as clearly as possible what employers need to do to control these risks in practical terms. While the guidance notes set out standards agreed to be acceptable and are used by employers and inspectors alike in assessing conditions in workplaces against legal requirements, other solutions may of course be possible - and technical progress will be made.

Making sure your company meets the standards agreed in the guidance may take some effort. However, if employers make that effort the number of accidents in the meat industry can be significantly lowered.

Any questions you have on the guidance can be raised through your trade association, local inspector or directly with the HSE, Food Section, 375 West George Street, Glasgow G2 4LW, telephone 041 275 3000.

ACCIDENTS IN THE MEAT INDUSTRY

The following statistics show how the meat industry compares with other industries and what are the most common types of accidents.

Incidence rates are calculated according to the HSE standard, i.e. number of accidents divided by number of employees, multiplied by 100,000. When this guidance note was first published in 1990 the accident incidence rate for the slaughtering sector was 8125 and for the meat processing industry, 4852.

A small survey of meat plants that carry out the full range of processes from slaughtering to retail packing, shows that 30% of the accidents occur in packing. Typically, where packing is not carried out the accident split is 50% boning, 40% other and 10% slaughter.

Major injuries include fractures to limbs, amputations, 24 hour hospitalisation and injuries (including electric shock) leading to unconsciousness. O3D (over three day) injuries are those which keep an employee off normal work for more than 3 days.
For a complete list see RIDDOR explained: HSE leaflet HSE 31 (Rev).

TABLE 1

2004/05						
Industry	No of Emp.	Major	O3D	Total	Major Rate	All injury rate
Slaughtering and by-products	17500	31 / 1 fatal	164	196	177	1120
Bacon curing and meat processing	66200	149	787	936	225	1414
Poultry slaughtering and processing	17400	41	221	262	236	1506
Total all food manufacture average	417105	1118 / 3 fatal	6487	7608	267	1824
All manufacturing industry average		6097 / 42 fatal	26305	32444	196	1041

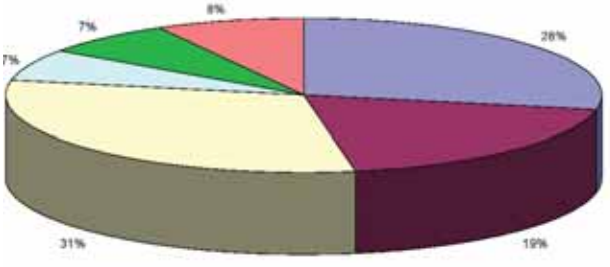
TABLE 2

MAJOR INJURIES BY KIND IN SLAUGHTERING & MEAT PROCESSING 2004/05		
KIND	SLAUGHTERING	MEAT PROCESSING
Injury while handling, lifting, carrying including sprains and strains	4	33
Slip, trip or fall on same level	6	40
Hit by moving, flying or falling object	10	24
Fall from a height	4	6
Injury by an animal	5	0
Contact with moving machine or material being machined	3	27
Hit something fixed or stationary	1	7
Exposure to or contact with harmful or hot substance	0	4
Fire	0	0
Hit by moving vehicle	0	5
Accident not falling into the categories listed	1	2
TOTAL	32	150

TABLE 3

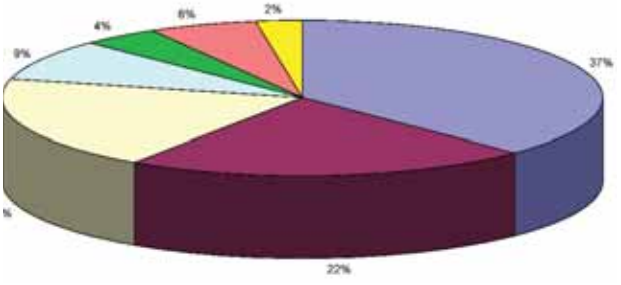
OVER 3 DAY INJURIES BY KIND IN SLAUGHTERING & MEAT PROCESSING 2004/5		
KIND	SLAUGHTERING	MEAT PROCESSING
Injury while handling, lifting, carrying including sprains and strains	51	319
Slip, trip or fall on same level	32	164
Hit by moving, flying or falling object – includes accidents involving power tools	51	160
Contact with moving machine or material being machined	10	53
Hit something fixed or stationary	5	32
Exposure to or contact with harmful or hot substance	6	20
Fall from a height	4	17
Injury by an animal	7	0
Hit by a moving vehicle	0	3
Contact with electricity	1	1
Assault	0	3
Accident not falling into the categories listed	5	8
TOTAL	172	780

REPORTABLE ACCIDENTS IN SLAUGHTERING 2004/05



- Injury while handling, lifting, carrying including sprains or strains
- Slip, trip or fall on same level
- Hit by moving, flying or falling object
- Contact with moving machine or material being machined
- FFH, Hit by vehicle, Exposure to harmful substance
- Accident not falling into the categories listed

REPORTABLE ACCIDENTS IN MEAT PROCESSING 2004/05



- Injury while handling, lifting, carrying including sprains or strains
- Slip, trip or fall on same level
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- Contact with moving machine or material being machined
- Hit something fixed or stationary
- FFH, Hit by vehicle, Exposure to harmful substance
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Training for Health and Safety in the Meat and Poultry Industry

INTRODUCTION

This guidance note summarises the current legally required health and safety training needs of companies and gives suggested training outlines for different grades of staff. Areas of particular relevance to the meat and poultry industry are listed at appendix 1 and the specific legal duties on training most applicable to the meat industry are listed at appendix 2.

WHAT TRAINING IS REQUIRED?

Under the Health and Safety at Work etc Act 1974 (HSW Act) and the Management of Health and Safety at Work Regulations 1992 all employees, including supervisors and managers, need to receive training to ensure competence in health and safety aspects of their job. There are specific requirements under individual pieces of legislation (see appendix 2).

Training needs at all levels are likely to be greater on recruitment. All new employees should receive basic induction training covering such things as company rules, individual responsibilities, first-aid, fire and emergency procedures. Beyond this, training needs to be tailored to the job and responsibilities of employees concerned. Supervision, practice and development of skills are also important. All health and safety training and assessment sessions are to be documented and included in the employees training records.

In small firms training may have to take the form of individual tuition. The extent of such training will vary between individuals depending upon existing competence. The training need should always be assessed. This is particularly important with young people and others new to the sector. It should never be assumed that appropriate or effective training has been given e.g. by previous employers. It is equally important to assess the outcomes of training to ensure competence. National and Scottish Vocational Qualifications (N/SVQs) contain units on health and safety and provide for such an assessment to nationally agreed standards. The Meat Training Council is happy to advise on N/SVQs and training courses, materials and organisations offering training.

Where safety representatives have been appointed by trade unions under the 1977 Safety Representative and Safety Committee Regulations or elected under the 1996 Health and Safety (Consultation with Employees) Regulations, there is a duty to consult with them in good time on the arrangements for health and safety training. The views of the safety representatives will help in assessing the adequacy and effectiveness of the training provided

Senior Managers

Senior managers (this includes partners or directors of small firms) need to know enough about health and safety matters to determine priorities and assess the performance of people further down the management line.

They need to make sure that a responsible and professional attitude is exhibited throughout, by themselves, by departmental managers and, via supervisors, all other employees. They should make clear that failure by employees at any level to obey safety rules will be taken as seriously as failure to obey other company rules such as those, which govern hygiene, production, etc. This commitment to health and safety, together with a commitment to training, should be given in the company safety policy.

Managers and Supervisors

Health and safety training for managers and supervisors is essential. They have a key responsibility for maintaining a safe working environment.

They need to be aware of hazards within their area of responsibility, company standards and the procedures for ensuring standards are maintained and used when necessary, e.g. wearing of protective gloves during knife work or emergency evacuation and rescue procedures in the event of an ammonia leak.

Employees

For employees, training is most needed to ensure competence and safe performance in their work tasks.

INDUCTION TRAINING FOR ALL

Company Structure

This should be explained by a director, company secretary, or a senior manager responsible for health and safety. It should include the names of the departments and managers.

Company Safety Policy

Copies of the current policy should be provided for employees. The meaning of the document and the company's commitment to it should be explained. Particular attention is to be given to arrangements for monitoring health and safety standards and the role of supervisors and departmental managers.

Safety Committee

- Terms of reference and membership.
- Arrangements for calling meetings and actioning matters agreed
- Copies of the minutes of the last meeting should be distributed

Safety Representatives

- The role of the safety representative and agreed arrangements for joint consultation on health and safety at work.

Occupational Health Arrangements

- Including first-aid arrangements and facilities, any specific arrangements for health-related issues, services of any medical and nursing staff.

Responsibilities of Individuals

- The need to obey the company rules: disciplinary procedures.
- Reporting of accidents, near misses and work-related health problems

Hazards and Standards for Safe Working

- General overview of significant site hazards which may affect all and relevant precautions.

Fire and other Emergencies

- State whether there is a fire certificate; describe means of escape and the need for good housekeeping to maintain them.
- Rules on smoking; fire extinguishers, alarms and evacuation

TRAINING OUTLINE FOR EMPLOYEES

Training should not be used to compensate for inadequacies such as poorly safeguarded machinery or badly designed workstations. All health and safety training should be recorded.

Identifying Training Needs

- Consider risks and hazards in the workplace.
- Consider accident, ill health and incident records relevant to the job, to identify how such events have occurred and how they can be prevented.
- Information from workers about how jobs are done.
- Observation of tasks, comparison with known good practice

Basic Instruction

- Equipment to use, how it works, what it does
- Dangers associated with use
- Proper use of equipment including safety and health precautions
- Cleaning of equipment
- Fault reporting
- What protective equipment to wear

Final Check

To ensure effectiveness of training techniques like close supervision during introduction to work and questionnaires designed to test understanding of safe operating procedures should be used. Information on training and testing should be kept with employee records.

TRAINING OUTLINE FOR SUPERVISORS AND MANAGERS

Responsibilities

- Explanation of supervisors' and managers' responsibilities for the health and safety of those under their role as defined in the company's safety policy and job description, encouragement of employees by personal example
- Consultation with safety representatives, where they have been elected, and organising paid release for their training and for carrying out their functions
- Identification of training needs of workers
- Company commitment not to tolerate the breaking of safety rules.

Hazard identification and risk assessment

- Significant hazards and risks in their area of responsibility

Precautions

- The precautions necessary to avoid hazards and control risks

Monitoring of health and safety standards

- Regular preventive inspections
- Preparation of safety check lists
- Occupational health provision
- Initiation of remedial action

Accident investigation

- Typical causes of accidents; relationship between near misses, minor and serious accidents.
- Reporting of accidents and identification of actions needed to prevent recurrence

Relevant legal requirements

- Acts, e.g. Health and Safety at Work etc Act 1974
- Regulations, e.g. Noise at Work Regulations 1989, Control of Substances Hazardous to Health Regulations 1988, Electricity at Work Regulations 1989, Management of Health and Safety at Work Regulations 1992 and other regulations implementing European Community Directives
- Approved codes of practice, e.g. COSHH, first aid at work
- Powers of Inspectors

Sources of information

BMPA Guidance Notes, Trade Unions e.g. USDAW, Health and Safety Executive (HSE), Meat and Livestock Commission (MLC), Meat Training Council (MTC), National Federation of Meat and Food Traders (NFMFT) etc.

TRAINING OUTLINE FOR SENIOR MANAGERS

- The purpose and implications of the company safety policy
- Provision of adequate resources for implementing the policy
- Consideration of health and safety implications when planning and decision-making
- Personal accountability
- The need to encourage interest in and commitment to, health and safety; safety culture
- Assessment and review of company health and safety performance. Use of safety audits. Role of the competent person/safety adviser. Role of occupational health services Causes of accidents, ill health and hearing loss. Costs of these losses
- Training needs of employees including those of managers with additional health and safety responsibilities
- Functions of safety representatives and safety committees
- The requirements of relevant acts, regulations and approved codes of practice, including legal duties to visitors and contractors
- Knowledge of the work of HSE and an understanding of the role and power of inspectors.
- Existence of relevant standards, e.g. BMPA Guidance and HSE publications and commitment to apply these throughout the company

APPENDIX 1

Health and safety areas where training is of particular relevance in the meat and poultry industry are as follows:

1. Slips and trips

Correct selection of footwear and its maintenance
Correct avoidance of spillages and cleaning up
Correct ways of moving around to minimise risk

2. Prevention of cuts and stabs during use of knives and hand tools

Correct use of knife for particular job
Use of correct knife for particular job
Sharpening of knife
Misuse, bad practice, storage
Correct use of protective equipment
Emergency first aid

3. Dangerous machines

Meat mincing machines
Bowl choppers
Bandsaws
Circular knife slicers
Machines with circular saw blades

4. Manual handling

Sides and quarters of meat
Boxed meat

5. Fork lift truck driving

Selection of drivers
Approved code of practice

6. Health risks
- Range
- Symptoms
- Upper limb disorders
- Frost bite
- Infections

7. Handling/use of corrosive and acidic materials
- General cleaning
- Cooker/smoker cleaning
- Personal protective equipment

8. Emergency rescue/evacuation
- Ammonia leakage
- Use of breathing apparatus
- Emergency first aid

9. Electrical safety
- Danger from wet environment
- Maintenance work
- Use of high voltage equipment
- Fault finding on equipment

This list is not exhaustive and employers need to consider their own needs carefully.

APPENDIX 2
SPECIFIC LEGAL REQUIREMENTS FOR HEALTH AND SAFETY TRAINING

Management of Health and Safety at Work Regulations 1992
Training in health and safety on recruitment on being exposed to new risks, new work equipment, systems etc; training of the required competent person, and persons required to be competent to implement procedures for dealing with serious dangers

Personal Protective Equipment at Work Regulations 1992
Training in risks PPE will avoid, use of PPE, maintenance of PPE.

Health and Safety (Display Screen Equipment) Regulations 1992
Training in use of workstations

Provision and Use of Work Equipment Regulations 1992
Training in use of equipment
Training of supervisors
Training for maintenance

Manual Handling Operations Regulations 1992
Training on manual handling risks and prevention

Noise at Work Regulations 1989
Training on risk, steps to minimise risk, obtaining ear protectors, employee obligations

Control of Substances Hazardous to Health Regulations 2002
Training in risks and precautions

Electricity at Work Regulations 1989
Training to ensure competence to prevent danger

Health and Safety (First Aid) Regulations 1981
Appropriate first aid training

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Risk Assessment in Meat Processing

INTRODUCTION

This guidance note is intended to assist in assessing risks as required by the Management of Health and Safety at work Regulations 1999. It lists common hazards related to the meat industry and identifies priority risks for attention.

WHY DO WE NEED RISK ASSESSMENT?

Apart from being a legal requirement of the Management regulations, the purpose of a risk assessment is to identify what has to be done to make work safe. It means no more than:

- Identifying what may harm people at work. **(hazards)**
- Estimating the chance of harm occurring, who may be affected and how much **(risk).**
- Gauging whether existing precautions are adequate.
- Carrying out improvements where the existing precautions are unacceptable.

WHAT SHOULD THE RISK ASSESSMENT COVER?

All risk needs to be considered, but trivial risks can be disregarded. Only significant risks need to be recorded.

Hazards

Based on the accident and ill health data known to the HSE and drawing upon the collective experience of inspecting slaughter-houses and meat processing plants, a list of common hazards in the meat industry has been compiled and is attached as an appendix to this guidance. The list is not exhaustive and will need to be adapted to suit individual circumstances.

As far as is practicable assessments should cover all aspects of work and should reflect what does happen rather than what should.

The assessment must cover all groups of employees from management and should also include visitors and the public if they have access.

Trained persons, who are familiar with the operation being assessed, should carry out the assessment. The "competent person" required by the regulations should be able to assist.

Risk

It is important to distinguish between hazard and risk. Risk means the chances of a hazard actually causing harm. For example, a head-dropping guillotine can be extremely hazardous, but carry no risk if being operated by a robot in a sealed area. On the other hand if it is being operated manually in such a position that other workers have to pass nearby it would represent an unacceptably high risk. The assessor must consider:

a) The likelihood of an accident or ill health occurring.
b) The seriousness of any injury or ill health caused.
c) The number of people exposed.
d) Special risk such as that to pregnant women or disabled persons.

Controls

Once the assessments have been carried out it is important to ensure that they are updated as the tasks change or are modified. Health and safety law, hygiene requirements and special local conditions will all influence the final outcome. Trade associations and the local HSE will give advice. Appendix 2 lists relevant guidance material.

Action

Where risk assessments highlight shortcomings then action should be planned and initiated to remove or control the risk. A system of checks or audits should be used to ensure continuing control. There should be robust systems to ensure that new and modified tasks are assessed before being put into operation.

Employers have a legal duty to consult with staff and safety representatives when developing risk assessments and control measures. This is vital to ensure that all important risks are identified and that control measures are practicable. In addition feedback from staff and safety representatives is an effective way of continually monitoring the effectiveness of the controls.

Prioritising risks

The main causes of fatal accidents are well known. Transport accidents are a major cause and special attention must be given to safe systems for workplace transport. Vehicle movements, including forklift truck operations, should have special attention. Other major risks are falls from height and serious knife wounds. Accident and ill health records can give guidance to "hotspots" in the business.

Common accidents in meat processing

(Guidance Note 1 has more detailed information on accident causes)

Major injuries are generally caused by:
Slips, trips and falls.
Machinery such as derinders and bandsaws.
Struck by objects such as knives and meat hooks.
Falls from height.

Less serious injuries that result in 3 or more days off work
Slips, trips and falls.
Machinery (often conveyors).
Hand and upper arm knife injuries.
Manual handling.

Health risks

Ill health in the meat processing industries follows a pattern directly connected with the work activity and includes: upper limb disorders and back pain (boners and poultry workers); hearing damage from noise (carcass splitting saws, frozen meat choppers, bowl choppers and lairages); occupational dermatitis (caused often by the high hygiene standards requiring frequent washing of hands) and infections from animals and poultry.

Conclusion

The meat processing industry ranks quite high in terms of accidents and ill-health. Good quality risk assessments and planned control action can substantially reduce accidents and ill health, leading to a safer, more efficient workplace.

Records and reviews

Companies with 5 or more employees must record the significant findings of the risk assessments and make them available to the employees. There is no need for this to become an all-consuming task. Many risk assessments can cover a large number of tasks, particularly where the tasks are the same. (For example, where a production line has many people doing the same job, one risk assessment will cover them all) Equally where a task comes up very rarely it is often easier to write the risk assessment just prior to starting the task. This is particularly useful for engineering departments and saves writing hundreds of risk assessments "just in case". It is important to review risk assessments on a regular basis but the level of risk and the type of task will dictate the frequency. Long term tasks with very low risk may well only require review once every 5 years, but a high risk task with frequent changes such as a band saw operation might require review every 3 months.

APPENDIX 1
KNOWN HAZARDS IN THE MEAT INDUSTRY

Struck by Objects
Cuts and stabbings from knives
Goring, kicking, crushing by animals
Collision with moving carcasses
Captive bolt pistol

Slips, Trips and Falls
Broken uneven floors
Wet slippery floors
Unsuitable footwear
Smooth floors
Slippery stairs
Obstructions
Stairs in poor condition, badly lit or with no handrails
Outside yards (rain, ice)
Uncovered drainage channels

Manual Handling
Quarters of meat
Boxes of meat, trays of meat
Pushing/pulling bins
Vehicle loading/unloading
Bowl chopper knives

Machinery
Hide strippers
Flaying devices
Dehairing machines
Pig singeing furnaces
Power hand tools
Bandsaws
Derinders
Packaging machinery
Bowl choppers
Mincers
Pie and tart machines
Slicing machines

Falls/Falling Objects
Raised work platforms
High level cleaning
Roof repairs
Light bulb changes
Maintenance
Storage racks
Steps
Ladders
Fork lift truck work platforms
Mezzanine storage areas
Falls from vehicles
Feed chutes in floors
Falling carcasses
Falling hooks
People climbing on equipment

Transport
Vehicle movement in yard
Vehicle deliveries
Reversing
Delivery bays
Vehicle loading

Mechanical Handling
Fork lift trucks
Offal carriers
Conveyors (belt, screw)
Bin lifts
Goods lifts or hoists
Elevators
Passenger lifts

Ergonomic
Use of hand tools
Packaging
Poor design of work stations

Electricity
Electric shock especially from equipment in wet environment, pressure washers, electric stunners.

Noise
Animals in lairage
Pneumatic exhausts
Stunning guns
Machinery including bowl choppers, large mincers, large saws
Scalding tanks (steam injection)
Tray washers

Hazardous Substances
Carbon dioxide
Nitrogen
Biological hazards including from animals and Legionella
Ammonia
Corrosive cleaners

Fire and Explosion
Ammonia
Fuel storage (LPG)
Gas fired ovens
Welding equipment
Bulk gas storage
Pressure cookers
Oxygen (controlled atmosphere packaging)
Debris in ovens
Flour silos
Fryers
Polystyrene, polyurethane cored building panels

Temperature Extremes
Burns from hot surfaces
Work in cold environment (chills, freezers)
Entrapment in chills, freezers
Handling frozen products
Steam
Hot water

References
"Recipe for Safety" on the HSE website: www.hse.gov.uk
Five steps to risk assessment

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Control of Substances Hazardous to Health (COSHH) Regulations

Regulations to control substances hazardous to health were first introduced in October 1989. Since then the regulations have been updated and new advice on compliance has been developed by the Health and Safety Executive. This guidance note explains the main principles involved in the COSHH Regulations and gives advice on further sources of information.

WHAT DOES COSHH COVER?

COSHH applies to most substances in the workplace which are known to be toxic, harmful or irritant. The exceptions are asbestos and lead which have their own separate regulations. COSHH does not apply to radioactivity or to fire and explosion hazards.
The range includes:

- chemicals or substances that are used in the workplace such as cleaning chemicals or spices and seasoning products
- dust or fumes that are produced as by-products such as cooking fumes
- biological hazards such as bacteria, viruses or fungal infections.

HOW CAN HAZARDOUS SUBSTANCES AFFECT WORKERS?

There are three main routed of exposure

Inhalation: Dust, fumes or aerosols in the air can easily be breathed in. This can cause damage to the nose, upper respiratory tract and lungs. It is also the most efficient way of absorbing chemicals into the blood stream.

Skin Contact: Hazardous substances that come into contact with the skin can damage the skin itself causing burns or dermatitis. Some substances can trigger an allergic reaction. Others can be absorbed through the skin to affect other organs in the body.

Ingestion: Finally people can swallow hazardous substances. In a workplace setting this is usually less of a risk than inhalation or skin contact. However, it can happen. For example, poor hygiene practices could mean that workers hands are contaminated when they take a meal break.

Generally the effects on health include:

Acute Effects: Immediate effects such as irritation, burns, shortness of breath are called acute effects. They are often easy to spot and the need to control the chemical that causes them may be fairly obvious. For example, it is well known that sodium hydroxide solution is caustic so the need to protect against exposure when using it as cleaning product is clear.

Chronic Effects: Longer term damage such as cancer, or liver damage are called chronic effects. It is also possible for an acute problem such as dermatitis to develop into a chronic problem if there is repeated exposure over a period of time. Chronic effects may often be much more difficult to recognize.

NEW AND EXPECTANT MOTHERS

The Management of Health and Safety at Work Regulations 1999 require employers to do a more detailed risk assessment on risks to pregnant workers. Some substances may pose particular risks to these women. For example, toxoplasmosis poses a particular risk during pregnancy and can be contracted through accidental ingestion when handling raw meat such as pork, lamb or venison. Where women of child-bearing age are employed any substances that pose a particular risk should be assessed and the woman who may be at risk should be informed. The assessment should be reviewed for any woman who does become pregnant.

MATERIAL SAFETY DATA SHEETS

For substances that are supplied for use in the workplace, the supplier should provide a Material Safety Data Sheet (MSDS). The MSDS should contain standard Risk Phrases that should help to identify any chemicals that may be hazardous. It should also provide information on safe storage, recommended use and safe disposal.

MANAGING HAZARDOUS SUBSTANCES UNDER COSHH

A risk assessment should be done for any hazardous substances in the workplace. Suppliers MSDSs are a good place to start for substance that are used in manufacture or cleaning. Other sources of advice about hazardous substances that may be present include the HSE, trade associations and trade unions. The assessment should identify the hazards, the groups of workers who may be exposed and the prevention and control measures to be used. Remember to include foreseeable abnormal situations that may cause greater exposure – e.g. a spillage, a burst pipe or occasions where normally enclosed machinery has to be broken down for cleaning.

In April 2005 the regulations were modified. A new duty to comply with eight basic principles of good practice for any hazardous substance was introduced. These are:

- Design and operate processes to minimize emission or spread of hazardous substances
- Take account of all relevant routes of exposure
- Use control measures that are proportionate to the health risks
- Where possible use the most effective control measures that minimize the escape and spread of hazardous substances
- If adequate control cannot be achieved by other means use suitable personal protective equipment along with the other controls
- Check and review regularly to make sure that controls are working
- Inform and train all employees on the hazards and risks and the use of controls
- Make sure that the introduction of controls does not increase the overall risk to health and safety.

This means there is a hierarchy of control measures that should be considered.

Eliminating the Hazard Is there a safer substance that can be used? Can the process be changed to prevent the production of hazardous fumes or dust? Can a safer form of the substance be used – e.g. if a powder produces a dust hazard, is there a pelletised form which is less dusty or can a pre-mixed solution be used to avoid the need for mixing?

Enclosure Isolating the source from the majority of workers can help. However some people may be exposed if there is a rupture in containment or if maintenance work has to be done inside the enclosed area.

Ventilation General ventilation that provides sufficient fresh air may be suitable for low-grade hazards. For some substances local exhaust ventilation (LEV) may be needed at the point where the dust or fume is produced. LEV should be designed to remove dust or fumes before they get into workplace air. The shape, size and location of the intake and the design of ducting and pipework can greatly affect the efficiency of the extraction. Dust or fumes drawn into the extraction system must be disposed of safely. Material Handling Dust or fumes are often produced when workers have to handle substances – e.g. to load products into a mixing vessel. Automation or mechanical aids can reduce the need to pour from sacks, drums or kegs. This can reduce the risk of dust, fumes or splashing and may also reduce manual handling risks.

Organisational Controls Restricting access to areas where hazardous materials are present reduces the number of workers exposed to risk. Good housekeeping to clean up spills and make sure that hazardous substances are properly stored can help. Washing and changing facilities may be needed for some workers. Workers exposed to the risk must be informed and should be trained so that they can follow the control procedures.

Personal Protective Equipment As a last resort or as a temporary measure – e.g. in emergency situations – workers may have to use PPE. PPE should be suitable for the job in hand and should comply with the relevant European standards.

For tight-fitting respirators (e.g. disposable masks, half masks and full face masks) the initial selection should include a fit-test to make sure that it is suitable for the wearer. The test must be done by a competent person using the appropriate test equipment and the test results should be recorded. Advice should be available from the supplier. Workers who are required to wear RPE should be trained in its use.

MONITORING AND MAINTENANCE

As with any risk management system, there should be regular monitoring and review to make sure that control measures are working.

Under COSHH there are specific duties to test LEV systems at least once every 14 months and to regularly test RPE, other than one-shift disposable masks. Frequency of testing of RPE will vary and advice should be sought form suppliers. RPE that is rarely used – e.g. emergency breathing apparatus – must also be regularly checked and maintained in line with the supplier's instructions.

OCCUPATIONAL EXPOSURE LIMITS

At the same time as the new good practice principles were introduced, the complicated two-tier system of occupational exposure standards was replaced with a simpler system. Around 400 substances have been given A Workplace Exposure Level (WEL) that must not be exceeded. Most WELs are given as 8-hour time-weighted averages with a short term (15 minute) maximum within that.

Few of the substances encountered in the meat industry have a WEL, but there may be some. Certain areas like QC laboratories may use a range of solvents and other chemicals. Some cleaning products may give of fumes that contain chemicals that have a WEL. There is a WEL for carbon dioxide. Argon and nitrogen do not have WELs and are not directly harmful. However, they can act as asphyxiants. In areas where gases of this type are used it may be necessary to monitor oxygen levels.

There is a general WEL for all inhalable dusts of 10mg. per cubic metre over 8 hours or 4 mg. per cubic metre for dust that is fine enough to be respirable (i.e. breathed deeper into the lungs). However some dusty materials will have their own WEL.

For substances that cause asthma, cancer or inheritable genetic damage, exposure must be reduced below any WEL to the lowest level reasonably practicable.

Flour dust, for example, is an occupational asthmagen. It has a WEL of 10 mg per cubic metre of air over 8 hours, with a short term limit of 30 mg per cubic metre over any 15 minute period. But because it causes asthma the legal duty is to get exposure as far below that standard as is reasonably practicable.

HEALTH SURVEILLANCE

COSHH requires health surveillance to be used where there is known exposure to a substance that causes a specific effect that can be detected by valid techniques. Health surveillance could be something as simple as training a supervisor to inspect the hands of workers where there is a known risk of dermatitis. Or it could be something more sophisticated – e.g. lung function testing where there is exposure to a substance that is known to cause asthma. Where health surveillance is needed a health record should be kept for each employee.

Monitoring of airborne exposure levels and health surveillance are not alternatives to controlling exposure, but they do help to monitor the effectiveness of the control measures that are used.

COSHH ESSENTIALS – PRACTICAL GUIDANCE ON CONTROL MEASURES

To help employers decide on the appropriate control measures for chemicals they use, the HSE has developed a guidance approach called COSHH Essentials. An electronic version can be accessed free of charge on http://www.coshh-essentials.org.uk/. The website gives instruction on how to work through the guidance for the particular chemical or substance you are interested in and allows you to print of records and details of control methods for your risk assessment.

The starting point for COSHH Essentials is the MSDS from the supplier. Health hazards should be identified by standard risk phrases like "R21 Harmful in contact with the skin" or "R43 May cause sensitisation by skin contact". The guidance explains how to use these risk phrases to allocate the substance to one of five hazard groups. It then advises how to score the substance depending on the quantity used and how dusty or volatile it is. Finally it refers the user to a set of guidance sheets with the appropriate control measures depending on the score the substance achieves. The guidance sheets cover common manufacturing processes like sack emptying, mixing, etc.

SOME COSHH HAZARDS IN THE MEAT INDUSTRY

Infectious Risks There is a possibility of "zoonotic" infections from the handling of animals. Possible hazards include bacteria such as campylobacter and salmonella, viral infections such as "orf" from sheep, fungal infections such as ringworm and parasites such as toxoplasmosis. In practice serious infections are rare among slaughterhouse workers and meat handlers. The standard hygiene controls appear to be effective at controlling the risk. However there may still be a risk so in some plants the risk will have to be assessed and employees informed about it. The HSE produces guidance on the common occupational zoonoses.

Cleaning and Disinfectant Materials Many cleaning materials used in the industry are irritant and some are toxic. Problems can be worse if certain types of material are mixed together. The HSE publishes a useful information sheet on disinfectants.

Food Ingredients Although they are safe to eat some food additives and ingredients can be hazardous when workers are exposed in the workplace. Flour dust is the second commonest cause of occupational asthma in the UK. Other spices or seasoning products can be irritant or can cause allergies. The Seasoning and Spice Association provide advice on appropriate exposure levels. For example, dried horseradish flakes/granules, whole and ground mustard seeds, ground cayenne, chilli powder, ground black and white pepper, and galangal (Thai ginger) are irritants. The SSA recommends an exposure limit of 3 mg. per cubic metre (as opposed to 10 mg. per cubic metre for general nuisance dusts). Garlic powder, celery powder and celery seeds are identified as potential sensitisers (i.e. they may cause asthma) and exposure should be reduced as low as is reasonably practicable – certainly well below the nuisance dust exposure limit. Meat tenderisers containing proteolytic enzymes are also sensitisers. The risk can be reduced by use of aqueous solutions of enzymes, but care must still be taken to avoid splashing or the formation of aerosols. Advice is available from the Seasoning and Spices Association.

FURTHER INFORMATION

Control of Substances Hazardous to Health (4th Edition), L5, HSE Books
Contains the COSHH regulations 2002 and Approved Codes of Practice and Guidance.

COSHH Essentials: Easy Steps to Control Chemicals, HSG193, HSE Books
(Electronic version on http://www.coshh-essentials.org.uk/)

Seven Steps to Substitution of Hazardous Substances, HSG110, HSE Books

Selection, Use and Maintenance of Respiratory Protective Equipment: A Practical Guide, HSG53, HSE Books

Fit Testing of Respiratory Protective Equipment Facepieces, HSE Occupational Circular 282/28
http://www.hse.gov.uk/pubns/fittesting.pdf.

Maintenance, Examination and Testing of Local Exhaust Ventilation HSG54, HSE Books

An Introduction to Local Exhaust Ventilation HSG37, HSE Books

The Occupational Zoonoses, ISBN 0 11 886397 5, HSE Books

Controlling exposure to disinfectants used in food and drink industries, HSE Food Information Sheet no. 29
(Electronic version on http://www.hse.gov.uk/pubns/fis29.pdf)

Occupational Dermatitis in the Catering and Food Industries, HSE Food Information Sheet No. 17
(Electronic version on http://www.hse.gov.uk/pubns/fis17.pdf)

For advice on hazards from seasoning and spice ingredients contact Seasoning and Spice Association
6 Catherine Street, London WC2B 5 JJ
Tel: 0171-8362460 Fax: 0171-8360580

List of approved Workplace Exposure Levels,
HSE COSHH Web pages: http://www.hse.gov.uk/coshh/index.htm

British Meat Processors Association

High Voltage Electrical Stimulation Systems (HVES)

INTRODUCTION

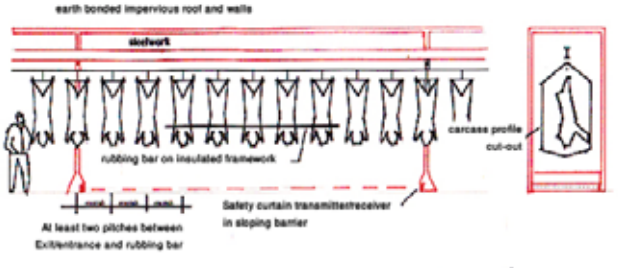
This guidance note contains information and advice on preventing injury from electric shock and burns during use, maintenance and cleaning of High Voltage Electrical Stimulation (HVES) systems.

Electrical stimulation of carcasses uses voltages typically in the range 700 to 1100 volts AC or over for the prevention of cold shortening of meat.

All existing systems have an exposed electrode that forms a rubbing bar along which the moving carcasses brush for about 90 seconds as they are carried along by an overhead conveyor. Current flowing from the electrode through the carcass to the earthed conveyor causes tenderisation of the meat.

The voltage and power available from the electrodes create a risk of electric shock and burns which may be fatal for anybody who may come into contact with it. The wet environment that exists in abattoirs will tend to increase the risk of injury. It is therefore important that persons cannot be in or enter the hazardous area of the stimulator while the electrodes are live. This can be achieved by a combination of measures including enclosure of the equipment; personnel detection and trip devices; earthing, emergency stop controls and warning indicators supported by instruction and information.

ENCLOSURE



The HVES system must be installed within an enclosure (see figure and photo) that prevents anybody touching the live electrodes from outside and causes the system to shut down if personnel attempt to enter the enclosure.

To achieve this in practice the enclosure should have walls to ceiling height or 2.5 metres high, whichever is the lowest and be roofed to prevent access from above and to prevent water from hoses or power washers making contact with the live conductors. Walls and roofs should be solid. All exposed conductive parts associated with the enclosure should be electrically bonded together and connected to the main earth terminal of the installation.

At the carcass exit and entry apertures there must be a barrier to let staff know that they are near a hazardous area and to dissuade them from entering. The barrier may be a ground level barrier (e.g. a rail or a 45° sloping threshold) and the opening for the carcass should be the minimum size necessary. There must also be warning lights to indicate the status of the stimulator.

To prevent the possibility of people touching the live rubbing bar from the carcass entry and exit points, an adequate separation between the bar and the entry/exit points must be provided. There is also the possibility that carcasses being stimulated may become bunched on the overhead rail. Carcasses other than the one being stimulated may then be-come live and create a hazard. Taking these factors together, a minimum distance of 2 metres or 3 successives, whichever is the greater, should be provided between the personnel barriers and the live parts of the rubbing bar. This distance may have to be increased for stimulation of cattle carcasses. The installer of the system should assess this.

Where practicable, a separate and interlocked access door should be provided for maintenance, cleaning, product recovery etc. Opening of the door must immediately cause the HVES to be switched off, and restarting must only be possible by means of a start control located outside the hazardous area. Interlocking devices such as a captive key, an interlocking switch with guard locking, or dual positive and negative mode interlocking devices would be suitable. Where practicable a window should be provided to allow staff and visitors to see the stimulation process without needing to enter the enclosure or stand where they might block the entry and exit points.

If there is any risk of water jets hitting the rubbing bar through the carcass entry and exit points, hoses should be relocated or screens installed. Alternatively, water supply to hoses that could reach into the HVES must be automatically turned off when the HVES is in use.

ELECTRICAL STANDARDS

The electrical supply to the installation should conform with BS 7671:1992 *Requirements for electrical installations* and the electrical parts of the stimulator itself should comply with BSEN 601204-1 *Safety of machinery - Electrical equipment of machines Part 1 Specification for general requirements.*

PERSONNEL DETECTION

If staff climb over or through the physical barriers at the carcass entry and exit points their presence shall be automatically detected and the HVES shut down immediately. This can be achieved by installing an Active Opto-Electronic Protection Device (AOPD) such as a light curtain. The preferred solution is to locate the light curtain so that it scans the entire floor area of the enclosure. This floor detection system does not rely on the operator to decide if it is safe to switch on. Every time the unit is switched on it will automatically check that the floor is clear of personnel or fallen carcasses and will prevent start-up of the stimulator if an obstruction is detected. This solution also ensures that no one can be present inside the enclosure when the system is operating.

Another possibility is to install the light curtains so that they scan the floor horizontally inside the enclosure at the entry and exit points for the carcasses. To ensure that staff cannot step over the beams they should be at least 1200mm wide in the direction of entry or exit. Moreover, the equipment must be installed such that personnel cannot enter the stimulator by walking on the AOPD transmitter and receiver units. However, this system has the disadvantage that it leaves large areas of the floor unscanned and relies on the operator to check that no one is in the enclosure before the system is switched on. It is essential that whoever starts the system has a clear view of the entire stimulation area to ensure that no one is inside the area at start up. If there is a blind spot in the stimulation area other means of checking must be provided. CCTV might be used but this has not always been reliable in a slaughterhouse environment.

Whatever system is used, the AOPD should comply with the requirements of BS EN 61496 *Safety of Machinery - electrosensitive protective equipment. Part 1 General requirements and Part 2 Particular requirements for equipment using active opto-electronic protective devices*, or to an equivalent standard of performance. Guidance on the application of this standard is published by the HSE in guidance note HSG180 *Application of electrosensitive protective equipment using light curtains and light beam devices to machinery*. Systems that are already in use and which use photoelectric safety systems to BS 6491 and which have an installation standard derived from HSE Guidance Note PM41 *Application of photo-electric safety systems to machinery* will meet the required standard.

The degree of risk on HVES systems and the importance of the light curtains in achieving adequate risk reduction means that Type 4 light curtains (as defined in BS EN 61496) should be used. These have 2 output switching devices that provide for 2-channel interfacing with the HVES control systems such that a single fault will not lead to the loss of the safety function. All HVES systems presently installed use electromechanical contactors as the primary control elements. In accordance with the guidance contained in HSG180, the contactors used as the primary control elements should incorporate suitable means to monitor the 'on/off' positions of the main contacts configured in such a way that a failure of a contactor will be detected. This can sometimes be achieved by using auxiliary contacts on the same former as the main power contacts.

The safety-related parts of the HVES control systems should not rely on software, such as ladder logic in Programmable Logic Controllers, for their operation.

If the HVES is tripped by the AOPD, the HVES should only be capable of being restarted by a deliberate reset action. Reset switches must be located outside the HVES enclosure.

MAINTENANCE

The installation must be provided with means for ensuring positive electrical isolation for maintenance work. The installation must therefore have a power isolator or disconnector fitted and which is capable of being locked in the off position.

An alternative system uses a captive key that is contained in a remote control box adjacent to the personnel door. The key must be used to open the personnel door and removing the key from the control box automatically shuts down and isolates the HVES system, providing a safe working environment.

It is highly advisable to enhance safety by providing facilities for earthing the electrode during maintenance and cleaning work. One manufacturer fits a lockable earthing bar that must be used each time anyone has to enter the stimulation enclosure. This is interlocked with the main control system to ensure that staff cannot operate the HVES unit with the earthing bar still in place.

CONTROLS AND INDICATORS

All start and reset controls must be located outside the enclosure in an easily accessible position with a clear view of the inside of the stimulation area. An emergency stop control must be provided at the control panel and at the carcass entry/exit points to allow the HVES to be switched off in an emergency.

The control system should be protected from unauthorised use by means of a key operated switch with the key held by a competent person who has been trained in the operation of the stimulation unit.

To avoid confusion, the main warning lights at the entry and exit apertures should be very simple, green for "safe to enter" and red for "do not enter". A set of lights should be provided at every possible personnel entry point.

It is very important that the interlocking devices are interfaced with the control system to maintain the overall integrity of the safety related sub-systems. The system should be designed and commissioned by a qualified engineer. It is not acceptable to allow persons who do not have sufficient knowledge of the system to commission it.

The carcass conveyor must be interlocked with the stimulation system to stop the conveyor in the event of any problems. For cleaning purposes, however, the conveyor should be able to run when the stimulation equipment is switched off.

NOTICES

Warning notices should be placed at all possible personnel entry points warning of the dangers of electric shock and the policy concerning entry to the stimulator.

INSTRUCTIONS, INFORMATION AND TRAINING

A full instruction manual should be provided with the equipment. This manual must include instructions on the safe installation, operation and cleaning of the HVES.

All operators must be given training on safe operation and cleaning of the HVES.

Instructions on routine maintenance tests and examination of the HVES, its guards and protective devices, must also be included. Routine tests must include insulation resistance and earth continuity tests, as well as proof tests of the safety systems such as the AOPD and interlocking devices.

USEFUL PUBLICATIONS

1 **Supplying New Machinery –** HSE leaflet, INDG 270

2 **Buying New Machinery –** HSE leaflet, INDG 271

3 **Approved Code of Practice and Guidance on the Provision and Use of Work Equipment Regulations 1998**
L22 HSE Books 1998 ISBN 0-7176-1626-6

4 **Application of electro-sensitive protective equipment using light curtains and light beam devices to machinery**
HSG180 ISBN 0-7176-1550-2

FURTHER INFORMATION

For further information please contact the Meat and Livestock Commission or your Local Health and Safety Executive Office.

In Revision

Health and Safety Guidance Note GN6

British Meat Processors Association

Safeguarding against Possible Exposure to the BSE Agent in Cull Abattoirs

Due to the concerns that abattoir workers may be exposed to the BSE agent during the cull of animals in the Over Thirty Month and associated schemes HSE has prepared this reminder of the required protective measures. The main risk is splashing of broken skin or mucous membranes with materials containing the agent. Action must be taken to avoid cuts and to ensure the wearing of adequate Personal Protective Equipment. (PPE).

This checklist is intended to highlight the main precautionary measures required to prevent and control possible exposure to the BSE agent during the slaughtering and carcass handling processes in abattoirs. Failure to comply with the advice given in this check-list is likely to be in breach of the Control of Substances Hazardous to Health Regulations.

Abattoirs must NOT

1 *Pith
2 *Centre split carcasses
3 Use high pressure water jets [1]
4 Allow employees to eat, drink or smoke in the workplace

Abattoirs MUST

5 *Use bungs to plug the captive bolt hole after stunning
6 Use PPE, appropriate to the task
(see BMMA Guidance Note 55 attached) which will include,
- impervious overalls and boots
- impervious gloves which cover hands and arms
- chain-mail or equivalent cut protection
- full face visors during back splitting and stunning (a fixed guard may be substituted
- for a visor during stunning but such a guard must be shown to be effective as there is evidence that neural material from stunning may be ejected up to 2 meters)

7 Use protective clothing which is disposable, for preference, or washable and stored separately after cleaning

8 Ensure that skips used for disposal of carcasses are in good condition and do not leak

*These measures are required by the contract between the RPA and the cull abattoirs.

[1] Water pressure should be as low as practicable consistent with hygiene needs but not more than 500psi.

British Meat Processors Association

Machinery Safety and Hygiene Standards

Machinery purchased after 1 January 1995 must comply with the Machinery Directive 98/37/EC, enacted by The Supply of Machinery (Safety) Regulations 1992).

Compliance with the directive must be achieved by ensuring that the "essential health and safety requirements" (EHSR) have been met. The EHSRs are described in the directive but for an increasing range of machines there are now specific standards and compliance with these standards is considered to be compliance with the directive.

These standards are harmonised across the EU and published in the UK as BS ENs

The list below is a selection of standards covering the main topics for the meat and bakery industry. BS EN documents can be purchased from BSI. 389 Chiswick High Road, Chiswick, London W4 4AL (tel 020 8996 9000)

1. STANDARDS FOR SPECIFIC MACHINES

Meat Machinery

BS EN 1974	Slicing machines
BS EN 12355	Derinders, skinning and membrane removal machines.
BS EN 12267	Circular Saws
BS EN 12268	Bandsaws
BS EN 12855	Rotating bowl cutters
BS EN 13871	Cube Cutting machines
BS EN 12331	Mincers
BS EN 12463	Filling machines
BS EN 12984	Portable / hand operated machines
BS EN 13570	Mixers & Blenders
BS EN 13870	Chop Cutters
BS EN 13288	Bowl lifters
BS EN 13885	Clipping machines

Bakery Machines

BS EN 453	Dough mixers
BS EN 454	Planetary mixers
BS EN 1673	Rotary rack ovens
BS EN 1674	Dough and pastry brakes
BS EN 12041	Moulders
BS EN 12043	Intermediate provers
BS EN 13390	Pie and tart machines

Packaging Machinery

BS EN 415	Pt 1	Terminology and classification
	Pt 2	Pre-formed rigid container machines
	Pt 3	Form, fill and seal machines
	Pt 4	Palletisers and depalletisers
	Pt 5	Wrapping machines

Hygiene

BS EN 1672	Pt 2	Basic concepts, Hygiene requirements

2. RELATED TO PEOPLE

BS EN 294		Safety distances to prevent danger zones being reached by upper limbs.
BS EN 811		Safety distances to prevent danger zones being reached by lower limbs.
BS EN 349		Minimum gaps to avoid crushing parts of the human body.
BS EN 547	Pt 1	Principles for determining the dimensions required for opening for the whole body access into machinery.
	Pt 2	Principles for determining the dimensions required for access openings.
	Pt 3	Human body measurements – Anthropometric data.
BS EN 7250		Basic human body measurements for technological design.
BS EN 999		Positioning of protective equipment in respect of approach speeds of parts of the human body.
BS EN 1005	Pt1	Human physical performance – Terms and definitions
	Pt3	Recommended force limits for machine operation.
BS EN 563/A1		Temperatures of touchable surfaces (amended 1999)

3. MACHINE DESIGN

BS EN 292	Pt1	Basic terminology – general principles for design.
	Pt 2	Technical principles and specifications.
BS EN 953		General requirements for the design and construction of fixed and movable guards
BS EN 982		Fluid power systems and their components (Hydraulics)
BS EN 983		Fluid power systems and their components (Pneumatics)
BS EN 60204 –1		Electrical equipment of machines (1997)
BS EN 60529		Degrees of protection provided by enclosures (IP code)

4. MACHINE CONTROLS

BS EN 418		Emergency stop equipment, functional aspects. Principals for design.
BS EN 574		Two-handed control devices.
BS EN 954	Pt1	Safety-related parts of control systems – General principle.
BS EN 1037		Prevention of unexpected start-up.
BS EN 1088		Interlocking devices associated with guards. Principal for design and selection.
BS EN 61496	Pt1	Electro-sensitive protective equipment – general requirements and tests.

5. SIGNS AND AUDITORY SIGNALS

BS EN 981		System of auditory and visual danger and information signals.
BS EN 61310	Pt1	Indication, marking and actuation. Requirements for visual, auditory and tactile signals.
	Pt2	Requirements for marking.
	Pt 3	Requirements for the location and operation of actuators.

6. NOISE (ACOUSTICS)

BS EN 3743	Pt1	Determination of sound power levels of noise sources. Comparison method for hard-walled test rooms.
	Pt2	Methods for special reverberation test rooms.
BS EN 3744		Determination of sound power levels of noise sources using sound pressure. Engineering method in an essentially free field over a reflecting plane.
BS EN 3746		Determination of sound power levels of noise sources using sound pressure. Survey method using an enveloping measurement surface over a reflecting plane.
BS EN 9614	Pt1	Determination of sound power levels of noise sources using sound intensity. Measurement at discrete points.
BS EN 11200		Noise emitted by machinery & equipment – Guidelines for the use of basic standards for the determination of emission sound pressure levels at work station and at other specified positions.
BS EN 11201		Measurement of emission levels at a work station and at other specified positions. Engineering method in an essentially free field over a reflecting plane.
BS EN 11202		Measurement of emission sound pressure levels at work station and at other specified positions. Survey method in situ.
BS EN 11203		Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level.
BS EN 11204		Measurement of emission sound pressure levels. Method requiring environmental corrections.
BS EN 11546	Pt1	Determination of sound insulation performance of enclosures. Measurement under laboratory conditions (for declaration purposes)
	Pt2	Measurement in situ (for acceptance and verification purposes)

7. RISK ASSESSMENT

BS EN 1050	Principles for risk assessment.

8. MISCELLANEOUS

Fire Protection

BS EN 13478	Fire prevention and protection.

Battery Operated Trucks

BS EN 1175 Pt1	Electrical requirements. General requirements for battery-powered trucks

bmpa
British Meat Processors Association

Managing Manual Handling Risks in the Meat Industry

INTRODUCTION

This guidance note summarises current health and safety legislation applicable to manual handling risks. The information is intended to outline issues relevant to the meat industry and provide practical guidance on methods of reducing risk. It should not be considered as an alternative to the requirements of the legislation or a risk assessment.

Manual handling risks fall into the general category of musculoskeletal disorders (MSD's) which are problems affecting the muscles, tendons, ligaments, nerves or other soft tissue or joints.

1.2 million people in GB suffer from work related musculoskeletal disorders (WRMSD). This accounts for approximately 60% of reported ill health. 9.9 million working days are lost per year and (based on 1995/96 prices) the cost to the economy is c£523-556m. More than half result from back injuries.

CHALLENGES

The meat industry has traditionally needed to use the manual skills of its employees in most of its processing tasks. Automation and mechanisation have been progressively introduced but it can be difficult or expensive to automate these tasks. Knife work, packing, and picking, for example, have relied on manual dexterity and in some situations, replacing operatives with machinery may not be practicable.

Skilled workers tend to remain on certain jobs e.g. boning, often for many years. This is challenging for employers to manage, particularly where work patterns encourage employees to work at a fast pace such as on piecework, at premises where workers can finish early if they complete their set tasks or where bonus schemes operate. These factors increase the risk of developing musculo-skeletal disorders.

Larger businesses have more scope to reduce and control risks, but smaller companies, like butchers, may not be able to afford specialist handling equipment. However, by taking a fresh look using risk assessment techniques, some of the risk factors can be reduced or eliminated. For example, simply keeping floors free of slip and trip hazards may significantly reduce the risk.

WHAT IS MANUAL HANDLING?

The Manual Handling Operations Regulations 1992 States:
"Manual handling operations" means any transporting or supporting of a load (including the lifting, putting down, pushing, pulling, carrying or moving thereof) by hand or bodily force. A 'load' includes any person and any animal.

Table 1 outlines some of the more common manual handling risks in the meat industry.

TABLE 1

LAIRAGE	ABATTOIR	CHILLS
Opening & closing gates & partitions	Slinging	Quartering saws
Closing vehicle ramps	Legging	Pushing sides
Pushing & pulling animals	Removing heads	Carrying quarters & sides
	Reaching from platforms	
	Carrying hooks	
BUTCHERY	**PACKING**	**MAINTENANCE**
De-boning	Boxes & trays	Toolboxes
Handling primals	Lifting pallets	Large components
Handling bones	Moving pallet trucks	Gas cylinders
Pushing tote bins	Moving equipment	Awkward access

WHAT DOES THE LEGISLATION REQUIRE?

The Health and Safety at Work etc Act 1974 Section 2 requires that employers provide systems of work that are safe, so far as is reasonably practicable. The Manual Handling Operations Regulations 1992 (as amended) require, so far as is reasonably practicable, the avoidance of manual handling likley to cause injury. Where manual handling cannot be avoided, employers are required to:

1. Carry out a suitable and sufficient assessment of risks from manual handling.
2. Take appropriate steps to reduce risk of injury from manual handling.
3. Provide information to people engaged in manual handling about the weight and characteristics of the load.
4. Provide suitable and sufficient information, instruction, training and supervision to enable employees to work safely.

LIMITATIONS WHEN LIFTING AND HANDLING

The guidance on the regulations provides guidelines for the maximum weights that should be lifted or lowered by a person in particular zones around the body. This varies significantly between males and females, whether one or more people lift an object together, the frequency of lifting, the nature of load itself and the prevailing environmental conditions.

MAKING AN ASSESSMENT

The regulations and associated guidance provide employers with a systematic method of assessing which risk factors that may apply during manual handling tasks. The assessment table contained in the code of practice breaks the task of manual handling into elements and asks what risk factors may be present.

It is essential for legal compliance to have a competent person carry out risk assessments. Some simple assessments require a basic competence, which can be gained from reading the regulations and following the guidance. More complex risks will require greater competence, for example; where young or pregnant workers are involved or employees who may have an existing health condition which limits their capacity for lifting and handling.

MANUAL HANDLING ASSESSMENT CHART (MAC)

The Health and Safety Executive has designed the MAC to help inspectors assess the most common risk factors. The MAC is also available to employers. The publication examines elements of manual handling tasks involving; lifting, carrying and team handling operations. Each element can then be assessed and risks levels classified as Low, Medium, High and Very High using the numerical and colour coded guides.

REDUCING THE RISK

The task itself will dictate what measures can be taken to reduce manual handling risks. Some simple measures include: tool balancers for heavy equipment; maintenance of wheels on pallet trucks; cleaning and maintaining floors to provide good grip; reducing the weight of loads and carrying distances; reducing twisting and reaching; simple handling equipment e.g. using a sack barrow instead of carrying sacks and brakes on trolleys used on ramps.

REFERENCES

The Manual Handling Operations Regulations 1992 (as amended) and guidance, HSE Books, L23, ISBN 071762823X

Moving food and drink: Manual handling solutions for the food and drink industries. HSE Books HSG196 ISBN 0 7176 1731 9

Manual Handling Assessment Chart Tool (MAC), HSE website

British Meat Processors Association

Safe use of Knives

SAFE USE OF KNIVES

This guidance is intended mainly for users of knives in slaughtering and meat processing plants, but the advice is relevant for butchery tasks. However, all tasks must be assessed and suitable controls implemented according to the hazard potential identified and the likelihood of injury identified. Regarding butchery in retail shops where the work is generally carried out at a slower pace and craft butchers tend to have very good knife skills, it is often found that the risk rating is much lower than in an industrial environment. The general rule in retail is that light trimming and cutting can be carried out reasonably safely in the front shop without industrial PPE, but for backshop boning operations where more force is used full chain mail glove, arm guard and apron is normally worn.

HAZARDS AND RISK

Traditionally knives caused a large number of accidents in the meat industry, but where good practice, training and suitable personal protective equipment has been introduced the incidents of knife injury are much lower. Where a knife is a necessary tool to carry out tasks then the hazard potential remains and the risk must be controlled.

The risks (and parts of the body at risk) vary from task to task and from business to business as layout and equipment vary. Some common hazards to look out for are listed below, but employers and the self-employed must carry out their own assessment of risk so that adequate control measures can be provided.

Slaughter processes

Here knives are generally held in a sword or artisan grip rather than the more forceful dagger grip used in boning operations. Many tasks do not present a high non knife hand risk, as cutting is not towards the hand. More common injuries happen when the knife hand slips down onto the blade, and also cuts to the thighs on beef legging tasks.

Boning operations: there are three methods employed here;

- Traditionally in many retail operations each bone is removed individually. This requires considerable force to cut through joints.
- The second method probably most common in factory operations is cutting the carcass into primal cuts and then sheeting the bones out in one piece.
- Some boning plants employ mechanical boning systems which pull the meat from the bone as the operative cuts, reducing the force required.

All these methods involve risk of slicing cuts, stabs and slip down cuts. However, parts of the body at risk, and therefore protection required will vary according to the working position.

Slicing and dicing

The main risk here is usually to the hands, to the non knife hand and also to the knife hand when a slip down is caused through catching the edge of the table.

Injury through misuse of knife

Serious facial injuries including loss of sight have occurred when knives have been used to handle meat and when the knife has been kept in the hand while handling other items such as trays or boxes.

PRECAUTIONS

Always select the right knife for the task. Deboning knives normally have a plastic handle that is designed to prevent fingers slipping onto the blade.

For sticking or other operations mainly involving pushing movements of the knife, the handle should have a suitable cross guard, see figure 1. The knife should be comfortable to grip, and it should have raised portions at the junctions of the handle and the blade to minimise the possibility of the knife hand sliding over the blade.

Figure 1: double edged sticking with anti slip guard

Knives should not be used when sharpening has reduced them to thin narrow blades that can pass through protective aprons or snap under pressure. See fig.2

Figure 2: a knife worn to the point where it would be unsafe to use

Steels should have handle guards large enough to prevent cuts.

SAFE STORAGE OF KNIVES

Knife racks or other storage facilities should be provided, next to the work station. Scabbards should be provided if workers need to move around the workplace with knives. The scabbards should be divided into compartments and be easily dismantled for cleaning.

When not in use knives must never be left lying around.

SAFE DISPOSAL OF KNIVES

Old knives should be collected in a securely sealed container with a 'letter box' type slot to put the knives through. This container can then be collected by an approved scrap collection service who have facilities to deal with them.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Most injuries can be prevented if operators wear the right protective clothing, in particular protective aprons and gloves. All PPE must fit properly and be the right size for the wearer. If in doubt, seek advice from your supplier on manufacturer.

Aprons

Suitable protective aprons, usually chain mail or overlapping metal discs, must be worn during all deboning work or during other work where the knife is pulled with the point towards the body.

The apron should cover the body area from mid breast bone to mid thigh. The weight should be borne by the wearer's shoulder and not their neck. The apron should be fully adjustable with shoulder straps and waist/hip belts so that it sits neatly against the body. The bib should not sag when the wearer bends forward.

Aprons should be properly maintained. Loose or missing links or discs should be replaced immediately and straps and fastenings should be kept in good condition.

"Stab pads" made of Balata belting or similar materials are not suitable as protection against stabbing injuries.

Aprons, trousers and vests should comply with the penetration test set out in BSEN ISO 13998:2003, *Protective Clothing-Aprons, trousers and vests protecting against cuts and stabs by hand knives.*

Aprons, Leggings and upper torso

An apron with the lower half divided to form knee length leggings secured to each leg by straps should be worn by persons in abattoirs engaged in "legging out" (skinning of the leg) which involves holding the leg of the carcass between the thighs and drawing the knife towards oneself along the carcass shin bone. The danger is of stabbing, particularly in the thigh or abdomen. This type of protection may also be necessary for deboning hanging meat when the knife is brought down low. Tunics which cover the body and come right over the shoulder may also be needed when working on hanging meat at height.

Gloves

A suitable protective glove providing 3 or 5 digit protection, usually chain mail or overlapping metal discs, should be worn on the non knife hand during deboning work.

Protective gloves are also recommended for other hand knife operations particularly when an operator is inexperienced or under training.

Chain mail gloves should comply with BS EN 1082-1:1997

Forearm Protectors

Some gloves are designed to give wrist and forearm protection but forearm protectors made of clear plastic and either attached to or independent of the gloves can also be obtained.

Footwear

Boots or shoes must be non-slip. A slip or fall whilst holding a knife is potentially lethal. A dropped knife easily penetrates soft shoes.

See also HSE leaflet L25, PPE at work guidance.

TRAINING

All new employees must be given a thorough basic grounding in the use, care and maintenance of knives and other equipment including steels and scabbards. It is important to check whether a person is right or left handed before commencing instruction.

All new employees must also be given a thorough grounding in the dangers associated with misuse of knives.

The use and maintenance of protective aprons, gloves and trousers should also be explained and attention should be drawn to the employee's obligation to wear such protective equipment.

Instruction should be given either by the foreman or an authorised training instructor. Whoever carries out the training must be satisfied that the employee has understood and absorbed all information supplied. The training should include grinding and steeling to full proficiency. Newly trained staff must be introduced gradually to full speed production. They must be carefully supervised until sufficiently skilled to work with safety at full production rates.

Children (under the statutory school-leaving age) MUST NOT be allowed to use, handle or clean knives. For young people between school leaving age and 18 years, a more detailed risk assessment is required taking into account their inexperience, and supervision by a competent person is also needed. See The Management of Health and Safety at Work Management regulations 1999.

Training courses

There is now a recommended level 1 qualification available from the Meat Training Council, 'The Certificate in Knife Skills for the Meat and Poultry Industry'. Details from MTC at www.fdq.org.uk

WORKPLACE

Working areas must be clean and tidy. Working surfaces and surrounding floor areas in particular should be free of debris and production waste. Floors should be slip resistant.

Lighting levels should be sufficient to ensure good visibility. (500 lux minimum).
There should be enough space for each operator to work safely. Working tables should be at the right height for the operator.

FIRST AID

Most of the fatalities and serious injuries occur during deboning or similar operations. A serious stabbing injury can result in heavy external bleeding, particularly if a main artery is punctured. In a number of cases the victim has bled to death in a few minutes. Prompt first aid action could save a life.

During deboning operations someone should be available who knows how to deal with stab injuries and heavy bleeding. However, this should be backed up by training all staff in dealing with stab wounds and displaying an instructional sign. The first thing to do is to immediately apply firm pressure to the wound using a pad. Lay the victim down while continuing to press the wound. Call for help.

APPENDIX

SAFETY WITH KNIVES: ADVICE TO USERS

1. Never use a blunt knife.
2. Know your own knife and how sharp it is.
3. Employ correct sharpening methods and learn the right way to use a sharpening equipment and steel.
4. Do not grind your knife blade until it is dangerously narrow.
5. Never use a steel that does not have a hand guard.
6. Always replace knives in the scabbard or steriliser when not in use. Never lay them down on a working surface where they may be covered by other objects.
7. Always pick up a knife by the handle.

8. Keep the working area as tidy and as dry as possible.

9. Never wear soft shoes. Keep a pair of non slip safety/stout shoes for working. Slips and fails with a knife in the hand are potentially lethal.

10. Direct the knife away from the body whenever possible. Never cut towards your fingers, hand or an unprotected part of the body.

11. Keep all knives, steels and scabbards clean and sterilise them at the end of the working day.

12. Never carry a knife in the hand when away from the point of work, unless the blade is covered.

13. Never try to catch a failing knife.

14. Make full use of protective clothing that is provided, including gloves and aprons.

15. Get first aid treatment for ail cuts, however small. Septic cuts and scratches can be dangerous.

16. Never handle meat with a knife.

17. Never handle meat or any other items with the knife in your hand.

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Bandsaws

DESCRIPTION

Bandsaws are used in the meat industry for portioning meat and other products. They consist of an endless saw-blade running over and driven by pulleys which presents a forward facing vertical cutting edge against which product is pushed for cutting.
They are the cause of a disproportionately high number of machine accidents, frequently resulting in deep cuts and finger amputation.

HAZARDS

Contact with the blade during cutting or removing product is the greatest hazard and the most common cause of accidents.

PRECAUTIONS

The first precaution is to make sure that a bandsaw is not used where another machine or process will do.

Certain operations on bandsaws are unacceptably high risk and should not be carried out. In general the cutting of fresh meat that necessitates close approach of the fingers to the blade is too hazardous but courts and tribunals have held the following operations to be unacceptable:

(a) trimming of butt ends of lamb carcasses (that is, trimming off the thick fatty ends of the breast);
(b) splitting of legs or shoulders of lamb (that is, cutting across the leg or shoulder of lamb to produce the cuts called a half-leg and half-shoulder)
(c) preparation of pork chops from loin of pork.
(d) cutting cooked chickens in half by hand feeding

If a bandsaw has to be used for other operations then users should consider a conveyor feed to a totally enclosed blade or the use of jigs to avoid hand approach to the blade.

When it has been decided that a bandsaw with an exposed blade is the only practical way of doing the job then the risk must be reduced as much as possible. These are some of the ways to reduce the risk:

(a) make sure you have the right machine for the job with enough power so that operators don't need to force product against the blade too hard and with a table big enough to support the product.
(b) only the minimum of blade, enough to make the cut, should be exposed and the rest of the blade should be guarded.
(c) access to dangerous parts should be interlocked so that opening any doors cuts off the power and the machine will not start unless these are closed. A time lock prevents access during run-down.

Using a bandsaw safely needs care and concentration. The machine should be sited where the operator can have plenty of space or the working area should be barriered off to prevent people bumping into him. As well as keeping the floor clean the use of slip resistant materials and shoes should be considered. Good lighting is important and a value of 500 lux is recommended.

As operators may be at the bandsaws for long spells, the materials and workspace should be organised to make using the machine as easy as possible. Particular care should be taken about ensuring table heights are set to prevent backache as discomfort can be a cause of accidents.

Only selected and trained people should use bandsaws and to remind operators and others about the dangers, clear notices should be displayed at the machine saying, for example, **DANGEROUS MACHINE** and **DO NOT DISTRACT THE OPERATOR.**

Nothing should be worn which could become entangled in the blade. Chain mail gloves must not be worn when a toothed blade is being used but roughened rubber gloves may add grip when handling some products.

Even when removing or fitting blades there is a risk of serious cuts so care must be taken and protective gloves may be worn for these tasks.

CHOP CUTTING

The Tribunal decision of Gateway Foodmarkets Limited v Sheila Patricia Walton, London Borough of Redbridge on 16,17,and 28 March 1988 clarified that hand feeding of bandsaws with fresh meat in the preparation of chops presented unacceptably high risks of injury and that such a practice had rightly been the subject of a Prohibition Notice issued under the Health and Safety at Work etc. Act 1974. Bandsaws are inappropriate for the preparation of fresh meat chops where hand feeding is involved.

Where the quantities of fresh meat chops being produced is small the traditional methods involving the use of knife and cleaver are appropriate.

An alternative safe method where larger numbers of chops are to be produced is the use of the proprietary chop-slicing machine. These machines have high speed scimitar-shaped rotating blades with access to the blade being protected by interlocked guard tunnels at both ends.

REFERENCES

BS EN 12268:2003
Food processing machinery-Bandsaw machines

Guidance Note PM33
Reducing bandsaw accidents in the food industry

Bowl Choppers

DESCRIPTION

Bowl choppers are used extensively within the meat industry to mince meat to a fine degree and to blend and emulsify proteins. The machine comprises a rotating bowl into which meat, protein and other ingredients are deposited, manually on small machines or by means of a mechanised container tipper on large machines. Ingredients are minced in the bowl by a multi-bladed revolving knife positioned at the rear of the bowl and revolving in the vertical plane. Most machines have a selected range of knife speeds.

Manual removal of product is common on small machines, but large machines are usually fitted with an uploading scraper which discharges the product from the bowl into a container via a chute.

HAZARDS

- Contact with moving and stationary blades.
- Electrical hazard from wet cleaning.
- Dusty product
- Injury by contact with moving container tippers.
- Noise.

PRECAUTIONS

1. The knife blades and associated drive shaft must be guarded to the greatest practicable extent. As a minimum they should be protected by a hood which extends to the width of the machine and to at least half the bowl diameter. The hood should be interlocked with the machine drive and fitted with a suitable overrun device. Many machines will also be fitted with a lid which also encloses the front of the bowl when lowered, however this is to reduce noise at high speed and will prevent pieces of blade flying out if the blade breaks. It is raised at low speed to enable the bowl to be filled or emptied. In addition to the hood at the rear of the machine, it is recommended that the following additional safeguards are provided;

   (a) A non-return flap should be fitted to the outfeed side of the rear hood, so arranged that with no material in the bowl, it falls by gravity to the vertical position and with material in the bowl, it rides on top of material being processed. Suitable stops should be fitted to ensure that the flap cannot be raised upwards beyond the horizontal position. Stops should also be fitted to prevent the flap being pushed back towards the blades unless the flap is shaped to a profile slightly larger than the internal surface of the bowl, thus achieving the same result.

   (b) As it is not possible to entirely enclose the infeed side of the blade the reach distance for an operative must be 850mm or more when standing on the floor. Some machines already have the 850mm reach distance to the blade, but where this is not the case, the reach can be increased by fitting a bar, as can be seen in the picture below.

2. An identifiable isolator switch that can be locked off should be positioned adjacent to the machine. The machine should be isolated by turning the switch to the off position and locking off with a lock off device before cleaning commences.

3. During the cleaning of the machine a guard or cover should be in position over the blades, except when they are being cleaned.

4. Blades should only be removed or refitted by a competent person using a blade guard or carrier.

5. The floor around the machine should be kept clean and clear of other persons. On machines incorporating a container tipper, the operator needs to see the motion of the tipper to avoid danger to other persons in the area.

6. Potentially dusty ingredients should be pre-damped or pre-mixed to ensure that dust is not evolved during the adding of material to the machine. Where this is not practicable, it may be necessary to provide local exhaust ventilation to remove the dust.

7. Noise levels should be assessed in accordance with the Noise at Work Regulations. Since a high proportion of noise results from contact between the blades and product, noise reduction hoods and the use of lower speeds may achieve a significant reduction. Worn shafts and bearings on older machines may be a significant noise source. Badly balanced blades also cause noise as does a lack of proper lubrication. Where noise reduction cannot be achieved, segregation of noisy machines may be necessary along with the use of hearing protection.

Note: BS EN 12855: 2003, all bowl choppers purchased from 2003 should meet this standard

Users of bowl choppers pre 2003 should:

Compare the standard of safeguarding on an old machine with BS EN 12855 and determine what is missing by way of guarding, (i.e. the risk gap) .Any risk gap should be closed as far as is reasonably practical weighing cost v. risk Although BS ENs are not retrospective this is useful advice to ensure machines are as safe as reasonably practical.

Training:

Risk assessments must be carried out for operating, cleaning and maintenance of theses machines. Safe working procedures should be devised based on and including the risks identified and then staff should be trained to the procedures. Monitoring to ensure procedures are adhered to should be carried out with regular job observations.

Brine Injectors

DESCRIPTION

Brine injectors are used extensively within the meat industry to inject brine evenly into meat, for example for curing.

Meat is transported to the injection position by means of a conveyor belt, which forms an integral part of the machine. Brine from a storage tank is pumped to the head of a machine and then into the bank of needles. The brine is injected into the meat via either a pneumatically or hydraulically operated vertical needle beam. On some types of machine a pneumatically driven meat stripper puts adjustable pressure on the meat during the injection period to ensure that any meat which is held on the needles when the needle beam starts its upwards stroke is retained on the conveyor.

HAZARDS

- Traps associated with the injector needles and the needle beam
- Possible dangers from electrical fittings while cleaning.
- Traps associated with the meat conveyor belt.
- Possible access to the drive mechanism.

PRECAUTIONS

1. Fixed guards should be provided at the feed and discharge ends of the conveyor to a distance of at least 1,000 mm from the outside of the needle beam to prevent access to the traps formed by the injector needles.

2. The side panels of the machine enclosing the drive mechanism should be fixed by means requiring a tool other than a screw driver for their removal.

3. It is recommended that an additional emergency stop button should be positioned at the discharge side of the machine in addition to the one provided normally at the feed side of the machine. The emergency stop button should stop not only electrically driven components but those driven by hydraulic or pneumatic power.

4. An earth-leakage circuit breaker should be fitted to the machine to ensure operator safety especially whilst the cleaning operation is taking place.

5. Any traps between the conveyor belt and the tail and head pulleys of the conveyor should be provided with suitable fixed guards.

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Gas Flushing Systems

DESCRIPTION

Gas flushing is incorporated into packaging machines to improve product shelf life. Typical gases used are Carbon Dioxide, Nitrogen, Oxygen or a mixture of inert gases.
The gas flush is performed at the pre-final sealing stage and is normally carried out at low pressure.

HAZARDS

- Storage of gases.
- Gas leaks.
- Excess gas from chamber machines.
  (The gas outside the package).
- Oxygen enrichment. Normal air contains 21% oxygen.
  In concentrations higher than 21% substances are more readily ignited burning faster and at higher temperatures. Oxygen enrichment to around 25% should be considered dangerous.
- Inert gases and oxygen depletion. Leakage of inert gases can deplete the room air of oxygen and create an asphyxiation risk.

Occupational exposure limits for some gases are contained in the HSE publication EH40 entitled "Occupational Exposure Limits".

PRECAUTIONS

1. Bulk storage of oxygen should comply with the British Compressed Gases Association (BCGA) Code of Practice CP19 entitled "Bulk Liquid Oxygen Storage at User's Premises".

2. Bulk storage of liquid nitrogen and liquid inert gases should be in accordance with guidance from HSE reproduced as Appendix 1.

3. Bulk storage of Carbon Dioxide should be in accordance with the HSE Note CS9 entitled, "Bulk storage and use of liquid carbon dioxide: Hazards and procedures".

4. All gas bottle storage should be in a well-ventilated area preferably external to the building. A cage or similar protection is required to prevent impact damage from vehicles. All bottles should be made stable by the use of secure anchorages. If it is not possible to site bottles outside, good bottle management should be encouraged to ensure that a minimum of filled bottles is inside the building. Empty bottles should be removed as soon as possible.

5. All pipework should be installed to BCGA COP 4. Wherever possible the gas pipework should be of a continuous pipework run and protected from external damage. Flexible pipework should be kept to a minimum length so that it does not become a trip hazard. Rupture or leakage of pipework can give rise to an oxygen enrichment fire hazard and/or an inert gas asphyxiation hazard.

   Pressure gauges should be fitted at the gas source and local to the packaging machine. The use of a "No Gas-No Operation" detector is recommended.

   All distribution pipework should be provided with a means of isolation clearly marked and upstream of any flexible hose.

   Reducing valves should be fitted at the gas source (bottles or bulk) so that all piped gas lines within the building are at low pressure.

   All gas lines should be colour coded with flow direction marked.

6. The gas supply should be isolated at the main source during any period of non-production.

7. A gas analyser should be made available for frequent periodic checks on room atmosphere.

8. Local exhaust ventilation should be considered at the point of use to avoid gas build-up, particularly if the operation is in a confined space.

9. Only qualified persons should adjust or change the operation of any gas flushing system.

10. Supervisory staff must ensure all operatives are aware of hazards arising from gas flushing operations.

APPENDIX 1

PRECAUTIONS FOR BULK LIQUEFIED NITROGEN AND LIQUEFIED INERT GAS STORAGE INSTALLATIONS

1. Simple asphyxiant liquefied gas storage installations should, whenever possible, be located in the open air and not in a space immediately surrounded by structures, which may unduly restrict natural ventilation. They should be kept well away from cellars and other areas which may be occupied and in which gas, which has leaked from the installation, may be liable to accumulate. If the storage installation has to be inside a building, it should be sited in a dedicated storeroom which is normally unoccupied, is isolated and is separated from any occupied parts of the building by means of a barrier that is impervious to gas. At least one side of the storeroom should be an outside wall.

   If an indoor installation is necessary, the maximum possible natural ventilation should be achieved by fitting a louvred outside door and fitting louvres or steel mesh instead of windows etc. In underground rooms mechanical ventilation extracting at a low level in the room may also be necessary. Any mechanical ventilation system should discharge to a safe place in the open air. Basement or semi-basement locations and occupied rooms are the least desirable locations. There should be two separate exits to permit means of escape in the event of a significant release of nitrogen or inert gas into the storeroom.

2. For indoor installation the storeroom outside door should be secured in the fully open position during coupling and uncoupling of transfer hoses and during transfer of liquefied gas from road tanker to the bulk storage tank. The filling connection should be sited near to the main door.

3. All vent pipes and any trycock from the bulk liquefied gas storage tank should discharge to a safe place in the open air as far from doors, windows and air intakes as is possible.

4. The overpressure relief devices provided for the bulk liquefied gas in the storage tank and any interspace over pressure relief devices should generally be discharged to a safe place in the open air as far from doors, windows or air intakes as is possible.

5. Transfer hoses and any sealing rings or gaskets associated with transfer hoses should be maintained in good condition.

6. Adequate provision should be made to prevent unauthorised access to any liquefied nitrogen or liquefied inert gas bulk storage installation.

7. Road tankers should be situated in the open air when discharging liquefied nitrogen or liquefied inert gas. The location should be such as not to restrict the dispersion of liquefied gas or heavy vapour. If possible the road tanker off-loading position should not be in a public thoroughfare. In cases where this cannot be avoided, warning notices to deter persons not concerned with the discharging operation from approaching should be erected and adequate supervision provided.

8. A suitable system of work should be implemented to ensure that Dewar flasks are not overfilled. Any indoor decant lines used to fill Dewar flasks should be of the minimum necessary internal diameter for the flow rate required. Dewar flasks should not be left unattended.

   Local exhaust ventilation should be provided if the filling of Dewar flasks directly from the bulk storage installation is carried out indoors. The maximum rate of flow of liquefied gas, which if spilled will subsequently vaporize to form a large volume of gas, may be used as a guide for the required capacity rating of the exhaust ventilation system.

   A competent person should periodically inspect the gas storage installation.

Dicers and Cubers

DESCRIPTION

Dicing or cubing machines are used to size reduce fresh meat and meat products into cubes.

There are several types in two main categories. These are:

(1) Machines that push product through a lattice, forming strips and cutting those strips into cubes with a rotating sickle blade, and,
(2) Machines that cut product into strips then use a multi-segment cutter head to produce cubes.

All types can have manual feed or semi-automatic or automatic feed with conveyors or loading devices.

Discharge is normally into a container but may be onto a conveyor.

HAZARDS

- Access to the rotating blades at the discharge end.
- Access to the hopper or feed chamber.
- Crushing by a ram extending beyond the end of the feed tunnel.
- Trapping between a loading device and the machine.
- Handling blades during cleaning and maintenance

PRECAUTIONS

The discharge aperture should not exceed the dimensions specified in BS EN 294 in relation to the distance from the blade. Alternatively, the machine should discharge into a container enclosure or on to a conveyor that prevents access to the blade and is interlocked so that the machine will not operate without these in position.

All non-fixed doors and covers giving access to dangerous parts should be interlocked.

When the cutting chamber door is opened by 20mm or a discharge system (container or conveyor) is removed, the cutting blades should stop in 0.15 seconds.

Hoppers should have some means of preventing access to the danger points. These include interlocked grids, trip bars or light barriers. On larger machines with hoppers over 1600mm there should be a mirror to see into the hopper or a fill level indicator.

If danger points in the hopper can be reached from steps or platforms these should be interlocked.

The ram should be set so that there is no gap between it and the tunnel and the machine should not operate unless the tunnel is in position.

There should be a gap of at least 120mm between the base of the machine and the loading device. Descent of the device should be controlled by a hold-to-run switch and should be no faster than 0.4 metres per second (mps). If the descent is automatic it should be at 0.1 mps and the last 0.5 metres should be controlled by hold-to-run.

Gloves should be worn which can protect against knife cuts when changing cutting tools or working near them.

REFERENCES

BS EN 13871 Cubes cutting machinery

Frozen Meat Cutter

DESCRIPTION

This machine is used to break up frozen blocks of boneless meat. This is done by an hydraulically operated guillotine blade or a rotary cutter blade that cuts the product into slices about 50mm thick in preparation for further mincing.

Product is loaded manually onto the machine before being pushed to a sloping feed tunnel to be carried by gravity to the blade.

The sliced meat falls into a container placed beneath a hinged cover that protects the outlet. Options are available such as a hydraulically operated feed platform, adjustments for size and shape of meat to be cut and a totally enclosed cutlet container.

HAZARDS

Access to the blade by the in-feed apparatus. This is possible if the operator stands on a platform or the feed slope is not protected by a loading table. Attempts to speed up the process by pushing the meat block or efforts to free any blockage are particularly dangerous.

Failure to interlock the hinged outlet cover would allow easy access to the moving blade. In some models access to the blade is possible from beneath the outlet cover either when a close fitting wheeled container is not in position or small containers such as trays are used.

PRECAUTIONS

1. The guarding of the blade should be in accordance with the safety distances in BS EN 294: so that the operator cannot reach the blade. It should be impossible for a person to reach the blade when standing in any position next to the machine, and feed tables or loading devices should be incorporated into the machine in such a manner as to achieve this.

2. The safety devices at the feed opening of this machine can only ensure safety as long as an operator is standing at floor level and close supervision is necessary to ensure that elevated working platforms are not used.

3. The outlet cover should be fitted with an interlocked switch of suitable design that fails to safety.

4. When the discharge for the machine discharges into a collecting bin, either,
   (a) the bin should be situated inside a suitably interlocked enclosure which completely encases it; or,
   (b) where the bin when in position prevents access to the dangerous parts, a suitable sensing mechanism should be provided to ensure that the machine can only be run when the bin is in position.

5. When delivery is by conveyor, fixed or interlocked guards should be provided between the discharge of the machine and the conveyor to prevent access to the blade. Where the conveyor is removable, it should be interlocked with the machine in such a way that the machine cannot be run unless the conveyor is in position.

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High Speed Slicing Machines

DESCRIPTION

These slicers are used mainly for cooked meats. They have a variable cutting speed and are adjustable for slice thickness. The inclined blade is mounted eccentrically to provide the cutting action. The sliced meat discharges onto a conveyor. The machines can be gravity or power fed.

HAZARDS

- Access to the blade from either the feed or discharge side or if the blade cover is opened.
- Handling the blade for cleaning or maintenance.
- Electrical hazards from wet cleaning.

PRECAUTIONS

1. Suitable guards should be provided to prevent access to the blade from the feed chute area. Where a fixed tunnel guard is used it should not be possible for a person standing at floor level to reach down the tunnel guard to the blade. Where a fixed tunnel guard is used however, it will be necessary to ensure that no person can stand in an elevated position where he may gain access to the blade. A suitable routine should be established to ensure that the machine is isolated before any cleaning is attempted.

2. Guarding the blade from the feed chute may also be done, by means of interlocked guard which when in position prevents any access to the blade. Opening on the interlocked guards should only be possible either;
   a) after the blade is stationary; or,
   b) after a shutter has come into position over the blade thereby preventing access during loading.

   Any guarding provided at the feed chute should be so arranged that adjustments can be carried out without altering the guard.

3. A suitable tunnel should be provided at the discharge end of the machine with openings that conform to the safety distances in BS EN 294. Where the discharge conveyor forms part of the guarding and can be removed for cleaning it should be suitably interlocked with the movement of the blade to ensure that the machine cannot be run unless the discharge conveyor is in position.

4. The blade itself should be completely encased, apart from the openings necessary for feed and discharge, should be suitably interlocked with the drive and be fitted with an overrun device where necessary. Suitable arrangements should be made for the collection of trim pieces of product and it should not be possible to reach up any discharge chute to the blade. Where the removal of a container for scraps allows access to the blade it should be suitably interlocked with the drive for the blade and fitted with suitable overrun protection where necessary.

5. Cleaning of the machine should only be done by persons who have been specifically trained in the hazards of the machine and the routine followed for cleaning.

6. Undue vibration can occur if the blades are not kept properly balanced and a routine to ensure proper maintenance and balancing of the blades is essential.

7. The use of suitable anti-vibration and anti-slip floor mountings is recommended in instances where the machine is not secured to the floor.

8. Effort should be made to ensure that foreign bodies do not come into contact with rotating blade.

ADDITIONAL HAZARDS OF POWER FED MACHINES

Trapping caused by the powered feeding device to feed the meat into rotating blade.

On some machines there may be additional hazards from the discharge mechanism to the conveyor.

Tenderisers

DESCRIPTION

Mechanical tenderisers provide a quick means of breaking up tough connective tissue and supply a product of uniform tenderness prior to further processing.

The machines consist essentially of sharp serrated discs mounted on twin rotating shafts into which unfrozen meat is fed by means of an endless belt conveyor. Discharge is normally into another conveyor or into a suitable container.

HAZARDS

1. The main hazard associated with the machine is contact with the serrated tenderising discs.

2. Hazards associated with the infeed and outfeed belt conveyors.

3. Electrical hazards due to the wet environment in which these machines are often used.

PRECAUTIONS

1. The guard over the serrated discs to protect the infeed at the serrated discs should extend to a distance of 1000 mm along the infeed conveyor. Any part of the guard which requires to be removed for cleaning should be suitably interlocked.

2. The guarding provided at the outfeed end of the machine will depend on whether or not the product is removed by conveyor or fed into a collecting bin. If the product is removed from the machine by conveyor the conveyor should be guarded to a distance of 1,000 mm from the danger point. Any part of the guard which is removable for cleaning should be suitable interlocked.

3. When the discharge for the machine discharges into a collecting bin either:
   (a) the bin should be situated inside a suitable interlocked enclosure; or
   (b) where the bin when in position prevents access to the dangerous parts a suitable sensing mechanism should be provided to ensure that the machine can only be run when the bin is in position.

4. Where the machine is fed by the conveyor or where the delivery is affected by conveyor and the conveyor is removable, the conveyor should be interlocked with the machine in such a way that the machine cannot be run unless the conveyor is in position.

5. Suitable fixed guards should be provided to protect the intake between the conveyor belt and the head and tail drums of the conveyor.

6. An earth leakage circuit breaker should be fitted to the machine.

7. An emergency stop button should be provided and located at the infeed point of the conveyor.

8. A safe system of work should be established and enforced for the cleaning of this type of machine.

Degristlers

DESCRIPTION

These machines, sometimes called "separators", are really modified mincers. By alterations and additions to the plates and discharge, the meat is minced normally while the gristle is separated and discharged through a central tube. They are fed by a hopper that is filled from a hoist.

HAZARDS

- Access to feed worm from above.
- Access to knives through front plates.
- Hazards associated with hoists.
- Removal of feed worm.
- Hazards associated with cleaning and electrical equipment.

PRECAUTIONS

1. The height of the hopper should prevent access to the feed worm. If this is not practical the access ladder to the platform should be hinged and interlocked.

2. To prevent access through mincer plates, which have holes over 10mm, a hinged portable interlocked hood may be fitted. Due to the size of the hood required a lift-off one would be too heavy. The front plate has access for the gristle discharge tube to be inserted and screwed into place. When lifted the hood is secured by means of a snap-on clip on the front of the hopper. This allows free access for dismantling and cleaning.

3. Hoists should be fitted with side guards and the carriage with a positive lock arrangement for the container and a safety chain. A hold-to-run control should be used for the hoist.

4. The feed worm may be removed by pushing a suitable wheeled trolley against front of the machine, the worm pulled out onto it for cleaning and replaced in a similar manner.

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Pig Dressing Equipment
Scald Tanks

DESCRIPTION

A scald tank is a tank, usually rectangular, filled with water at 60°C. The water is heated by steam, either directly or indirectly via a coil.

Pigs are immersed in the water in order to soften the hair prior to removal in the dehairer.

Manual

Here the pig is lowered into the water and it is propelled down the tank towards the dehairer cradle by operators using poles.

Automatic

Pigs are fed into the tank and pulled through, either by the continuation of the bleed conveyor, or by the pigs being de-shackled and pushed through by a conveyorised frame. Automatic tanks tend to be considerably longer than the manual type, in order to give the pigs sufficient dwell time (6 minutes). Another type is quite deep and the pigs are carried into the water by means of a rotary cradle device.

HAZARDS

Manual

- Contact with steam piping.
- Splashing by the hot water.
- Steamy conditions.
- With rapid fall entry systems there is a danger of operators being struck by carcass/shackle.

Automatic

- Entanglement or contact with in-feed conveyors, de-shackling devices etc.
- Trapping by the discharge cradle.

PRECAUTIONS

Manual/Automatic

1. Piping should be lagged.
2. In the case of direct heating, a steam control valve should be used to reduce the amount of steam bubbling to the surface. Special care is needed at the point where the pigs enter the water.
3. Area should have adequate ventilation and have a good standard of lighting.

Automatic

1. Only personnel involved in the operation should be in the vicinity of the tank.
2. Floor should be easy draining and floor drains must be kept clear.
3. Automatic lines should be enclosed
4. All drive mechanisms should be guarded.
5. An emergency stop switch should be positioned in the automatic scald tank area at an operator position.
6. The scald tank conveyor, and the in-feed and discharge mechanisms must be switched off and isolated, with the isolator locked, before operators try to dislodge or retrieve any carcass caught in the mechanism or any cleaning or maintenance work is attempted.
7. On automatic lines, care must be taken at startup to ensure all personnel are clear of the system.
8. On some machines the use of a propping device may be necessary to support the discharge cradle before anyone enters the tank.

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Pig Dressing Equipment
Dehairers

DESCRIPTION

The machine comprises a metal box containing one or more shafts to which are attached beaters. These are pads in hard rubber or similar material to which are attached curved hardened steel plates.

The action of the rotating shafts and beaters removes the hair from scalded pigs.

The entry and exit of pigs is usually by means of manual or automatic cradles.

HAZARDS

- Contact with rotating beaters and loading cradle.
- Steamy conditions due to adjacent scald tank.
- Hair and debris on floor.
- Gap between cradle, tank and fixed frame of machine.

PRECAUTIONS

1. Machine should have flaps or similar guards on the rotating parts on the scald tank side and to prevent debris flying out on discharge side.
2. Automatic lines should be enclosed
3. Floors should be cleaned regularly of hair and other debris
4. Floor should be easy draining and the drains kept clear.
5. Only personnel involved in dehairing operation to be in vicinity of machine
6. Machine should only be loaded in accordance with manufacturers specification.
7. An identifiable stop switch should be positioned adjacent to the machine, preferably on the scald tank poling side.
8. Machine must be switched off, electrically isolated and locked-off before operators attempt to dislodge any carcase caught in the beaters and before any cleaning or maintenance work is attempted
9. If the machine is of the type that requires the shafts to be set wider to handle sows, the machine must be electrically isolated when this is done.
10. The machine should electrically isolated when the gambrel table is removed.
11. The beaters should be inspected on a regular basis to check for cracks and loose or missing bolts/rivets.
12. There should be suitable guards in cradle movement area.
13. Scald tank poles must not be used to assist carcases into or out of machine.

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Pig Dressing Equipment
Gambrel Tables

DESCRIPTION

A table constructed of stainless steel or galvanised mild steel and situated at the discharge side of de-hairer and used for lifting sinews on pig hind legs for insertion of gambrel.

HAZARDS

- Carcase falling from table.
- Hair and debris on floor.
- Knife used by hocking operator.
- Trapping between gambrel and elevator.

PRECAUTIONS

1. A retaining bar around the edge of the table, will prevent carcases dropping onto floor or on to an operator's foot. This retaining bar needs to have a open section to enable the hocking/gambrelling operation to be carried out.
2. Floors should be cleaned regularly of hair and other debris
3. The table should be easily drained and moveable to assist cleaning of de-hairer and floor.
4. The table should be wide enough to prevent operator from reaching into de-hairer.
5. There should be a knife holder for the hocking operator.
6. Any gambrel return device should be located so as to minimise the risk of an operator being struck by gambrels.

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Pig Dressing Equipment
Automatic/Hand Operated Singers

DESCRIPTION

A vertical metal cylinder with a burner in the base, split vertically, and lined with firebrick. It is used to harden the skin for bacon production, to remove hair missed in de-hairer and to give the skin colour and depth.

HAZARDS

- Open flame and lighting of the burner
- Hot surfaces.
- Noise.
- Trap on automatic machines between closing halves of the cylinder
- Steam.

PRECAUTIONS

1. Barriers to keep personnel away from the flame.
2. A long torch to light the burner.
3. Burner fuel storage located separately.
4. Operators should ensure that water is turned on to cool the rail when singer is operating.
5. Screening to cut down noise.
6. Regular inspection of the rail and supporting steelwork for distortion etc. and a check that the water supply piping is clear of any obstructions that may affect water flow.
7. In the case of a breakdown or a carcass falling, the singer should be allowed to cool down before any work is done.

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Pig Dressing Equipment
Black Scraper, Polisher and White (or Dry) Scraper

DESCRIPTION

Carcasses from the singer enter each of these three machines in turn. They remove marks or blemishes from the skin.

A **black scraper** has a water spray and moving metal scraper blades that remove the scorch marks.

A **polisher** is a similar machine containing rotary brushes or nylon claws that remove any hair or particles left on the pig carcase after the black scraper.

The **white scraper** blades remove particles of water and a thin layer of skin from the carcass.

HAZARDS

- The main danger is from entanglement or contact with drive mechanisms, blades and brushes etc.

PRECAUTIONS

1. The dangerous parts including drive mechanisms must be properly guarded.
2. There should be an emergency stop in the scraper/polisher area, at an operator position.
3. Machines must be switched off and isolated, with the isolator locked before maintenance, lubrication, changing of blades or brushes and cleaning of equipment.
4. Should a pig become dislodged from a gambrel, the machine must be switched off and isolated before the carcass is retrieved.

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Pig Dressing Equipment
Hand held torch type Singers

DESCRIPTION

Hand held gas torches used to remove carcass hair missed in de-hairer.

HAZARDS

- The danger from this equipment is the open flame

PRECAUTIONS

1. Operator must be properly trained.
2. Use of a flint gun is recommended to light the torch.
3. A stand should be provided to support the torch when not in use. Flame should be directed away from work point when the torch is on the stand.
4. Fuel storage must be located separately.
5. The operator should have adequate room for this task.

Mincemasters and Lowboys

DESCRIPTION

These machines are used to mince meat to a fine degree and to blend and emulsify proteins.

Mincemasters comprise of a hopper mounted vertically above a revolving knife assembly directly driven from a base motor. Product is minced through a fixed cutting plate and ejected by an impeller blade through a chute into a container.

Lowboys are in effect horizontally mounted mincemasters using a worm to feed the knife assembly.

HAZARDS

- Access through the feed opening to the worm feed on lowboys and knife assembly on mincemasters.
- Access to the impeller blade on both mincemasters and lowboys through the discharge opening.
- Ejection of product from mincemaster feed hopper.
- High noise levels, particularly when using frozen materials.

PRECAUTIONS

Mincemasters

1. Access to the knife assembly via the feed opening in the conical hopper should be restricted by a fixed plate.
2. Access through the feed chute should be restricted, for example by a grid or bars, or the safety distance should comply with BS EN 294.
3. Time delay interlocks should be used when removal of parts like the hopper and the feed chute can give access to dangerous areas during rundown.
4. A hinged flap should be provided to prevent ejection of product.

Lowboys

1. An interlocked infeed grid should be fitted to prevent access to the worm assembly
2. The knife assembly adjustment should give sufficient time delay for over-run. The cutting chamber assembly should be interlocked so that the machine cannot be operated unless the machine is fully assembled.

Noise

1. Noise levels on these machines are high and a noise assessment should be done and suitable measures taken to reduce noise at source.
2. The fitting of rigid or flexible plastic enclosures including tops can reduce levels by 10 – 15 dB (A)

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Smokers and Cookers

DESCRIPTION

These units typically consist of an enclosed chamber in which meat or meat products are cooked and/or smoked. Door(s) to the chamber can be at both front and rear. Heat can be introduced either by steam, electricity or by a friction burn method.

Depending on the cooker size, product is carried on racks either as single trays or multi-tiered trolleys.

Control of temperature, smoke, cooling showers (if fitted) and time cycle is achieved either by individual controls or jointly with a Programmable Logic Controller Unit (PLC).

HAZARDS

- Burns from hot product racks or trolleys.
- Slips and falls whilst manoeuvring loaded trolleys into/out of cookers over chamber floors coated with fat and water.
- Heat exposure
- Exposure to wood smoke, which contains carcinogens.
- Exposure (e.g. skin contact) to smoke condensate, which is carcinogenic.
- Burns while tending the smoke generator.
- Fire (from smoke generator).
- Injury from premature turning on of steam, gas, electric services or smoke generator whilst persons are present inside the chamber (e.g. for maintenance or cleaning).
- Corrosive and/or toxic chemicals used for cleaning the cooker smoker, the product racks or trolleys and smoke generators.

PRECAUTIONS

1. Where fitted, the cold-water shower should be used to cool the chamber before removing product. Otherwise suitable personal protective equipment should be used.
2. The floor should have a grip face finish together with drains to remove excess water.
3. Door interlocks should;
   - prevent doors opening during high temperature phases of the cooking cycle when entry would be dangerous,
   - prevent start of cooking or smoking cycles until doors are closed,
   - prevent doors being opened whilst smoke is present within the chamber or close down smoke generation and start extract fan purge to clear the smoke if the door is opened before the smoking cycle is complete.
4. Chamber door seals should be checked regularly and maintained in good condition.
5. Smoke generators should be maintained as directed by the makers. Particular attention is needed to clear ash and keep combustible material safe.
6. Hazardous substances (including cleaning chemicals and smoke) must have a COSHH assessment.

MAINTENANCE

Before undertaking maintenance work the cooker services must be isolated and locked off. Special attention should be given to retained heat on internal parts, steam valves, fans, baffles etc.

All safety systems, interlocks etc should be checked for operation before the machine is returned to normal use.

CLEANING AND HYGIENE

A 'clean as you go' procedure is recommended to avoid build up of debris on cooker racks etc. The cooker/smoker cabinet and the product support racks should cleaned according to a schedule that states the method, materials, water temperature and the PPE to be used.

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Hopper Fed Sausage Fillers

DESCRIPTION

Sausage fillers are widely used to fill both natural and artificial casings with sausage meat.

Meat from a feed-hopper under a partial vacuum is fed by a pump or through a worm/scroll to a nozzle where it is squeezed into the casing.

Casings are fed onto the nozzle either manually or mechanically through a forming attachment.

Large machines may be manually fed or by a hoist, tipper or electric clamp truck.

The feed hopper on some machines can be tipped over for cleaning on release of a clamp. On large machines the hopper may be swung in and out of position under power.

HAZARDS

- Contact with the pump mechanism or worm/scroll feed in the bottom of the hopper, either via the hopper when the machine is in operation or when the hopper is tipped over for cleaning etc.
- Contact with any scraper mechanism as it moves round over the internal surface of the hopper.
- There is a possible trapping point between the hopper and frame of the machine where the hopper moves under power.
- Most injuries at this class of machine occur at the end of the production run or during cleaning when operators reach into the hopper to push meat residue down onto the feeding mechanism.

PRECAUTIONS

1. Access into the feed hopper, to the scraper mechanism and to the feeding device in the bottom of the hopper should be prevented when the machine is in operation.

2. Where machines are manually fed, then irrespective of their size, a suitable hopper guard should be provided.

3. Where machines are mechanically fed, then unless the safety distance as described in BS EN 294 can be achieved, a suitable hopper guard should be provided. The distance to the danger point should be measured from the highest operating position. This might be the floor or a set of steps etc. The danger point will be measured be the scraper where one is fitted.

4. Even where the "safety distance" can be achieved it is recommended that a suitable hopper guard be fitted unless it is not reasonably practicable to do so.

5. Where the hopper can be tipped over, it should be interlocked so that the machine cannot be operated with the hopper out of position. If necessary a time delay device should be fitted so that moving parts at the bottom of the hopper are stationary before it is removed.

6. Where the hopper is driven in and out of position the controls should be hold-to-run.

7. Hoppers should only be tipped when empty.

8. Where operators need to see into the hopper then a mirror can be clamped on to the rim of the hopper so its contents can be visually checked from the floor.

Hamburger (Patty) Forming and Extruding Machines

DESCRIPTION

Although designs vary, the principle of these machines is the moulding of minced or ground product into portions. A mould is filled in one position and moved to another for the completed product to be ejected. Material is fed via a feed tray or, more commonly, into a hopper. This may be done manually or mechanically using a hoist, tipper or electric clamp truck or automatically via a conveyor. Scrapers or paddles may be fitted inside the hopper to aid mixing and feeding. A feeding device in the hopper takes the material to the forming station. The feeding device may be a worm/scroll or piston (or set of pistons).

The product is pressed into a mould plate and from here a tool known as a knock-out cup ejects it.

Machines may be categorised according to the way the mould plate operates: -

Reciprocating machines. Here the mould plate (a plastic slide with circular holes cut in it) emerges from the forming station and at the end of its outward travel an injection plunger (the knock out cup) pushes the formed shapes out of the slide, usually onto a discharge conveyor.

Rotary machines. On these machines the mould plate is round with a number of circular holes or forming pockets in it. As the mould plate rotates a plunger ejects the shape and it is removed by a conveyor as above or by a scraper, which can be manual or mechanical.

Both machines may be fitted with a mechanism that places a piece of paper between each formed portion.

HAZARDS

- Contact with the feeding device (whether pistons or scroll feed etc) or with the scrapers and paddles in the hopper.
- On some machines access may be possible via the hopper or the outfeed to the traps created by cams and blades etc at the forming station.
- There are shear traps between the ejection plunger and the mould plate.
- Shear traps between the mould plate and the frame of the machine as the mould plate either rotates or reciprocates.
- Traps created by the moving parts at the paper interleaving mechanism if fitted.
- Traps associated with scoring attachments sometimes fitted at the outfeed.
- Contact with mechanical feeding devices and/or containers of meat being lifted or lowered.

PRECAUTIONS

1. Access into the feed hopper, to the scraper/paddles or to the feeding device should be prevented when the machine is in operation. A suitable hopper guard should be provided. This guard should normally be interlocked with the machine so the machine cannot be operated until the guard is in position and opening the guard stops the machine. The guard may be a grid with suitably placed bars.

2. If the feed machine is fitted with a feed tray then a restrictor plate similar to the ones found on mincing machines should be fitted over the feed opening to prevent access to the feeding device.

3. Guards (which normally form the body of the machine) should be fitted to prevent access to the various trapping points that exist at the forming station. Fixed and/or interlocked guards may be used.

4. Suitable guards should be provided at the discharge to prevent access to the forming station and to the traps associate with the ejectors and paper interleafing mechanism (if fitted).

5. The guard at the discharge is removed frequently for cleaning and clearing blockages etc; it should be interlocked with the power supply

6. Suitable interlocked guards should be provided over the scoring attachments.

Extrusion machine. This is an attachment to a standard mincing machine. Meat is extruded from the mincer to form a continuous strip on top of a slip of paper. The strip is cut into portions by a solenoid-operated guillotine.

With the exception of the outfeed mechanisms the hazards and the precautions are broadly similar to those of patty formers. The guillotine presents a different hazard and it should be covered with a tunnel guard whose dimensions comply with the safety distances of BS EN 294. As the cover is lifted frequently for cleaning it should be interlocked with the power supply.

GENERAL

If it is necessary to push meat down onto the feeding device then a suitable scraper should be used. This should be designed so that the scraper cannot become entangled on the feeding device itself.

Where it is necessary to see into the hopper then a mirror should be clamped to the rim of the hopper.

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Derinders, Skinning and Membrane Machines

DESCRIPTION

These machines consist of a rotating toothed or serrated roller set beneath a fixed blade. When product is fed into the machine the roller grips the skin or membrane and leads the product to the blade where meat is separated and the skin or membranes fed to a waste chute.

The machine can be hand fed or conveyor fed. Only round or irregular product such as hams can be processed on hand fed machines. Where possible all other product must be processed on conveyor fed machines with suitable tunnel guarding.

For most purposes on hand fed machines the gap between the roller and the blade is kept very narrow. On membrane or skinning machines this feed gap is normally non-adjustable and set at <I mm. BS EN 12355 allows a maximum gap of 5mm but normally a maximum gap of 3mm should be used for derinding purposes.

HAZARDS

- The main hazard is on hand fed machines and these have been a common cause of accidents. Usually, the hand is drawn onto the blade by the roller and skin is lost from the fingertips and fleshy parts of the hand or the wrist. Skin grafting is often required.

PRECAUTIONS

1. The correct machine should be chosen for the job. Hand fed machines must not be used where product is suitable for conveyor fed machines. Derinders should not be used where skinning machines are more suitable as, for example, with fish.

2. The blade must not be inserted upside down. Very severe accidents have been caused in this way.

3. A low voltage shrouded foot pedal should be used as the machine start/run control. A belly bar should only be used as a stopping device.

4. Blades and rollers must be kept in good condition as blunt parts encourage operators to stab product on to the machine increasing the risk of injury.

5. Suitable rubber gloves, often with thickened rubber fingertips, can be used. BS EN 12355:2003 advises the use of such gloves if "manufacturer approved".

6. Chain mail gloves must **not** be worn. Serious accidents have occurred when chain mail gloves were drawn in to the mechanism causing such serious crushing injuries that fingers had to be amputated.

7. Suitable training is very important. Operators must be fully trained to understand the machine controls and the dangers of the machines so that they know what to do in the event of an emergency.

8. Only competent persons over the age of 18 should operate the machines.

9. To protect third parties the machine should be sited where the operator will not be distracted by those working in the vicinity and so that access to the dangerous parts is prevented as much as possible.

10. On conveyor fed machines dimensions of guards should be to BS EN 294.

TOUCH-STOP/ DISCONNECT DEVICES

- Machines are available fitted with electrical devices that include the operator in an electrical circuit and which stop the machine when the device detects a circuit change. The operator is required to wear conductive gloves, which are connected to the machine and rubber overgloves of the type mentioned above. If the rubber gloves are damaged and the conductive material or the operator's skin completes a circuit to earth, the machine will stop its motion and reverse for part of the roller circumference. Such machines have been in service for some years and appear to work satisfactorily.

REFERENCE

BS EN 12355 Derinding machines

Loin Pullers

Loin pullers are used to produce a high quality loin with the required thickness of rind and fat removed. The two main types of machine have either a fixed or a moving knife.

FIXED KNIFE MACHINE

DESCRIPTION

The loin is placed back down on the infeed side of the belt conveyor. A driven ribbed roller pulls the loin into the machine and a pneumatic hold-down clamp is triggered. The oscillating cutting blade mounted just to the rear of the clamp cuts off the required thickness of rind. The depth of cut can be adjusted manually or, on some machines, automatically..

HAZARDS

- Contact with the blade
- Trapping under the clamp
- Nip point between driven roller and the conveyor belt.

PRECAUTIONS

1. A fixed and/or interlocked guard should be provided to prevent access to feed roller, clamp and blade. Tunnel guards should comply with the safety distances in BS EN 294

MOVING KNIFE MACHINE

DESCRIPTION

The machine comprises an adjustable height receiver bed, a pneumatically operated hold down bar, and a pneumatic piston to draw and return a shaped knife through the loin. A small steam jet is used to heat and clean the blade to make cutting easier. The loin is placed in the receiver bed rind down. The bed is adjusted to the required height and the start valve button is depressed starting a sequence of automatic operations. First the hold-down bar clamps the loin, then the knife is drawn through it. Next, the bed is released to drop the rind and loin onto the discharge conveyor, and the machine returns to the start position

HAZARDS

- Contact with the cutting knife.
- Trapping by hinged receiver bed and the hold down bar.
- Scalding by steam/hot water jet.

PRECAUTIONS

1. Guarding should be provided to prevent dangerous access to the knife blade and associated pneumatic equipment. Opening of an interlocked guard should arrest the automatic sequence and exhaust the air in the system.
2. Where the machine delivers onto a conveyor then a tunnel guard should be provided and should comply with the safety distances in BS EN 294
3. Where the machine discharges into a collecting bin this should be interlocked such that its removal isolates and exhausts the pneumatic supply.
4. The steam/hot water jet should be enclosed in a suitable tundish.

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Cleaning Operations

INTRODUCTION

Cleaning of workplaces, plant and machinery is of prime importance in the meat trade for hygiene reasons. This note is not intended to give guidance on hygiene standards but to recommend the adoption of safe methods of achieving the hygiene required by other legislation or codes of practice.

HAZARDS

- During cleaning operations machinery may need to be dismantled and guards removed. Serious injury can result from uncovenanted movement or deliberate running of machinery under these conditions.
- Machines incorporating heavy or sharp cutters present a handling risk to workers. Strains and falls as a result of incorrect handling of heavy items of plant are significant hazards.
- Steam and hot water used in cleaning create burning and scalding hazards. The source of steam may be direct injection pipes used to heat tanks of water, mixer valves or portable pressure washers. Hot water is handled via hoses or various containers such as bins, mobile baths, buckets and tanks. Serious burns may occur by contact with large quantities of hot water because of dangerous systems of work or inadequate protective clothing. A particular hazard is the use of incorrect equipment such as plastic buckets, which soften and detach from the handle at high temperature.
- There are dangers associated with electrical equipment in wet conditions, particularly if hosed down at high pressure.
- Certain chemicals used in cleaning operations may be harmful to health if incorrectly stored or used. Some chemicals become more hazardous when mixed than when used separately.
- To carry out satisfactory cleaning of plant, access may be needed to equipment or places not otherwise approached, for example, high level pipes, overhead conveyors or very large machines. Falls from height are a prime cause of fatal and major injuries.
- Persons entering confined spaces may be affected by harmful fumes/vapours or lack of oxygen.

PRECAUTIONS

1. A responsible person should be in charge of all cleaning operations. They must be adequately trained and have sufficient knowledge and experience to enable them to supervise and control a system of working. Complex installations may need a written safe system of work for cleaning.

2. ### Machinery dismantling and reassembly

   Supervision should assess the requirements for the specific cleaning operation to be done, identify the potential hazards and the precautions necessary to avoid danger. Typical precautions might include:

   #### Machine isolation

   If dismantling includes removal of guards, whether fixed in place or interlocked, the machine should be electrically isolated. It is not sufficient for the machine isolator to be switched to the off position. Some form of positive isolation should be provided, such as a facility on the isolator to enable it to be padlocked. Such a facility allows the use of securing hasps such as **Islok** or **Scissorlok** that enable several maintenance personnel to use their own personal padlock. Whilst any one padlock remains in position the isolator cannot be moved to the on position. On smaller machines the plug may be simply removed from the socket.

   #### Reassembly:

   When cleaning is finished the person responsible for the operation should check that the work has been completed properly. All machine components, including guards should be replaced and in full working order. The operation of guards, interlocks, emergency stops and other controls should be checked.

3. ### Handling machine components

   Where heavy or unwieldy components are to be moved, arrangements should be made for safe handling. This might include providing lifting equipment for the operation or ensuring that adequate manpower is available.

Machines incorporating sharp cutters, e.g. slicers, should have suitable devices for safe handling during dismantling and cutter cleaning.

Persons required to handle heavy or unwieldy objects should be trained in handling procedures including the use of lifting equipment where appropriate. Safety footwear should be provided and worn.

4. **Safe means of access**

Where practicable, permanent access and working platforms should be provided. Platforms should have a sound surface and be surrounded on open sides by a handrail, intermediate rail and toeboard.

Where scaffolding is used as a temporary working platform or means of access, it should be a sound structure. Guidance on scaffolding is contained in the HSE Guidance Note GS15 General Access Scaffolds.

Drain covers, manhole covers and any similar covers in floors should be replaced immediately after work has been completed. If openings are left unattended, suitable barriers are necessary to prevent persons tripping or falling.

Forklift trucks should only be used for access when fitted with a suitable working platform and in accordance with a safe system of work. Further advice is given in HSE Guidance Note PM 28 - Working Platforms on Forklift Trucks.

Power operated mobile work platforms (extending work/access platforms, power access platforms, aerial work/access platforms or mobile work/access platforms are other descriptions) may be used during cleaning operations. Hazards associated with such equipment and the precautions necessary are contained in the HSE booklet, HS(G)19.

5. **Electrical Equipment**

Precautions should be taken to prevent ingress of water to electrical equipment. Employees using high-pressure jets should be instructed and supervised to minimise the risks both to the equipment and operators. It should be recognised that even protected electrical equipment is unlikely to withstand direct high pressure jetting and fogging.

Equipment used for the purpose, such as steam or water pressure cleaners, should be constructed and maintained to a high standard. Guidance on their use is given in HSE Guidance Note PM 29 - Electrical Hazards from Steam/Water Pressure Cleaners.

6. **Chemical Safety**

The Control of Substances Hazardous to Health Regulations (COSHH) require an assessment of the risks to health posed by any hazardous substances so control measures can be selected applied and maintained to control those risks.

Management must obtain and keep information about hazardous chemicals. This information should include details about the potential hazards, the precautions to be taken, first aid action and the proper method of use. These details are available from the suppliers in a data sheet.

Any person who has to use harmful or toxic substances must be made aware of the hazards and instructed/trained in the appropriate precautions. Adequate supervision should be provided to ensure that the correct procedures are being followed.

Every chemical container must be clearly marked with its contents and correct method of use. Dispensing from bulk into other containers should only be permitted after the container has been thoroughly cleaned and re-marked to indicate the new contents. Old markings should be removed. The use of food containers for this purpose should be prohibited. In addition, chemicals should not be transferred by pouring direct from the container but should be transferred by the use of suitable dispensing equipment.

Mixtures of certain chemicals can produce toxic gases, which may be dangerous to persons and liable to contaminate the products. Violent chemical reactions may also occur. This can be a particular problem if incompatible chemicals mix in drains. Instructions for the proper use of the chemicals should be specified and the procedures monitored by supervision.

Supplies of acids and alkalis should be physically separated. Where large quantities are kept, it may be appropriate to provide clearly marked separate storerooms.

Concentrates should be kept well away from water supplies and should be added to water not water to concentrate.

The recommended dilution rate should be observed, i.e. solutions should not be prepared at increased strength.

Protective clothing should be provided to minimise the risk of accidental splashing of the skin and eyes by cleaning chemical. These chemicals may be acidic or alkaline, both of which can be corrosive to skin and eyes or they may contain bleaches or solvents having a harmful chemical action on skin and eyes. Protective clothing supplied should be impervious to the chemical being used and will normally consist of apron, goggles and gloves in addition to overalls and wellington boots.

Eye wash bottles/drenching facilities should be provided at suitable locations.

7. **Entry into confined spaces:**

Serious accidents continue to occur whilst work is being done in confined spaces. The chief risk is of toxic gases or fumes inside the space to be entered. Typical spaces might include cookers, boilers, tanks, pits, sewers etc. There are specific regulations that must be complied with, the *Confined Spaces Regulations* 1997 and there is an HSE guidance leaflet IND (G) 258 aimed at employers and the self-employed who carry out work in confined spaces. It explains, simply, what action is necessary to meet the Regulations.

8. **Use of steam and hot water**

Employees working with steam or hot water should receive training and information about the potential hazards.

All taps, valves, connections and hoses should be maintained in good repair.

Live steam should never be discharged from a hosepipe.

Steam mixer valves should display clear instructions about correct use, e.g. always turn on water before steam. Controls should be clearly marked.

Preference should be given to the installation of calorifiers to heat water if steam is utilised.

Mobile tanks or baths should not be filled beyond a safe level in order to prevent spilling and splashing.

Plastic buckets or containers not designed for carrying hot water should never be used for this purpose.

Wherever possible, hot water should be dispensed from tanks and vats by means of taps or valves. Never fill buckets from a tank or other vessel if this involves lifting the bucket above chest height.

The correct protective clothing should be provided and worn when working with steam or hot water, namely long wellington boots and a waterproof apron, which covers the front of the body and overlaps the boots.

Hot water hoses should never be directed at other persons.

Areas being cleaned should be clear of all personnel before swilling or hosing with water.

Water or steam hoses should not be directed at electrical equipment.

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Workplace Transport

INTRODUCTION

This Guidance Note is intended to cover both the general requirements for safety in the use of workplace transport and the requirements for the meat trades in regard to loading and delivery operations. The information in this document can be used in compiling risk assessments for transport activities.

Workplace transport-related accidents are the major cause of deaths in the food industry and a significant cause of serious injuries. In the meat industry, loading and unloading of vehicles is the cause of many manual handling lost time accidents.

Being struck by vehicles, including forklift trucks, accounts for almost 60% of transport-related injuries and half of these accidents were during reversing.

PRECAUTIONS

Three main priority areas have been identified for action,

- pedestrian/vehicle separation
- vehicle reversing
- falls from vehicles

1. Pedestrian/vehicle separation
   - Have safe traffic routes been planned - preferably with one-way systems and, if needed, pedestrian crossing points?
   - Are vehicles and pedestrians kept safely apart by, for example, provision of safe pedestrian routes both outside and, where possible, inside buildings?
   - Do vehicles and pedestrians have separate doors into buildings with suitable barriers where required?
   - Are appropriate speed limits enforced and, where required, speed bumps installed?
   - Are adequate signs in place, e.g. indicating direction, speed limit, no entry, etc., and mirrors fitted on blind corners?
   - Are vehicles, including private cars, parked in designated areas?
   - Is access to loading yards restricted to essential personnel and are they wearing high visibility clothing where necessary?
   - Can deliveries etc. be planned to avoid unsuitable times such as shift changeover?

2. Vehicle reversing
   - Can reversing be eliminated or at least reduced, for example by one-way systems?
   - Do vehicles have adequate all round visibility? Are mirrors or other visibility devices fitted?
   - Is there need to mark 'reversing areas' so these are clear to drivers and pedestrians?
   - Is there a need for a signaller (banksman) to direct reversing vehicles? Does the banksman have somewhere safe to stand?
   - Has the signaller been trained to keep the reversing area clear of people and to make sure the reversing manoeuvre is done in a safe manner. Do the signaller and driver both understand what signals are to be used. The HSE gives guidance on recommended signals in the leaflet *Reversing Vehicles*, INDG148.
   - Do the vehicles need to have reversing alarms fitted?

3. Falls from vehicles
   - On Fork Lift Trucks (FLTs), are make-shift platforms (e.g. pallets) used to raise workers on the forks? Deaths regularly occur from this unsafe practice. It is a legal requirement that only properly constructed cages are used designed especially for lifting persons, and that operators are competent and trained.
   - On flat bed vehicles can loading/unloading/sheeting be done without getting onto the vehicle? For example, by using FLTs to put the load on and take it off the vehicle, and using sheeting gantries.
   - On flat bed vehicles where access onto the vehicle is required, can this be achieved from loading bays to stop injuries while ascending/descending?
   - On all vehicles, are access to cab arrangements well designed with suitable slip-resistant steps and handholds?
   - On refrigerated vehicles, is access to controls and instruments possible without ascending ladders?

4. Lighting

   All roads, manouevring areas and yards should be adequately lit, with particular attention being given to areas near junctions, buildings, plant, pedestrian areas and places where there is regular movement of vehicles or mobile equipment.

5. **Vehicle design and maintenance**
   - The floor should be of slip resistant material where practicable
   - At the rear a substantial stepping bar and a good hand grip should be provided
   - Rail hooks must be free running and strong enough to withstand spreading
   - There should be safety catches on rail ends which prevents a runner falling
   - Lifting equipment should be examined in accordance with the Lifting Operations and Lifting Equipment Regulations (LOLER) 1992.
   - Part loads and other loads liable to fall must be properly secured while the vehicle is moving

6. **Loading Bays**

   Where possible the height of the loading bay and the floor of the vehicle should be equal but where this is not the case ramps or steps may be used.

   Steps should;
   - Be sufficiently strong and rigid
   - Be at least 900mm wide (36")
   - Have slip resistant treads about 250mm deep with risers about the same
   - Be fitted with a handrail on the left-hand side
   - Have a landing area at the top
   - Be fixed securely when in use

   Ramps should;
   - Be slip resistant
   - Have a maximum slope of 1 in 6
   - Be fitted with a handrail on the left-hand side
   - Be sufficiently strong and rigid
   - Be fixed securely when in use

7. **Loading and Unloading**

   Accidents have been caused by premature departure of vehicles from loading bays. Vehicle restraint systems or traffic lights can be effective at preventing this. Alternatively, the person in charge of the loading/unloading can retain the keys to the vehicle with the consignment paperwork.

8. **Systems of Work**
   - Carcasses, quarters and primal cuts should be hung so that bone or ligament tissue supports the weight.
   - S hooks with sharp points should be avoided particularly the smaller versions
   - Boxed meat, offal or poultry should be bonded during loading particularly at the rear door of vehicles.
   - Vehicle doors should be opened carefully and used as protection against badly stacked and displaced loads
   - Good housekeeping is important. Grease, fats and uncut box bands must be regularly removed.

REFERENCES

Workplace (Health Safety and Welfare) Regulations 1992
HSE Publications:
HSG 76 Health and Safety in Retail and Wholesale Warehouses
HSG 136. Workplace Transport Safety. *A Guide for Employers.*
HSG 6 Safety in Working with Lift Trucks

Reverse and safety signals for guidance of drivers Road Transport Industry Training Board (RTITB)

The HSE website also gives advice on workplace transport at the following sites:

http://www.hse.gov.uk/workplacetransport/index.htm

http://www.hse.gov.uk/pubns/indg148.pdf

Thermal Comfort

INTRODUCTION

Workers in the meat trades may have to work in a variety of thermal environments.

The main part of this guidance is concerned with work in cold stores where the air temperature is well below zero. But there can be health and welfare issues for workers in chilled areas from +12 degrees down to just below zero. These are explained in the HSE Food Industry Information Sheet 'Workroom temperatures in places where food is handled'.

The 'comfort zone' for most workers is in the range of 13 degrees C to 24 degrees C. Once temperatures start to rise above about 24 degrees it can start to get uncomfortably warm. Thermal comfort in this temperature range is a complicated issue. It relates to the individual worker's perception of how hot or cold they feel. This in turn can be influenced by a range of factors such as air temperature, sources of radiant heat, air velocity, humidity, the clothing the worker wears and how physically strenuous the work is. The HSE gives some guidance on its website on how to manage thermal comfort.

At temperatures above 27 to 30 degrees C, the issue of heat stress becomes more important. Heat stress may also be a problem at lower temperatures for heavy work, high humidity or when workers have to wear certain types of protective equipment.

Heat stress occurs when the normal cooling mechanisms are unavailable and the body's core temperature starts to rise. Initial symptoms include irritability, loss of concentration, excessive sweating. In the extreme heat stroke can result in loss of consciousness and even death. HSE has published a useful information sheet for workplaces with cookers or ovens etc. where heat stress can be an issue.

WORKING IN COLD STORES

The rest of this Guidance refers to cold stores operating below freezing, typically –12 to below -30 Celsius.

Working in the cold conditions of Cold Stores is very different and requires special attention to safety by operators, maintenance engineers and management alike.

Operators should be healthy, a health check up before commencing duties and annually thereafter is recommended. The extremities of the body cool quickest and therefore fingers and head (nose, chin, ears) are the first to suffer. Protective clothing should at least ensure that the skin temperature does not fall below + 12o C at any of these parts of the body.

Health/ Welfare

A recent literature review conducted by the Health and Safety Laboratory concluded that there is insufficient information to say whether repeated exposure to cold environments has long-term effects on health. However there is evidence that some people may be more susceptible to injury and that the physiological and mental changes caused by exposure to cold may exacerbate other risks.

People suffering from certain medical conditions may be unsuited to work in cold stores. These include chronic respiratory disease, asthma, arthritis, cardiovascular disease and Raynaud's syndrome.

Hypothermia occurs when the core body temperature falls below 35 Celsius. Early symptoms include shivering, slurred speech and mental confusion. Victims may often be unaware of what is happening to them. Without re-warming death will result. Repeated brief interval exposures (such as workers entering and exiting freezers) can have a cumulative chilling effect. Although severe hypothermia is unlikely in a work setting, early symptoms can cause discomfort and can contribute to increased accident rates.

Other health problems can include frost nip, frost bite and chilblains. Risks of frost bite are greater where frozen product has to be handled without adequate protective clothing.

Accidents

The presence of ice and slippery surfaces, combined with reduced manual dexterity because of bulky PPE and the mental and physical effects of cold temperatures can lead to an increased risk of accidents. Ice build up is likely to be most serious at the entrance to the cold store, which is also likely to be the busiest area.

Musculoskeletal Disorders

Difficulty with gripping loads or manoeuvring because of PPE and reduced circulation of blood to the extremities can increase the risk of musculoskeletal injury. Cold draughts are particularly linked to shoulder and neck pain.

Being Locked In

Safe means of exit must be available at all times, even if the door is locked from the outside. A 'man down' alarm controlled by a low level cord switch positioned near an order picking station gives a means of warning in the event of single operators becoming incapacitated.

Slipping

This is the most common type of accident, usually on ice that has formed on the floor under the coolers. The defrost cycle must be maintained to prevent ice build up on coolers or let water be blown off during defrost. Drain lines should be heated throughout their length to minimise ice accumulation.

Access to high level racking link to MHE

Never climb on racking or temporary steps without secure fastening. Do not stand on a pallet that is elevated by a fork truck – there are proprietary pieces of equipment to provide safe access. If high level access is required close off aisles to create a safe working area, free from other traffic.

Fire

Whilst it is not obvious, the air in Cold Stores is very dry. Wooden pallets and cardboard stored for some time become tinder dry and can quickly catch fire given a source of ignition. Maximum diligence is required on the safety of electrical wiring and equipment and of work involving heat is undertaken.

The site fire alarm system should alert people working inside the cold store of emergencies occurring outside. This may require sounders within the store.

Lighting

General light levels for access purposes are recommended as 120 – 150 lux and at least double this if order-picking operations are required.

Emergency lights are important, sufficient number of battery powered fittings should be positioned in working areas and by exits to show escape routes in the event of power failure. Ensure the batteries and equipment can operate at the room temperatures.

Housekeeping

This is particularly important as otherwise areas can become dangerous with spillage and/or rubbish accumulating to be a tripping hazard or entangling in truck wheels.

Fork Lift Trucks

Manufacturer's or supplier's advice should be sought to make sure that trucks are suitable for work in cold temperatures. Where possible, trucks with enclosed cabs are preferred as these give protection to the operator without the need for PPE. It is advisable for battery-powered trucks to be retained in the cold store at all times. This reduces condensation and ice build up and prolongs battery life.

Refrigerants

While all refrigerants are contained within a sealed system, leakage is possible for instance as a result of accidents with forklift trucks or pallet handling, seal failures etc.

Given the wide range of refrigerants now used, including ammonia, HCFC, HFC, hydrocarbons, liquid carbon dioxide, and nitrogen it is not practical in this guide to examine each in detail. Seek advice from your refrigeration engineers. Data is also available in the Codes of Practice mentioned at the end of this guidance paper.

In cases of leakage persons in the affected area should be evacuated and the area ventilated. Remember cold refrigerant gases sink to lower levels so areas below ground level, plant rooms, basements, stairwells etc may pose extra risk. However ambient temperature ammonia gas is lighter than air and so will rise.

DO NOT ENTER WITHOUT APPROPRIATE PERSONNEL PROTECTIVE EQUIPMENT AND TRAINING.

Refrigeration Plant Rooms

Refrigeration plant rooms should be kept locked and secure against unauthorised entry. They should not be used for storage. The area should be well ventilated.

All equipment should be well maintained by competent refrigeration engineer(s). Copies of the Electric Shock poster and suitable fire precautions should be displayed.

Personal Protective Equipment

Protective clothing should protect the body core temperature and also the extremities. The degree of protection will depend on the temperature, "wind chill" caused by air movement and the physical effort involved in the work. A British standard provides advice on the appropriate level of PPE. The best protection is offered by several layers of clothing (this also gives flexibility of choice to workers). Clothing that becomes damp loses a lot of its insulation value so inner layers that wick sweat away from the skin are a good idea. Changing facilities that allow protective clothing to dry after use are needed.

Conventional steel-toed safety footwear may not be suitable as it provides little insulation for the feet.

Direct contact with cold surfaces can also cause damage. Contact with metal at temperatures below -7 degrees C can cause burns to the skin. Suitable insulated gloves or mitts are needed where workers handle frozen products or come into contact with cold surfaces.

According to the Cold Storage Association, the recommended protective clothing for temperatures below -5 Celsius includes:

- Thermal undergarments
- Jacket and salopettes or all in one coverall
- Cold store gloves with thermal liners
- Safety boots with thermal socks
- Safety helmet with thermal liner, thermal balaclava and thermal hood.

Exposure periods

Measures to counteract the overall heat loss or peripheral cooling in the hands and feet may include limiting the length of time spent in the cold area. In temperatures below -25 Celsius, protective clothing can never provide complete protection and it is necessary to restrict the time of exposure and to allow time for the workers to re-warm themselves. There are no hard and fast rules but the table below is based on a German DIN standard.

TABLE 1 EXPOSURE TO COLD AND RECOVERY PERIODS

Air temperature °C	Maximum uninterrupted exposure to cold min.	Recommended recovery period as a percentage of cold exposure	Recommended recovery period min.
below – 5° to – 18	90	20	15
below – 18 to – 30	90	30	30
below – 30	60	100	60

Note Recommended recovery periods (column 4) has been rounded off using the percentages in column 3.

REFERENCES – FURTHER READING

Workroom temperatures in places where food is handled.
HSE Food information sheet No. 3 –
http://www.hse.gov.uk/pubns/fis03.pdf

HSE thermal comfort webpages
http://www.hse.gov.uk/temperature/thermal/index.htm

Heat stress in the workplace: what you need to know as an employer. HSE general information sheet No.1
http://www.hse.gov.uk/pubns/geis1.pdf

Health and Safety Laboratory Report No. PE0407
Health Effects of Working in Cold and Frozen Food Environments.

British Standard BS EN 378 parts 1- 4
Refrigeration Systems and heat pumps –
Safety and environmental requirements.

British Standard BS 7915:1998
Ergonomics of the thermal environment –
Guide to design and evaluation of working practices for cold indoor working environments.

Codes of Practice for Refrigeration
The Institute of Refrigeration, Kelvin House, 76 Mill Lane, Carshalton, Surrey, SM5 2JR publish a series covering most refrigerants

DIN Standard 33403-5
Climate at workplaces and their environments.
Ergonomic design of cold workplaces January 1997

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Mechanical De-Boning Machine System

INTRODUCTION

Mechanical de-boning machines or liberators have largely replaced table boning in beef boning plants in recent years. This is because it has become more difficult to attract skilled employees or people who are capable of attaining the necessary skill. The mechanical system reduces both the skill level required and the number of boners needed. A table-boning line might typically have had twelve boners but a mechanical system will need just three or four. Liberators also help with controlling WRULD problems by reducing the manual force required on the knife and by eliminating the need to lift quarter and primal cuts.

DESCRIPTION

The machine system comprises a support cradle and bone saw, a drop rail and two metal boxes, each containing a hydraulic ram and fitted with suitable controlling devices. (e.g. on/off pulleys, adjustable limit switches to control speed/air pressure and emergency stop buttons.) These machines can be situated either parallel or at a right angle to the rail system

The basic function of the machine system is to provide a system-atic method of de-boning and to aid the de-boning process by applying tension to leg-bone, hipbone and rib cage while cutting.

HAZARDS

- Knife/Saw injuries.
- Slip injuries due to build up of meat, fat and bone-dust on floor.
- Being struck by quarters falling from rails
- Being struck by quarters moving at speed on rails
- Noise from saw and machinery.
- Manual Handling and ergonomic issues e.g. muscular-skeletal disorders, back injuries.

PRECAUTIONS

1. Knife Injuries:

   Appropriate equipment should be used to protect against cuts. A chain mail apron to cover the chest down to below the knee, "shoulder length" chain mail glove on non-knife hand or complete shoulder and arm chain mail garment and cut resistant glove on knife hand.

   - **Knives must be sharp.** Suitable sharpening equipment must be provided and operatives must be trained unless a sharpening service is provided.
   - Adequate working space should be provided between operators. (normally a minimum of one metre around the operative).
   - Scabbards should be worn by all operatives to hold knives when not in use.
   - Designated walkways and clearly visible danger signs should be provided.
   - All operatives must be trained in the safe use of knives.

2. Saw injuries:
   - Eye protection must be worn.
   - Operatives must be trained on the safe working procedure.
   - Segregation/protection should be provided for third parties.

3. Slip Injuries

   Floor gratings should be in place at the work stations to prevent build up of waste. If this is not possible with a built up stand because of the need to change the working height then the grating should be let into the floor. Gratings should be of the light carbon type rather than metal which present handling problems for cleaning staff. Any loose waste around the area should be removed frequently during the working shift.

4. Struck-by Injuries

   All possible precautions should be taken to ensure that quarters cannot leave the rail system. Points to pay particular attention to are as follows;

   - At any point at which the quarter is hoisted from a low to high rail or vice-versa, stops should be fitted to hold the roller in place.
   - Guardrails should be put in place at any curved part of the rail where the roller may be more likely to leave the rail.
   - Care should be taken when hooking the quarter through the carpal tunnel on the fore and Achilles tendon on the hind before it enters the system. If the tendon is weak or damaged the operative should revert to hooking the quarter securely under a bone.

- Care should also be taken when transferring the boneless quarter at the second machine. As before, if the tendon is damaged the quarter should be broken down while attached to the bone.
- If possible the pulling machines should be at a right angle to the rail as to avoid the quarter speeding along the rail. If this is not possible then an appropriate brake should be fitted to control the speed of the quarter.
- Head protection must be worn.

5. Noise
   - Where noise exposure is above the permitted thresholds an assessment should be carried out and steps taken to reduce exposure. However hand held saws cannot usually be quietened sufficiently, in which case these stations should be moved outside the main boning hall to reduce the number of people at risk of exposure. The wearing of hearing defenders should be the last step in the hierarchy of control, although this will be necessary for saw operatives.

6. Manual Handling
   - If there is a potential risk of injury a manual handling assessment should be carried out to identify the risks and measures needed to eliminate or reduce the risk. However all handling tasks should be eliminated by flighted conveyers on these systems to lift the meat onto the main line.

7. Ergonomics

   Deboning machines have largely removed conditions experienced by boners in the past such as tendonitis. Problems that do occur now are usually caused by poor working positions.

   - Workstations should be equipped with a support cradle designed to support the quarter at an angle so enabling the operator to adopt a comfortable posture and limiting the strain on the non-knife hand.
   - The rail system should be at a median height of 2.2 m adjustable up and down. This can reduce both working with arms raised and stooping to work on lower parts of the quarter.
   - Saws should be on a pulley, tensioned adequately so as to pull the saw above head height when not in use. Saws should be serviced regularly and blades changed when blunt.
   - Job rotation should be considered as one of the means of reducing risk.

INSTALLATION SAFETY.

- When installing the pulling machines, the following points should be considered:
- Where possible, the first pulling machine should be positioned at a right angle to the rail to avoid the risk of quarters moving at speed along the rail.
- The machine should be fitted with adequate controlling devices that the operative can adjust according to the type and size of the beef being processed.
- The support arm, which holds the quarter in place whilst being pulled, should have a height adjustment to suit the varying height of the operatives.
- The workstation design should provide enough space for all activities, while keeping the working points within convenient reach.
- At the second preparation station there should be a drop rail fitted to hold the quarter stationary and adjust the height of the quarter whilst working on it.
- At the final breakdown station there should be a stop to hold the quarter against while it is worked on. There should be a feed belt positioned directly below the workstation to limit both the lifting of the primals and the necessity for a pulling hook.

REFERENCES

Manual Handling Operations Regulations 1992 L23
Guidance on Regulations

Reducing Noise at Work L108
Guidance on the Noise at Work Regulations

Slips and Trips HS(G) 155
Guidance for employers on identifying hazards and controlling risks

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Insect Killers

DESCRIPTION

These devices are ultra violet lamps that attract insects and then kill them by contact with an electrical grid charged at high voltage. Dead insects are caught in a tray, which has to be periodically emptied.

HAZARDS

- Electric shock
- Ultra violet radiation

PRECAUTIONS

1. Electrical

   The equipment should comply with the Electrical Equipment Safety Regulations 1994 and be made to BS EN 60335-2-59:1995 *Safety of household and similar electrical appliances.*

   Contact with hazardous live parts of the grid is prevented by ensuring that the grid is electrically isolated from other circuits
   or that the earth side is outermost or that the supply is current limited.

   The fly tray should be removable without exposure to live internal parts. This should be achieved by means of fixed mechanical guards or an interlocked access hatch.

   The equipment should be manufactured from materials that can withstand sustained exposure to ultra violet light. Certain materials (e.g. PVC and rubber) may become brittle and have
   been known to cause fires in the fly tray.

   Some models, and in particular those of the industrial type which have no grid guard, must only be installed by competent persons and placed out of reach to be safe by position.

   Danger notices should be fixed at each unit warning that the equipment should be isolated prior to any work on it and the device should be easy to isolate, by being plugged into a fused socket for instance.

2. UV

   Provided the device is fitted with a lamp that produces almost entirely UVA, the radiation hazard is negligible.

   It is essential that replacement lamps of the correct type be fitted. Lamps that produce UVB and UVC radiation cause skin reddening and eye irritation.

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Safe Methods for Preparation of Fresh Meat Chops

INTRODUCTION

The Tribunal decision of Gateway Foodmarkets Limited v Sheila Patricia Walton, London Borough of Redbridge on 16,17,and 28 March 1988 clarified that hand feeding of bandsaws with fresh meat in the preparation of chops presented unacceptably high risks of injury and that such a practice had rightly been the subject of a Prohibition Notice issued under the Health and Safety at Work etc. Act 1974. Bandsaws are inappropriate for the preparation of fresh meat chops where hand feeding is involved.

SAFER METHODS

Where the quantities of fresh meat chops being produced is small the traditional methods involving the use of knife and cleaver are appropriate.

An alternative safe method where larger numbers of chops are to be produced is the use of the proprietary chop-slicing machine Typical types are the Treif, Holac, and Varlet machines amongst many similar. The machine comprises a high speed scimitar-shaped rotating blade with both feed and delivery to the blade being protected by interlocked guard tunnels which prevent access whilst the blade is in motion.

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Mincing and Grinding Machines

DESCRIPTION

These machines come in various sizes. For convenience they have been divided into three groups; small, intermediate and grinders. The small machines are most common in butchers shops and other retail outlets, while the grinders are common in meat preparation factories. However, no group of machine is found exclusively in any one type of premises and therefore they will all be considered.

The machines are used to mince/grind material into small pieces. The worm/s of the machine forces material along the barrel through a series of rotating knives and fixed cutter plates, perforated with holes. These plates are usually interchangeable with others, having different sized holes, so that different grades of mince may be obtained.

Machine Category

(a) Small: These machines, which have a cylindrical feed opening of not more than 54 mm (2.1/8") diameter, situated not less than 127 mm (5") above the worm. Note these machines do not allow access to the worm, as the opening is less than hand width.

(b) Intermediate: Feed opening or throat in excess of 54 mm (2.1/8") and/or less than 127 mm (5") above the worm. These machines should be guarded or fitted with a restrictor plate over the feed opening. See recommended precautions

(c) Meat Grinders: Have a substantial hopper with a large worm feed at the base. They are capable of dealing with several tons of meat an hour. The hopper may lead directly to the mincing worm, or to open flight worms which feed large pieces of meat into the mincing worm. These machines may be fed in a variety of ways; by hand, skip loading using a fork lift truck or other similar device, tote bin and bin lift, by auger, by conveyor; or through an opening in an upper floor.

PHYSICAL HAZARDS

- Shear traps on the worm from the in-feed side.
- Access to the blades or knives, through discharge openings.
- Handling blades and plates etc particularly when freeing jams and stripping the machine down for cleaning.
- Sudden jerking movements from the push stick, during feeding.
- Dangers arise when the operators might be tempted to move the parts under power both when the machines are being fed and emptied and also during cleaning.

Injuries caused by these machines are usually of a serious nature and have included amputations of fingers, hands, arms and the large grinders have amputated legs, and have even caused fatalities.

In the past there have been many accidents at these machines to women and young people who, because they have smaller, thinner hands can reach the worm when an adult male may not.

PRECAUTIONS

In-Feed

(a) Small machines:

Access to the worm should be restricted by the design and construction of the body of the machine. The feed opening above the worm should not exceed 54 mm (2.1/8") in diameter, and should not be situated less than 127 mm (5") above the worm. The restricted opening should afford permanent protection, even when the feed tray is removed. New machines are normally built incorporating these dimensions, but older machines may need to be modified. Some makers can provide modification kits.

Material may be fed to the worm using a suitable push stick. This push stick should be fitted with a restricting lip, of slightly larger diameter than the feed opening to prevent the push stick from coming into contact with the rotating worm.

(b) Intermediate Machines.

A restrictor plate should be provided over the feed opening. This must be robust and should be secured to the feed tray on at least two sides. See EN 12331 figs 6a and 6b

When considering the dimensions of the plate, the following should be taken into account:

- The size of the feed throat opening.
- The height of the plate above the feed tray and
- The distance of the outer edge of the plate from the worm.

The plate must not be set so high that it is possible to reach down into the worm beneath the plate.

Almost invariably an opening is provided in the restrictor plate, so that meat can be pushed down to the worm using a push stick. It is important to ensure that this opening is not so large that it allows the operator access to the worm. Push sticks provided at these machines should be fitted with a restricting lip, of slightly larger diameter than the opening in the restrictor plate and be of such a length that it is not possible for them to come into contact with the worm.

(c) Grinders

Guarding of these machines is more complex than for the other groups, mainly because of the different methods of feeding which can be adopted, the variation in the size of material being fed, and because it is necessary to feed the machines while they are running and other times they may be fed while stationary.

These machines will often be supplied unguarded or with just a pull cord or rocker bar emergency stop device for this reason. The user of the machine must add suitable guarding according to the chosen feed method. The emergency stop system does not suffice as a guard as it is quite easy to reach over or step over such a device.

Note red pull cord, which does not prevent access

Section 5.2.3.1 of EN 12331 states:

"Access to the danger zones at the screw conveyor in the feed intake hopper shall be or made safe. This may be achieved by any of the following measures:

- The design (e.g. closed feed intake hoppers) including a closed loading device for products. (e.g. feed screw, pipeline with pump)
- The use of guards (e.g. a cover) see EN 953
- the use of electro sensitive protective devices (e.g. light barrier) see 292-2
- The use of fixed guards (e.g. fence) see EN 935"

Feeding by hand.

As an alternative to the interlocking lid an interlocked feed chute may be used. A minimum distance of 1 metre should be achieved between the feed screw and the lower lip of the feed chute.

Above an interlocked extended reach guard for hand feeding

Feeding by skip and FLT

Where the machine is fed by skip, using a forklift truck, it is not always possible to provide an interlocking lid for the hopper. In this case, the sides of the hopper should be extended so that it is not possible for a person to reach into the dangerous parts from the normal operating level.

Feeding by tote bin and bin lift.

Where practicable an interlocking lid should be provided over the hopper, with a portion cut out to allow the skip to discharge its contents. Additional fixed guarding can be provided around the cut out portion. Where this is not practicable it may be necessary as for point 3 above to extend the sides of the hopper.

Bin Lifts

HAZARDS

- Falling product and falling bins
- Entrapment

PRECAUTIONS

- Bins must be secured to lift with self closing clips
- Bin lift should either be entirely fenced from top to bottom or more commonly safe guarded by a 'dead man' control which requires the start button to be pressed continuously during operation

Grinder hopper fenced to accommodate bin lift with extension to reach distance under the bin

The use of steps is not and should not be encouraged, often they are only provided to allow operators to see into the hoppers. Correctly positioned mirrors can be used for this instead. Mirrors should be made out of stainless steel, aluminium or other polished metal.

Any feed stick provided for use from should not be long enough to reach down to the worm.

Conveyor and auger fed machines. A fixed or interlocked guard over the top of the hopper/and conveyor can be provided. As shown below

Some larger hoppers may be fed via chutes through openings in upper floors. Access at such openings should be prevented by width/distance or by fencing and interlocking any gates which allow access

Discharge

(a) Small and Intermediate Machines: Where holes in the outer cutter plate at the discharge are more than 6mm (1/4") in diameter this will include kidney plates with elongated holes. It is imperative that adequate guarding should be provided, either by a shield or delivery chute.

(b) Grinders: The same principles apply as for the other groups of machines. There are two main methods of guarding at the discharge.

(i) By interlocking hinged hood or cover, fitted with bars, spaced close enough together to prevent hand access between the bars to the outer plate.

(ii) By a profiled hood over the discharge, which is used in conjunction with interlocking bins, so that the machine will only run when the bin is in position.

Above. An outfeed hood and interlock bin system
On larger machines for example 11 or 16" diameter worms over-run of the worm can be a problem. A Time-delay device should be fitted in addition to the interlock in such situations.

Interlocking

Interlocking has been referred to in a number of points above. Interlocking systems must comply with 4.2.1 of EN 1088

OTHER HAZARDS

- **Noise:** larger machines usually emit levels in excess of 90dBs Although a noise measurement is supplied with a new machine it should be remembered that the new is added to the existing noise level in the area so even a smaller quieter machine could put the noise level over the maximum under the latest edition of the noise regulations. Therefore a new survey must be carried out and appropriate precaution taken to reduce exposure as necessary

- **Electricity:** small machines usually run on 240v single phase through to the large grinders which are usually three phase, 416v and although ampage may vary it is usually 32amp. Often these machines are on plugs so they can be moved on and off line easily. Given the high voltages and the environment the machines operate in this is not good practice and they should be hard wired wherever possible.
  All machines should be fitted with a residual current breaker.
  There should be an isolation procedure in place, for cleaning clearing and maintenance
  There must be regular inspection and electrical testing

- **Gases:** some machines are designed to use N2, CO2 or steam
  There must be an impervious cover fitted, with interlocks for both electricity supply and gas, which can also act as a guard.
  Gases should be purged to external atmosphere before the cover can open

REFERENCES:

BS EN 12331: 2003
Food Processing Machinery, mincing machines, safety and hygiene requirements

BS EN 953: 1998
Safety of Machinery ,Guards, general requirements for the design and construction of fixed and movable guards

BS EN 1088: 1996
Safety of Machinery, Interlocking devices associated with guards. Principles for design and construction

Other related standards:

BS EN 294: 1992
Safety of Machinery. Safety distances to prevent danger zones being reached by upper limbs

BS EN ISO 12100-2: 2003
Safety of Machinery. Basic concepts and general principles for design. Basic terminology and methodology

BS EN ISO 12100-2: 2003
Safety of Machinery. Basic technical principles

Noise at Work

THE CONTROL OF NOICE AT WORK REGULATIONS 2005

Loud noise is a problem in many sections of the meat industry. For example:

- In slaughterhouses common sources of noise include animals in lairage, powered saws, de-hairing machines, compressors for chillers and freezers.
- In other meat processing plants, other possible sources of noise include machinery such as bowl choppers, vacuum packing equipment and pie laminating equipment.
- In many smaller workplaces such as retail butchers it is unlikely that there will be a significant noise hazard.

As a rough guide, if people have to shout to make themselves heard at a distance of two metres, it is likely that there is a problem.

Regulations to protect workers hearing from exposure to loud noise were first introduced in 1989. Basically they required employers to take specific actions where average noise dose levels exceeded 85 deciBels (dB) and 90 dB. In 2005 new regulations were introduced with much tighter control levels. So many workplaces that were previously unaffected will now be covered by the regulations.

NOISE AND HEARING LOSS

When the ear is exposed to noise above 80dB for more than a few minutes, the nerve endings in the inner ear become temporarily numbed and the hearing loses sensitivity. After a few hours away from the noise, the nerves return to normal and hearing is restored. Most people will have experienced this sensation after spending an evening in a noisy pub or a disco.

After prolonged exposure to such noise levels, the temporary damage becomes permanent. Once this permanent damage occurs the hearing will not recover.

As a result of damage to the nerve endings in the ear there are a number of symptoms:

Difficulty in understanding what people are saying because damage occurs to the most sensitive part of the ear first.

- Difficulty in picking out what you want to hear against background noise.
- Sudden swings in the apparent noise level (called 'recruitment'). Recruitment distorts common sounds and makes it difficult to find a comfortable level for holding conversations, listening to the television, etc.
- The damaged nerves cause a ringing sensation in the ear called tinnitus. This can sound so loud it stops you from sleeping at night.

Once the noise level reaches 140dB, the pressure of the sound waves is so great that it can cause immediate permanent damage to hearing. That is why, in addition to the average noise doses the action values and exposure limit also include single peak sound pressures.

CONTROL LEVEL

Under the 2005 regulations employers have a general duty to ensure that risk from noise is either eliminated or reduced. The regulations introduce two new 'action values' and an overall 'exposure limit'.

Lower Exposure Action Value

The first action value is a daily (8-hour) average noise dose of 80 dB, or a one-off peak sound level of 135 dB.

Where it is likely that this level will be exceeded, a detailed risk assessment is required. Personal hearing protection must be made available for employees who want to wear it.

Upper Exposure Action Value

The second action value is set at a daily (8-hour) average noise dose of 85 dB, or a peak sound level of 137 dB.

Where the upper action level is exceeded, employers must lower the noise level to the lowest level that is reasonably practicable, by means other than the use of hearing protection. If it is not possible to get the level down below the upper action level then the area must be marked as a hearing protection area and hearing protection must be worn.

In practice, many employers find it simpler to mark areas where the lower exposure action level is exceeded as hearing protection areas. This avoids any confusion over where wearing of hearing protection is compulsory or voluntary.

Pictogram for hearing protection zone sign

Employers must also ensure that no employee enters hearing protection zone without wearing personal ear protectors.

Exposure Limit Values

Whatever the noise level in the workplace, the employer must ensure that the actual exposure of workers does not exceed the exposure limit value. This is set at a daily (8-hour) average noise dose of 87dB or a peak sound pressure of 140 dB. When applying the exposure limit the use of personal hearing protection should be taken into account.

Weekly noise exposure

Where the exposure of an employee varies greatly from day to day, the employer may use a weekly (5 8-hour working days) noise exposure in place of the daily noise exposure when applying the action values and exposure limit. However the peak sound pressure levels remain the same.

HEARING PROTECTION

Where ear protection is needed, employers must provide protection which is suitable - taking into account the noise levels involved, the type of work being done and the compatibility with other protective equipment such as hard hats as well as the fit to the wearer and any difficulty or discomfort experienced by the wearer.

INFORMATION, INSTRUCTION AND TRAINING

If any of the action levels are exceeded, the employer must provide employees with information and training which: -

- explains the risk of hearing damage
- explains the risk assessment the employer has carried out
- gives information about the noise reduction measures that have been introduced and about the exposure limit and action values
- explain how employees can obtain ear protection.

MAINTENANCE AND EQUIPMENT

Personal ear protection and noise reduction equipment such as silencers must be regularly maintained and periodically checked.

Provision must be made for clean storage of re-usable personal ear protection. If special cleaning materials are needed they must be readily available.

HEALTH SURVEILLANCE – AUDIOMETRY

Where employees are likely to be regularly exposed above the upper exposure action values, or are at risk for another reason, e.g. they already suffer from hearing loss or are particularly sensitive to damage, the employer must provide suitable health surveillance including testing of hearing. If the tests show hearing damage from the noise, the employer must ensure that the worker is examined by a doctor. They must also review their noise risk assessment and consider transferring the worker to other work which does not carry a risk of further noise exposure.

EMPLOYEES' DUTIES

Employees must make full and proper use of personal hearing protection provided by their employer. They must co-operate with procedures the employer introduces to control the noise and must make themselves available, during working hours, for hearing tests.

They must take reasonable care of any noise reduction equipment or ear protection in their use and must report any defects or difficulties in using it.

NOISE DOSE – HOW MUCH ARE WORKERS ACTUALLY EXPOSED TO?

The key factor in deciding when the Regulations apply is whether or not one of the action levels or the exposure limit is exceeded.

The action levels and exposure limit are usually based on noise doses averaged over 8 hours. Noisy machinery may be used intermittently during the working day or an individual worker may move around the workplace and may only work in the noisy area for part of the day. To calculate the actual noise dose workers receive in such cases, it is necessary to understand a little about how noise intensity or 'loudness' is measured.

Noise intensity is measured in decibels (dB). The range of intensity with which the human ear can cope is remarkable. Painfully loud noise, which causes immediate permanent hearing damage, is some 10 million, million times louder than the quietest sounds that can be heard. For this reason the dB scale is a "logarithmic" scale and is not a simple linear measure.
The table across illustrates how it works and also gives some typical examples of noise levels.

The decibel scale

Intensity	dB	Example of Noise Source
1	0	Quietest sound which can be heard
10	10	
100	20	Quiet Whisper
1,000	30	
10,000	40	
100,000	50	Normal Conversation
1,000,000	60	Busy Office
10,000,000	70	
100,000,000	80	Heavy Traffic
Noise-induced deafness starts in this range		
1,000,000,000	90	
10,000,000,000	100	Pneumatic Drill
100,000,000,000	110	
1,000,000,000,000	120	Rivet gun; shot-blasting
10,000,000,000,000	130	Extremely painful noise

As you can see from the chart an increase of 10 units on the dB scale is equal to a ten-fold increase in the intensity. This means that small changes in the deciBel level can actually involve quite large changes in intensity. This makes the deciBel scale confusing for people who are not used to it. A simple rule-of-thumb to remember when looking at noise surveys is: -

An increase of 3 dB is equivalent to a doubling of the intensity

A decrease of 3 dB is equivalent to a halving of the intensity

This means that 93 dB is twice as damaging as 90 dB so exposure to 93 dB for 4 hours is equivalent to exposure to 90 dB for 8 hours.

If, in an otherwise quiet workplace, a machine was used intermittently which gave off a fairly constant 91 dB when running, it would have to be used for 2 hours in total during the day for the upper action level (8 hour - 85 dB equivalent) to be exceeded. If this was likely, then steps would be required to reduce the noise of the machine or to provide hearing protection when it was running.

Similarly, if a worker spends part of the day in a quiet area and part in an area when the noise level is 83 dB, the lower action level (8 hour - 80 dB equivalent) would be exceeded if they spent 4 hours in total in the noisy area during an 8 hour day.

FREQUENCY

Some more sophisticated measuring equipment will give information on the frequencies, which make up the noise as well as the loudness. Frequency is a measure of pitch not of intensity. The human ear is more sensitive to some frequencies than others and information on frequencies can also sometimes help to pinpoint sources of noise. Frequency analysis can help when deciding on appropriate protection or prioritising noise reduction measures. However, the limits in the Regulations are only concerned with loudness (regardless of the frequencies involved) and the time for which people are exposed to that loud noise.

CONTROLLING NOISE AT WORK

There are three stages in the journey, which noise takes from its source to the human ear: the noise source, the noise path and the ear itself.

1. **The noise source**

   The best way to control noise is to reduce the level at source in the first place.

   When new machinery is being bought to replace old noisy machinery, quieter machines should be bought where possible.

   Existing equipment can often be modified (e.g. replacing metal gears and chains with plastic ones) to reduce noise levels.

   Regular preventative maintenance will help to stop rattles and squeaks caused by wear and tear.

2. **The pathways the sound travels through the air and the building**

   Noisy equipment can often be isolated or enclosed. There may still be a risk for anyone who has to work inside the enclosure but at least the numbers at risk will have been reduced.

   Much of the noise will not travel directly from the source to the ear but will be reflected off walls, floors, ceilings and other hard surfaces. Lining such surfaces with sound absorbing materials can sometimes give substantial reductions in the overall noise level.

   For example, noise levels from bowl-choppers can vary considerably and may often exceed 90dB when the machine is operating. New bowl choppers are commonly fitted with sound-insulating lids. Unfortunately, because of hygiene considerations, it may be difficult to fit such lids to older machines already in use.

3. **The person's ears**

   If engineering improvements to the equipment or the use of sound absorbing materials do not reduce the noise level sufficiently, the last resort is to use hearing protection to cut down the noise reaching the ear.

   Both ear muffs and ear plugs can make substantial reductions in noise levels provided they fit properly. However, they are often uncomfortable to wear and can cause sweat rash or other types of irritation to the sensitive skin in the ear. They can be difficult to fit properly and can quickly become worn or damage.

The following factors are all essential when deciding on hearing protection: -

- careful selection of the most appropriate type;
- proper training and instruction on how to fit and wear it;
- close supervision to make sure that it is worn properly; and
- regular replacement of protectors that are worn, damaged or dirty.

Far from being a cheap and easy option, hearing protection can, therefore, be expensive. In any case, the Regulations make it clear that the provision of hearing protection is not a substitute for reasonable engineering solutions, which reduce the noise levels in the first place.

EXAMPLES OF NOISE LEVELS IN THE MEAT INDUSTRY

There are several processes in the meat industry, which can cause high noise levels. There will be considerable variation in the noise levels in different workplaces depending on the size, layout and construction of the building, volume of work, etc. The examples simply serve to show the sort of noise levels that might be found. It is also necessary to consider the exposure time when calculating the noise does. For example, exposure to animal noise of 95 dB for 15 minutes will exceed the lower action level (80 dB over 8 hours).

Lairage (animal noise)	80 dB - 110 dB
De-hairing Machines	80 dB - 95 dB
Electric Rotary Saws	Up to 100 dB
Cold Store and Chill Store Compressors	70 dB - 90dB
Vacuum Packing Machines	Up to 95 dB
Large Slaughterhouse:	
• Slaughterhouse Scald Area	82dB
• Slaughterhouse Washing Area	85dB
• Slaughterhouse Hide Puller	89dB
• Boning Room	84dB
• Cutting Room	75dB
• Chiller Rooms	82 dB – 92 dB
Small Boning Plant:	
• General Background	70 dB - 75dB
• Near Vacuum Pack Machine	90dB
• Box Chiller	65 dB - 70dB
• Refrigeration Plant Room	85 dB - 90dB

FURTHER INFORMATION

The Control of Noise at Work Regulations 2005. Guidance on Regulations, L108, HSE Books, 2005. £13.95

Noise at Work – Guidance to employers on the Control of Noise at Work Regulations 2005, INDG362 (rev1), HSE Books, 2005. Free for single copies.
http://www.hse.gov.uk/pubns/indg362.pdf

Reducing Noise Exposure in the Food and Drink Industries, HSE Food Information Sheet No. 32, 2002 (predates 2005 regulations), http://www.hse.gov.uk/pubns/fis32.pdf

Sound solutions for the food and drink industries: Reducing noise in food and drink manufacturing, HSG 232, HSE Books, 2002. £15.95 (predates 2005 regulations)

HSE web pages on noise - http://www.hse.gov.uk/noise/index.htm

British Meat Processors Association

Q Fever

BACKGROUND

Diseases transmitted from animals to humans are known as zoonoses.

Q fever is a highly infective zoonotic disease, caused by a micro-organism called *Coxiella burnetii.* This organism has a worldwide distribution among livestock and domestic ruminants. Sheep, cattle and goats are the most frequent source of human infection, although pets such as dogs and cats may also be a source. Infections in animals are generally asymptomatic (although it can cause abortion in cattle and sheep), and it is not considered to cause economically significant animal disease so there appears to be little effort to control the infection in farm animals. Human infection is divided into asymptomatic, acute and chronic Q fever with acute symptoms usually occurring two or three weeks after exposure.

Acute infection is usually characterised by an influenza-like illness, with varying degrees of pneumonia, or hepatitis. It can be easily misdiagnosed for other flu-like illness. Fever and fatigue are the most prominent manifestations whilst headache and muscle pains are also reported. In a small number of cases, chronic Q fever can develop and this is potentially more serious with high fatality rates if left untreated. This is often associated with underlying health issues or pre-existing conditions and generally follows within 6 months (and up to several years) after acute infection. The commonest complication is endocarditis (a condition affecting the valves of the heart). Cases of chronic fatigue have also been reported. Q fever is strongly associated with certain occupations e.g. farmers, abattoir and meat processing and packaging workers although the true incidence is difficult to determine because many cases are mild or show no symptoms. Pregnant workers may be particularly at risk.
In the UK, approximately 70 cases are reported annually. However, in the summer of 2006 an outbreak occurred in a Scottish meat processing plant resulting in over 100 cases of acute Q fever.

TRANSMISSION

Inhalation of infective aerosols or contaminated dust is the main route of transmission to man, either from direct exposure to infected tissues (eg birth products) or indirectly through contaminated materials. Humans are at greatest risk of exposure where animals are handled when giving birth, handling birth products or during abortions because large numbers of *Coxiella burnetii* may be present in the birth fluids or the placenta of infected animals. They may also be present in faeces, urine, and raw (untreated) milk. Outbreaks have occurred where wind-borne transmission of infective spores has taken place. The organism can survive for many years as a spore-like form before being inhaled and causing infection.

Coxiella burnetii may also gain entry to the body by transmission through cuts in the skin. Experimentally, only small numbers of organisms are required to establish an infection.
Person-to-person spread does not generally occur.

LEGAL REQUIREMENTS

Exposure to zoonoses such as Q fever need to be minimised as required by The Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended). Other relevant legal requirements are The Management of Health and Safety at Work Regulations 1999(MHSWR) and The Health and Safety at Work etc Act 1974.

COSHH requires employers and self-employed people to:

- assess the risks to health from work activities which involve potential exposure to a hazardous substance (eg a micro-organism such as *Coxiella burnetii*);
- prevent or, where this is not reasonably practicable, adequately control exposure to the hazardous substances;
- introduce and maintain control measures;
- inform, instruct and train employees about the risks and precautions to be taken;
- regularly review risk assessments and the effectiveness of control measures.

For more detailed information about the general requirements of COSHH see the BMPA guidance note GN4.

PREVENTION

As Q fever is mainly an occupational disease, prevention and control measures need to be directed at those occupational groups and environments at risk. Employers will need to ensure that their assessments made under COSHH and MHSWR address the risks arising from Q fever, so that suitable control measures can be implemented to protect the health of their employees and others. When developing and implementing a risk management program for Q fever, it is important to consult with health and safety representatives and employees, as they are often a valuable resource for determining the suitability of control measures.

PREVENTATIVE MEASURES

Regular cleaning and disinfection of lairages and livestock reception areas at abattoirs is an essential proactive precaution to minimise accumulation of contaminated material from Q Fever organism shedding by animals. Appropriate arrangements must be made for the collection, handling and disposal of any potentially high-risk materials. The greatest risk of exposure with livestock is associated with animals giving birth, handling birth products (eg placenta, foetal membranes, and aborted foetuses) because large numbers of *Coxiella burnetii* may be present in the birth fluids or the placenta of infected animals.

Access to lairages should be restricted to authorised personnel only. **Where access to Q fever risk areas is required, minimise the time spent is these areas.**

Ventilation systems and their potential for spreading contaminated air and/or distribution of spores should be carefully assessed. Dispersal of the micro-organism may be facilitated by an outward flow of air from lairages, eg produced by supply fans creating a positive pressure within lairage buildings thus forcing potentially polluted air to escape to areas frequented by workers. Where possible, plan and position lairages and their ventilation systems away from communal areas to reduce risks. Maintenance regimes for ventilation systems will also need careful planning and implementation. Consideration should be given to the location and operation of fans, ducting and deflectors, and the use of air scrubbers.

Workers should be provided with information and training on Q fever, which should include;

- Symptoms associated with Q fever
- How people can become infected
- Use of control measures necessary to adequately control exposure.
- Action to take in the event of an outbreak (or suspected case)
- Any other information as determined by the risk assessment or COSHH assessment

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Your COSHH assessment will help you decide when and where PPE is needed. Remember that you should only consider using PPE after you have considered other control measures. It is likely that the provision of adequate and suitable PPE will be necessary as an adjunct to other measures. However, the nature of your work may mean that PPE is sometimes a necessary option.

Ensure that personal clothing is stored away from work clothing and employees do not take contaminated work clothing out of the workplace in order to reduce the risk of contamination.

Examples:

- always wear PPE when handling afterbirths or birth products. Suitable PPE will include a coverall, footwear such as wellington boots, gloves and respiratory protection (EN149 -FFP3).
- use face protection (for eyes and mouth) if there is a risk of splashing from urine or placental fluids. Suitable protection will include a face shield to BS EN 166: 2002.
- Make sure that whatever PPE you use is suitable, properly maintained, cleaned and decontaminated after use (if re-usable), stored in a clean area and CE marked.

GOOD OCCUPATIONAL HYGIENE

Any work with animals inevitably involves contact with dung and urine, which may contain disease-causing organisms including *Coxiella burnetii*. Personal hygiene is therefore vitally important. Employers will need to provide washing facilities wherever staff or visitors work with animals (to include, clean running water, soap or hand cleaner and towels). There should be adequate segregation of welfare & work areas to prevent cross contamination. Make sure all staff:

- wash hands thoroughly before eating, drinking, smoking, going to the toilet, and at the end of the shift and in the event that they become contaminated with animal tissue or fluids.

- wash cuts and grazes immediately with soap and running water;
- cover any new and existing wounds with a waterproof dressing before beginning work. An effective first aid programme should ensure that any open wounds are treated quickly.
- are prohibited from eating, drinking, or smoking in animal holding or processing facilities

CLEANING, DISINFECTION AND WASTE DISPOSAL PROCEDURES

Spills of potentially contaminated material should be dealt with immediately using hypochlorite (5000 ppm available chlorine), 2% formaldehyde, 1% lysol, 5% hydrogen peroxide, 70% ethanol or 5% chloroform. These chemicals are believed to be effective against *Coxiella burnetii*.

Such products can also form the basis of a proactive cleaning regime and will also be subject to the COSHH regulations. *Coxiella burnetii* spores are resistant to normal disinfection products and dilute bleach etc.

Decontamination of large areas using a pressure washer should only be undertaken if appropriate precautions are taken to prevent further air borne spread which may occur by the use of such equipment. Unauthorised staff should also be excluded from these areas when cleaning is in progress. Any doors, shutters etc should be closed to limit aerosol spread. Any high risk materials/significant quantities of organic debris should be removed prior to pressure washing. Use of high pressure equipment may create inhalable aerosols containing infectious material so operators should be provided with suitable PPE to reduce the risk of exposure. Low pressure application may reduce the risk.

Personnel entering an area where infection has been confirmed or suspected should wear appropriate biologically resistant coveralls with outer gloves and boots (for example a CR1, PRPS or gas-tight suit) and a correctly fitting high efficacy particulate respirator of FFP3 standard at all times. RPE should be face- fit tested for each individual as necessary.

A number of outbreaks have demonstrated the possibility of spread of the infection on workers clothing, hay, straw, footwear, etc so these items will need to be treated as contaminated waste and disposed of accordingly.

Disinfection of exposed persons includes:

- Removal of contaminated clothing and possessions – to be double bagged and clearly marked until exposure has been ruled out. If *Coxiella burnetii* is confirmed, all contaminated material should be incinerated or autoclaved by a specialist waste contractor.
- Exposed persons should wash/shower thoroughly with soap and water
- Full PPE (as described above) should be worn when handling contaminated items.

An ongoing monitoring program should be implemented to ensure the control measures continue to operate effectively.

SCREENING

You should ask employees, and people you are considering employing, about any pre-existing health conditions they have which may mean that they are more likely to contract Q fever or that might increase the severity of it should they become infected. This should form part of pre-employment assessment. For example, individuals are likely to be at an increased level of risk if they:

- have a compromised immune system
- suffer from existing medical conditions such as valvular or vascular disease
- have had their spleen removed;
- are in receipt of transplanted organs
- are pregnant

Q fever infection in pregnancy may result in abortions, premature deliveries, low birth weights and stillbirths. Subsequent pregnancies may be at risk due to the possibility of a chronic infection in the mother. Note that The Management of Health and Safety at Work Regulations require employers to undertake a more detailed and specific assessment on risks to pregnant workers so that appropriate action can be taken. For example, pregnant women should avoid close contact with sheep and lambs during the lambing season and avoid exposure to these animals, cattle or goats which are in the process of giving birth or in the post-partum period.

All of the above conditions are likely to make the individuals concerned more vulnerable to infection, and employers should consider carefully whether they allow such people to work with animals or in areas where there is an increased risk of infection. Therefore, it may be necessary to reallocate work for high-risk groups of workers.

DIAGNOSES

Where individuals are suffering from the symptoms associated with Q fever, they should consult a doctor without delay. The doctor should be informed about the working environment (abattoir, meat processing or packaging plant) and work undertaken (eg contact with farm livestock). Q fever is diagnosed by a blood test but a positive result is obtained two to four weeks after onset of the illness. It is good practice for workers to carry the BMPA zoonoses pocket card and to take this with them when visiting the doctor.

In the event of an outbreak, individuals in the exposed/infected zone may be treated effectively with antibiotics. At present there is no vaccine against Q fever commercially available or licensed for use in the UK.

HEALTH AND SAFETY ASSISTANCE – THE NEED FOR COMPETENT ADVICE

Employers are required to appoint one or more competent persons to assist in undertaking the measures required to comply with health and safety law. Such persons will need to have a high level of knowledge and experience relating to the issues discussed in this guidance. For example, the Health Protection Agency or Veterinary Laboratory Agency may be able to offer advice and assistance on Q fever (see contact details below).

FURTHER INFORMATION

From HSE:

Control of Substances Hazardous to Health (4th Edition) - L5,
New and Expectant Mothers at Work –
A Guide for Employers – HSG122
Selection, Use and Maintenance of Respiratory Protective Equipment: A Practical Guide - HSG53
Common zoonoses in agriculture - Agriculture Information Sheet No 2 (revised),

HSE Books may be obtained by telephone (01787 881165) or from www.hse.gov.uk or www.hsebooks.com

The Health Protection Agency has useful information on Q fever. See www.hpa.org.uk/infections/topics_az/zoonoses/q_fever/default.htm

Other useful websites:
www.hpa.scot.nhs.uk
www.defra.gov.uk

www.defra.gov.uk/corporate/vla for the Veterinary Laboratories Agency (VLA) – an executive agency of DEFRA

Q FEVER – BMPA Question and answer brief

What is Q fever?

Q (Query) fever is a highly infectious zoonosis (an infection transmitted from animals to man). It is so called because for years the cause was unknown. However, we now know that Q fever is caused by the *Coxiella burnetii* micro-organism, and this is widespread globally among livestock and domestic ruminants. Sheep, cattle and goats are the most frequent source of human infection, although pets such as dogs and cats may also be a source. The peak incidence of infection in humans in the UK is associated with the spring/early summer lambing season.

How common is Q fever?

Coxiella burnetii has a worldwide distribution. In humans, Q fever is strongly associated with certain occupations e.g. farmers, abattoir and meat processing and packaging workers. However, other occupational groups such as veterinary staff and livestock hauliers may also be at risk. In the UK, about 70 cases of Q fever are reported each year. This probably underestimates the true incidence of Q fever because many cases are mild or show no symptoms.

What are the symptoms?

Around half the people infected with Q fever show symptoms of acute infection usually characterised by an influenza-like-illness, with varying degrees of pneumonia, or hepatitis. Fever and fatigue are the most prominent manifestations and headache is common. Muscle pains are also reported.

Since Q fever patients may exhibit a number of non-specific symptoms it may be difficult for GP's to distinguish it clinically from viral illnesses or other causes of atypical pneumonia. Full recovery usually occurs, but chronic Q fever can be more serious with high fatality rates if left untreated. It generally follows one to 18 months (average 6 months) after acute infection and the commonest complication is endocarditis (a condition affecting the heart). Most patients who develop Q fever have pre-existing medical conditions, such as valvular heart disease, cancer, kidney disease, or may have a compromised immune system. Transplant patients are also at risk of developing chronic Q fever.

Infection may also result in abortions, premature deliveries, low birth weights and stillbirths in pregnant women.

Q fever is diagnosed by a blood test, but a positive result is obtained two to four weeks after onset of the illness.

How do you catch Q fever?

Inhalation is the main route of transmission to man, either from direct exposure to infected tissues (eg birth products) or indirectly through contaminated materials. Humans are at greatest risk of exposure where animals are handled when giving birth, handling birth products or during abortions because large numbers of *Coxiella burnetii* may be present in the birth fluids or the placenta of infected animals. They may also be present in faeces, urine or raw (untreated) milk. Outbreaks have occurred where wind-borne transmission of infective spores has taken place. The organism can survive for many years as a spore like form before being inhaled and causing infection.

Coxiella burnetii may also gain entry to the body by transmission through cuts in the skin. Only small numbers of organisms are required to establish an infection. Person-to-person spread does not generally occur.

How long can you have the infection before developing symptoms?

The incubation period is between 7 and 30 days, depending on the infecting dose, route of exposure and age of the patient. Patients developing chronic infections, such as endocarditis, may remain infected without showing symptoms; however relapses may occur months/years in the future.

How is Q fever treated?

Q fever can be treated by using antibiotics such as doxycycline or tetracycline for 7-14 days, with treatment continued for at least three days after remission of fever. Antibiotics are less effective in chronic disease and despite improved results with combination therapy (doxycycline and chloroquine) relapse rates of over 50% are still seen and a minimum of 3 years treatment is recommended.

Women who develop Q fever in pregnancy may be treated with co-trimoxazole but professional medical advice should always be sought.

Can Q fever be prevented?

As Q fever is mainly an occupational disease, prevention and control measures need to be directed at those occupational groups and environments at risk.

Employers will need to ensure that their risk assessments/COSHH assessments address the potential risks arising from zoonoses including Q fever, so that suitable control measures can be implemented. Special requirements for assessment apply where pregnant workers or young people are employed.

Workers should receive information, instructions and training in order to increase their level of awareness and to ensure that control measures and procedures are followed. For example, the BMPA zoonoses pocket card is a useful tool to raise awareness and staff should be encouraged to take the card with them on visits to their GP.

In the event of an outbreak, individuals in the exposed/infected zone can be treated with antibiotics given a week after exposure.

At present there is no vaccine against Q fever available in the UK.

What cleaning, disinfection and waste disposal procedures are effective?

Spills of potentially contaminated material should be dealt with immediately using hypochlorite (5000 ppm available chlorine), 2% formaldehyde, 1% lysol, 5% hydrogen peroxide, 70% ethanol or 5% chloroform. These chemicals are believed to be effective against coxiella burnetti.

Such products can form the basis of a cleaning regime and will require assessment under COSHH. *Coxiella burnetii* spores are resistant to normal disinfection products, dilute bleach etc.

Decontamination of large areas using a pressure washer should only be undertaken if appropriate precautions are taken to prevent further air borne spread which may occur by the use of such equipment.

Personnel entering an area where infection has been confirmed or suspected should wear appropriate biologically resistant coveralls with outer gloves and boots (for example a CR1, PRPS or gas-tight suit) and a correctly fitting high efficacy particulate respirator of FFP3 standard at all times. RPE should be face-fit tested for each individual.

A number of outbreaks have demonstrated the possibility of spread of the infection on workers clothing, hay, straw, footwear, etc so these items will need to be treated as contaminated waste and disposed of accordingly.

Disinfection of exposed persons includes:

- Removal of contaminated clothing and possessions – to be double bagged and clearly marked until exposure has been ruled out. If coxiella burnetii is confirmed, all contaminated material should be incinerated or autoclaved.
- Exposed persons should wash/shower thoroughly with soap and water
- Full PPE should be worn when handling contaminated items

Is health screening necessary for workers?

Certain occupations and individuals may be particularly at risk as described above. In particular, pregnant women should not be permitted to carry out work where they might be exposed to infection. Staff with pre-existing medical conditions that put them at an elevated level of risk should also be excluded where necessary. Therefore, pre-employment screening should be considered an important measure to reduce risk.

Is it possible to identify animals with Q fever?

Infections in animals are generally asymptomatic, however in mammals infection can result in late stage abortion, stillbirths or delivery of weak offspring. It is not considered to cause economically significant animal disease and therefore there appears to be little effort to control the infection in farm animals. It is not generally considered pathogenic.

Where can I obtain more information about Q fever?

The Health Protection Agency website at www.hpa.org.uk and the agriculture and/or food pages of the Health and Safety Executive website at www.hse.gov.uk

British Meat Processors Association

Safety When Handling Cattle in Slaughterhouses

INTRODUCTION

The purpose of this Guidance Note is to help those operating cattle slaughterhouses to identify where significant hazards may arise when handling live animals. It is not intended as a conclusive study and competent advice should always be sought.

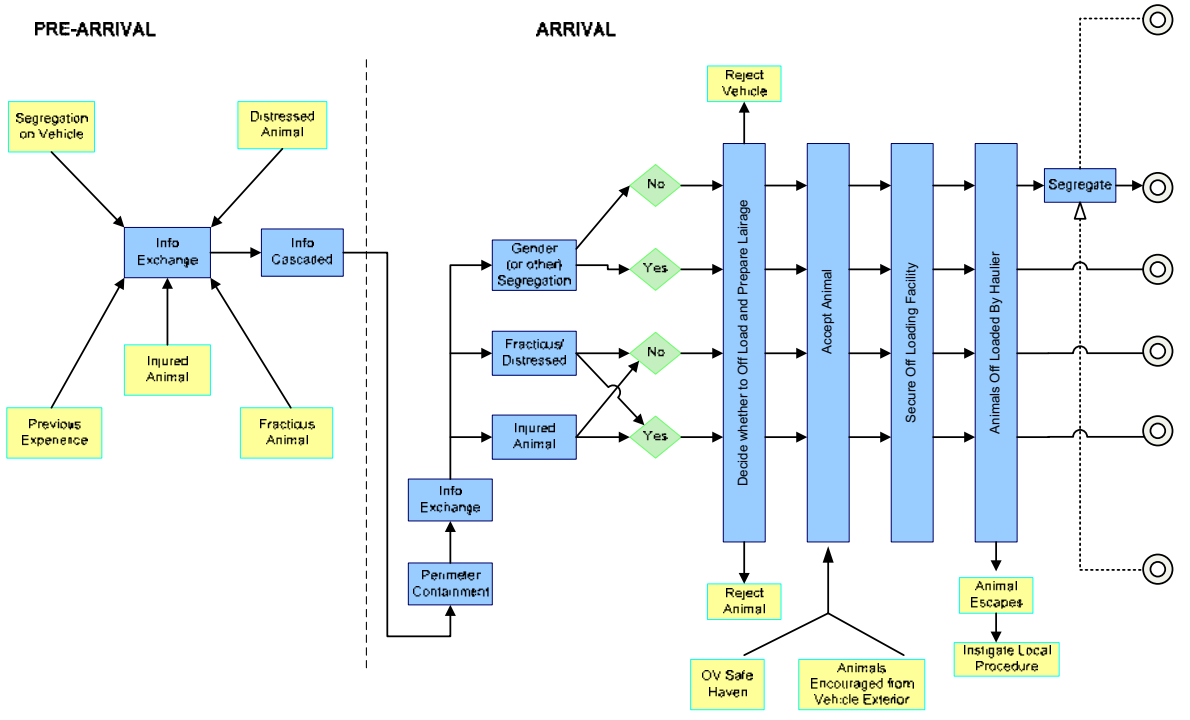
Extensive research[1] shows that changes in cattle rearing methods, reduced human contact and the introduction of continental breeds have contributed to an increase in risk to personal safety when handling cattle at abattoirs. These up stream factors are largely beyond the control of the operators of commercial abattoirs. It could be argued that commercial operations could be more selective when buying animals. However these animals would still need slaughtering and would only be moved to other slaughterhouses. Changes in legislation have also affected risks, for example ear tag reading has become an additional handling requirement.

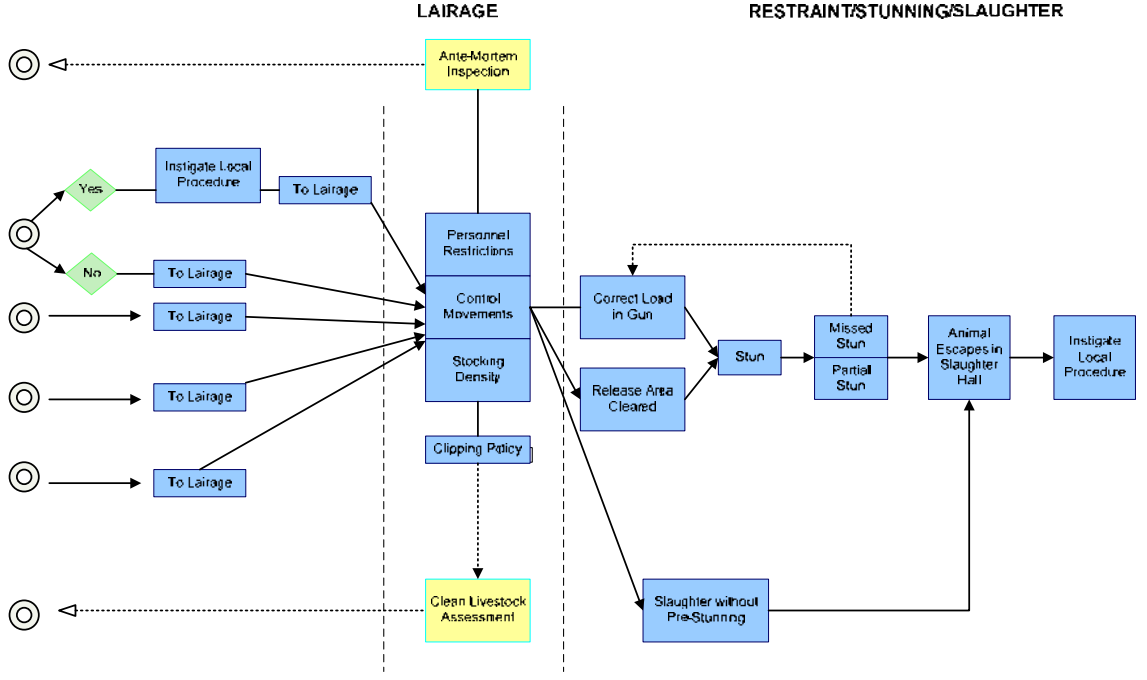
The investment in off-loading, lairage and handling systems can involve significant capital cost and many older systems are still used which have not been installed or modified with consideration to the changed risk. The balance between animal welfare and personal safety is sometimes compromised in favour of animal welfare, and human fatalities continue to occur at commercial slaughterhouses. Calm animals benefit both safety and welfare. This double benefit is cited as a reason for improving handling systems on-farm and for selective breeding towards calmer temperaments. The priority must always remain with human safety. Employers have a statutory obligation 'so far as is reasonably practicable' to control risks to the health and safety of their employees and other people who may be harmed by their operations. Abattoirs must reject animals which are likely to put people at an unreasonable level of risk. Where facilities are upgraded or replaced, these may incorporate features which address the change in handling risk, however many abattoirs have handling facilities which may be up to forty years old and may not be appropriate in some cases.

The evidence clearly shows that when animals are handled in a way which suits their normal behavioural characteristics, their behaviours are more predictable and the handling process is made safer and more efficient. Those in the industry will also confirm that there always remains a risk when handling live cattle given that the animals can weigh several hundred kilos; move very quickly when startled; are essentially unpredictable; jump approximately two metres almost from standing, and may also have horns. Even cattle which do not deliberately intend to cause injury to a handler should be viewed as a potential threat. Around half of the fatalities that occur on farms result from either the handler slipping and accidentally being trodden by an animal, or an animal accidentally slipping and crushing a handler.

Ultimately, the risk of injury can only be prevented by separating cattle from people. The law requires that risks are assessed and reduced to a reasonable level where this is not achievable.

Cattle Handling & Human Safety at Slaughterhouses





Abattoir workers handle many hundreds of animals each year and because of this some may become complacent about the risks associated with handling animals. Cattle, irrespective of age or size, have the potential to cause serious harm or worse. This risk is foreseeable and provision should be put in place to manage it.

The process flowchart is divided into four key areas;

Pre-Arrival

The exchange of information before the animal arrives can inform a number of decisions. The abattoir can decide whether they wish to receive the animal and if they do, they can ensure that the appropriate steps are taken to manage the animal when it arrives. All involved can then be prepared and are therefore less likely to be harmed. The person(s) supplying / delivering the animal owes a duty of care to those not employed by them to highlight any known problems with an animal.

Useful information to collect includes;

- Whether the animal is injured.
- Whether it is fractious.
- Whether it is distressed.
- Whether animals are segregated on the vehicle thus reducing the need to interact within groups of animals after unloading takes place. This more usually relates to gender segregation but could apply to age as well.

Further considerations could include;

- Is there a history of this 'supplier' delivering animals which have proven problematic to handle?
- Is there a history of this 'supplier' using a vehicle the design of which has created problems when off-loading in the past?
- Is there an unusual reason why the animal is being slaughtered? (sometimes animals are slaughtered because they have shown problematic behaviours in husbandry).
- In severe cases, is on-farm slaughter an option?

A system should be in place for ensuring that this information is collected at the point when the animals are booked in prior to their arrival. The information should then be cascaded to relevant personnel and in particular, those with nominated responsibilities for dealing with injured, fractious or distressed animals.

Arrival

Perimeter containment is a key control measure for minimising the risk from escaped animals. Whilst ever an animal is contained on site, the abattoir has greater control over achieving a satisfactory outcome to an escape incident. The provision and maintenance of suitable and sufficient perimeter containment should form part of the site control measures. Several legal cases are brought each year from members of the public being injured by cattle that escape onto roads. Poor perimeter containment therefore brings with it a risk of legal penalties.

When the animal arrives, interaction should take place between the vehicle driver and the person representing the abattoir at the off-loading point. If the communication system has worked correctly, the information obtained earlier should feature in this discussion. In addition, any new information should be provided by the driver which may include difficulties with the animal during loading or transportation.

The person representing the abattoir should have the authority or direct access to the authority for accepting or rejecting either the vehicle or the animal. If it is clear that the vehicle deign or its state of repair is not conducive to achieving a safe off-load then a decision should be made about how this is dealt with. Rejecting the vehicle should be an option. There is a risk to any person lowering a tailboard that cattle can escape onto it while it is being lowered, and in so doing injure the person underneath. Wherever possible the tailboard should be lowered from the side, and/or using a mechanical means such as a hydraulic ram and/or using a rope to pull the catch open.

Similarly, if it is clear that an animal represents a significant risk in relation to the capacity of the off-loading facility and the capabilities of those staffing it, then the option of rejecting the animal should be available.

Where it is decided to off-load the animal, wherever possible this should take place without entering the vehicle load bay. The Official Veterinarian should have a safe location from which to conduct their ante-mortem inspection and the vehicle should be secured to the off-loading facility. Structural failure or defect of a barrier at this point will mean that the animal can escape. The person responsible for off-loading the vehicle should normally be the vehicle driver. They are more likely to be acquainted with the animal and its characteristics having been involved in its loading.

If segregation is required a site procedure should be instigated. This will involve trained personnel and all others should stand clear of the process within a safe location. At no point should one person be left alone handling the animals.

It may be worth highlighting that cattle find the processes of loading and unloading more stressful than the journey itself (as indicated by stress hormone profiles). Calm handling is essential to prevent them becoming even more agitated.

Lairage

The lairage is an area where humans and animals are in close proximity. Animal movements are likely to be rapid and common place and these have to be controlled. Only nominated personnel should work within this area and a restriction should be in place to prevent unauthorised access. The site should have clear rules on stocking density. A pen which is over crowded can create problems for animals and those handling them. Those most at risk within lairage are people unsupervised and unfamiliar with the site. Vehicle drivers should not normally need to enter the area beyond the off-loading point.

If the ante-mortem inspection requires that an animal be isolated or separated for further inspection or examination, the segregation procedure should be followed. Similarly, if an animal is too dirty to be processed normally, it is likely to require segregation under the application of a clean livestock assessment. It should be noted that dead clipping is the safer option when cattle need to be clipped, however the emphasis must be on clean cattle being presented for slaughter. Clipping of an animal will once again require segregation, and in this case close containment, as it would during ante-mortem examination. Suitable and sufficient facilities should be put in place to ensure that this is done safely. A crush providing access to both sides of the animal is almost essential. Injuries are common during belly clipping and a contributory factor is the need to stretch under an animal to reach a side that can't be accessed because the crush is up against a wall. The sides of the crush should open to allow easy access with a minimum number of points against which an arm can be trapped. Any use of a crush must be done with a good understanding of the way any particular type operates, as different designs may make a procedure safe in one type, but dangerous in another. As a general rule, crushes should be quiet. They vary greatly in how much noise they make and a stressed animal will become even more agitated when approaching and inside a noisy crush. If this is a problem with an existing crush, use can be made of rubber strips to prevent metal-to-metal contact.

Isolation of an animal is frequently easier and safer if a companion is allowed to join the animal in question. Stressed cattle are much calmer in the presence of another animal.

Restraint/Stunning/Slaughter

Before stunning an animal it is imperative to ensure that the correct load is available in the gun and also the release area is clear. A missed or partial stun can result in an animal escaping within the slaughter hall. This can also arise during slaughter without pre-stunning. Where an animal escapes it should be regarded as an incident of serious and imminent danger6. A procedure should be in place requiring only nominated personnel to become involved in re-containing the animal, with all other people moving to a place of safety. Some side gates of stun pens are hinged sufficiently low to make escape into the slaughterhall impossible. Sometimes carcases need more assistance when being removed from the stun pen, but the chance of an escape into the slaughterhall is reduced to almost zero by having a low swinging door.

The Impact of Environmental and Other Factors

Lighting should be adequate to accommodate safe handling procedures. Adverse weather conditions could impact on off-loading procedures particularly if the area is not protected from the elements. In such cases personnel may be tempted to choose a location from which to work that is not suitable for purpose. Physical facilities should be subject to a planned maintenance regime, personal protective equipment should be provided and worn, procedures clearly understood and nominated personnel trained. All surfaces likely to become wet should have a non-slip surface.

BEHAVIOUR OF DOMESTIC CATTLE

This section describes the factors which shape cattle behaviour. It is not about the basics of field of vision, balance points and droving, fight or flight responses, or herd instincts which are covered well in other texts.

As stated before, cattle behaviour is generally recognised as unpredictable. However, there are factors, which influence it and, once we are aware of them, help us foresee the chance of them being a risk to people.

Background

Domestic cattle have been created by selectively breeding from wild cattle for about 10,000 years. The qualities that are desired by humans have been exaggerated by heavy selection pressure applied in the process of domestication over this time.

The characteristics selected have been for draft work, milk, meat and sport in the case of bullfighting. Each of the groups selected for these purposes have had different requirements imposed upon them, and have formed the basis of 275 breeds as we know them today. However, the characteristics that are exaggerated in, for example, fighting bulls remain in other breeds.

Behaviour

Whilst difficult to rank intelligence in a meaningful way, it is known that cattle prefer to be in herds, protect their young fiercely, and have social hierarchies and good memories. They can to be trained to find milking stalls, be ridden and pull implements. They will teach each other how to stand on a bank to avoid bloat, and dominant animals will push weaker animals to the edge of the herd, into the dairy first or through an electric fence.

They are sensitive to and have long memories for pain. Herds will run from warble flies from the first day of the season, cows will show reluctance to enter and have impaired milk let down in dairies with even small electric charges in the metalwork, and quickly learn what to expect in a TB test. The behaviour of a cow also tends to be adopted by her calves, due both to the direct inheritance of genes, and due to observational learning. Conversely they show signs of reduced arousal, or contentment, when listening to soft music and when trained, in the presence of quiet and calm people.

Cattle have strong self preservation instincts and once roused, will still pause to assess a situation. This short interval can be the only warning of an impending charge. Cattle do not typically charge unless they feel that no other option exists. A handler who is standing next to the only obvious exit from a pen is therefore at risk if the animal panics and this is a not uncommon cause of fatalities on farms.

They are not able to see colour well, but see light and shade to an exaggerated extent, compared to humans. It follows that they are not alarmed by bright colours, but are by light/dark contrast, such as shadows in a race, and by movement such as flapping material or arms. This can be used to cause cattle to balk if in flight, but equally can precipitate a charge if frightened. They also find sudden loud and unfamiliar noises frightening.

As many cattle are bred to have significant muscle mass they are strong and are able to accelerate and weave quickly. This agility and power is easy to underestimate. Care should also be taken to avoid standing excessively near to animals during movement as leg injuries can occur when kicked by an animal that has accidentally slipped.

Breed influence

In the same way that it is not possible to predict individual human behaviour based on race, it is not possible to give an accurate indication of the behaviour of individual cattle based on breed. However, this doesn't prevent people making generalisations, which, on a practical level are useful as a guide, but cannot be relied upon as a predictor of an individual animal's behaviour.

In one experiment involving 450 cattle Temple Grandin evaluated the temperament of the following breeds, high being more flighty:

Mean temperament ranking	
Bos indicus-cross	3.46 +- .09
Tarentaise x Angus	2.36 +- .31
Other Bos Taurus	1.80 +- .10
Simmental x Red Angus	1.77 +- .07
Angus	1.70 +- .19

As a rule, within-breed differences between individuals are every bit as significant as between-breed differences. Only about 30% of the variation seen between animals of the same breed is due to their genes; the other 70% being accounted for by their experiences earlier in life. This emphasises how difficult it is to predict likely behaviour from knowledge of breeding and every animal should be taken at face value.

Sex influence

As with breed influence, it is not possible to give an accurate indication of the behaviour of individual cattle based on sex.

However, generalisations go along the lines of all bulls are recognised as dangerous, and cows with calves at foot are a very close second. (The statistics on fatalities in the UK support this) Anecdotal evidence suggests that one of the contributory factors to cows being dangerous when having calves at foot is that their earlier temperament is a poor predictor of defensiveness when they become mothers. Apparently placid cows can become very defensive with little warning. Beef cows, then heifers and then steers are in the middle range, followed by mature dairy cows without calves, which are usually regarded as the most placid.

In the same experiment cited above, Temple Grandin went on to evaluate the temperament of a group of cattle based on their sex.

Mean temperament ranking

Gender	Observation 1	Observation 2
Heifers	3.72 +- .11	2.23 +- .10
Steers	3.39 +- .11	1.97 +- .10

Handling influence

Whether or not cattle are trained to recognise people as dominant over them probably has the largest impact on their behaviour.

Adult cattle which have not been dominated by people since birth pose a large risk to handlers. This group includes range fed cattle, intensively reared cattle which are mechanically fed and strawed, and also 'pet' bulls, which have grown up to see people as part of their herd, rather than dominant over them. Injuries and fatalities have occurred when bulls 'turn' on a person they are familiar with; the reason behind this is that the bull sees the handler as competition in his herd, and sets about dominating the person.

At the other end of the spectrum, old dairy cows which have been handled many times by a compassionate but firm farmer generally pose little risk from attack, but can injure people by standing on their toes, and sometimes can kick. The quality of stockmanship has been shown to greatly affect livestock flightiness. An unpredictable handling style (sometimes aggressive, sometimes calm) is apparently worse than a persistently aggressive style. It has also been quantified that moving animals through a race takes less time when using a calm voice than when shouting and slapping. In the latter case, cattle tend to move in rapid bursts, which increases the likelihood of slipping, and takes more time overall.

Summary

Putting these aspects of cattle behaviour together, means that their actions can be accounted for in retrospect. However in general, but in the abattoir environment especially, it usually means that they must be regarded as unpredictable. Add to this their size and agility means that cattle must be managed as a serious hazard when not under control with physical barriers.

These barriers must also be well maintained. Numerous cases of serious injuries and fatalities occur each year on farms because of the failure of poorly secured barriers.

GENERAL RISK ASSESSMENT FROM DELIVERY TO SLAUGHTER

Delivery Vehicle Construction

Area/Process	Hazard Description	Contributory Factors	Legislative requirements (where appropriate)	Good Practice
Tailboard Springs	Lifting & handling injuries.	Weight of board. Adjustment of spring assisters.	[2]	Ensure only the driver/attendant operates the tailboard. Drivers/ attendants will be familiar with their vehicle.
Tailboard	Crush injury from animal standing on part lowered tailgate.	Lowering handle in centre. Weak side gates / no side gates restraining cattle. Unaware personnel.		Opening handle(s) to one side. Slide or side hinged tailgates. 3rd gate able to restrain animals while tailgate being lowered. Drivers aware of the risks.
Tailboard Flooring	Slips / falls.	Ability to easily unload animals (animals will refuse to move forward if the flooring doesn't feel safe to them).	[3] - Vehicles must have non-slip flooring throughout – including the tailboard.	Responsibly for deciding to enter the vehicle is with the driver / attendant. Off loading facilities should be designed to take advantage of animal's natural instincts.
Tailboard Side gates	Lifting & handling injuries.		Lateral projections must be provided to prevent animals escaping. Facilities must be of a sound construction.	Responsibly for offloading and correct use of side gates is with the driver/attendant. Weight – ability to move easily. Constructed to withstand the weight of the animals to prevent escaping whilst tailboard being lowered. Sufficient size to prevent animals from escaping.
Ramp Angles	Steep slopes. Slips / falls. Crush injuries from rushing / falling animals.	The ramp angle is largely dependant on the height of the off loading point.	[3] - The information below shows the maximum ramp angles allowed. It is possible to make a step up to 20cm to reduce the ramp angles although this is not recommended. [4] - Ramp angles for existing vehicles carrying cattle): External 29° Internal 33°. [5] - new vehicles built/on road after 5th January 2007): All Ramps - Cattle 26° Calves 20°.	Cattle should be allowed to walk off the vehicle by themselves. This will take longer, and unloading facilities would need to be increased to take this into account. The responsibly for entering the vehicle should only be with the driver/attendant, and only as a last resort. The loading area should be well lit, but not excessively bright, and should be as quiet as possible.
General construction Lighting	General dangers of working in the dark.		[3] - Appropriate lighting must be provided.	The responsibly for entering the vehicle should only be with the driver/attendant.
General construction Decks	Manual decks – physical lifting, stock security, ability to escape/jump off. Hydraulic decks - stock security.		Lifting platforms and upper floors must have suitable and strong barriers to prevent animals falling or escaping.	The responsibly for entering the vehicle should only be with the driver/attendant. A means of escaping should be provided.
Parking on unloading bay Alignment		Poor parking can lead to the elements highlighted above being ineffective putting both animal and human safety at risk. Additional equipment, such as gates provided on the unloading bay, can help to minimise any risks from poor parking.	Abattoirs are required to provide unloading areas/bays/dock which are enclosed on three sides. Vehicles must be constructed as above.	Abattoirs to ensure they have sufficient suitable facilities to enable drivers/ attendants to unload with the minimum of risk. Drivers/attendants to ensure vehicles are maintained in a good condition.
Abattoir unloading /lairage Unloading		Animals will refuse to move forward if there are items/people blocking the way. Risk to both animals and people if the passage to the pen is obstructed.		Abattoir personnel must ensure that the pen and passage to the pen is clear before the animals are unloaded.

Area/Process	Hazard Description	Contributory Factors	Legislative requirements (where appropriate)	Good Practice
Unloading-Handling Goads/Sticks		Animals will refuse to move forward if there are items/people blocking the way. Incorrect handling of goads can not only cause the animals to behavior dangerously and be a threat to human safety, but also be a direct threat to human safety.	The transport regulations only allow goads to be used on the hindquarter muscles of adult bovines and then for a maximum of 1 second, and only when they have room ahead of them to move. Sticks must not be used to strike animals.	Suggest not allowing personnel to use goads or sticks, but if they must be used, on difficult animals, there use should be restricted to specific personnel –drivers or abattoir staff? Research on-farm has suggested that the unnecessary use of goads slows down movement through causing movement to become erratic rather than fluid.
Lairage and Restraint				
General	Attacking animal. Struck by the head of an animal. Crush injury (e.g. animal strikes gate). Trapping. Trampling. Being knocked over/down. Kick. Horns.	Stressed animals are more difficult to manage and therefore will be more dangerous to handle. Continental breeds (e.g. Limousin) are known to be particularly excitable. Even animals which appear docile can suddenly react. Design of pens and gates unsuitable, e.g. too low. Note: Bent down top rails may indicate inadequate height to restrain animals.	[8] - Suitable and sufficient information instruction training & supervision. Provision of safe workplace. [6] - Risk assessment. Relevant and comprehensible training. [11] - Designers have a duty to design out hazards to users.	Human safety must always be the priority. When animals arrive abattoirs reserve the right to reject them if people might be put at unreasonable risk. Plan ahead. Ensure gates and routes are set correctly. Always be alert to the potential dangers. Never take previous calm behavior as a guarantee of safety. Keep a substantial structure between animals and people whenever possible. This must also be secured properly. Use of temporary measures, such as rope to secure gates, often results in injuries. Avoid standing in front and close to cattle. Always keep a safe distance behind cattle. Remember that cattle can also kick out sideways. If it is necessary to drove animals, keep a safe distance and ensure you have a way to escape close to hand. Apply knowledge of humane handling and the behavioral response of cattle to handling. Ensure that all staff are aware of the correct procedures to use. Training in animal behavior and handling techniques. Design of handling facilities to minimise risk of harm. Refer to TN564 (SAC) TN 565 (SAC)
Lairage	Attacking animal. Struck by the head of an animal. Crush injury (e.g. animal strikes gate). Trapping. Trampling. Being knocked over/down. Kick. Horns.	Look critically at the animal handling facilities you have and how your staff use them. Consider how the animal perceives both your facilities and procedures. Walk through the system from the animal's perspective to identify fear-eliciting features. Look critically at the people employed. Does their understanding of welfare, safety and quality issues require improving? Have staff employed in the lairage and abattoir perceived that there may be a problem? If staff have perceived a problem, have they evaluated it?	[8] - Safe access & egress. Maintenance of workplace and equipment. [3] - Doors gates, etc Prevention of slips, trips, falls. [7] - Construction of suitable work equipment maintained in efficient state and good repair. [11] - Designers have a duty to design out hazards to users. [4] - Animals that have little or no room to move should not be subjected to coercion. Electric goads and prods should only be used in extreme cases and not on a routine basis to move animals. Goads and other aids should not be used repeatedly if the animal fails to respond or move.	Safer alternatives to physical contact should be applied. Suitable communications to enable employees to report concerns with management. Before making any changes to the physical characteristics of animal handling areas, ensure that the design incorporates principles which are known to encourage natural movement. Design to minimise the need for people to be in the same space as cattle.

Area/Process	Hazard Description	Contributory Factors	Legislative requirements (where appropriate)	Good Practice
Movement into restraint	Attacking animal. Crush injury (e.g. animal strikes gate). Trapping. Trampling. Being knocked over/down. Kick. Horns.	Cattle can often be seen in pens or raceways staring at the alleyway ahead and refusing to move. This can be seen as the animal being stubborn, and can provoke goading. However, it usually indicates an 'obstruction' to the animal's forward movement which could be one or more of a number of visual (sight), auditory (sound) or, olfactory (smell) stimulants. The point of balance is at the animal's shoulder. All species of livestock will move forward if the handler stands behind the point of balance. They will back up if the handler stands in front of the point of balance. Many handlers make the mistake of standing in front of the point of balance while attempting to make an animal move forward in a race. Groups of cattle in a race will often move forward without coercion when the handler walks past the point of balance in the opposite direction of each animal in the race. Often tapping the side of the race can move them.	[6] - Risk assessment. Relevant and comprehensible training. [8] - Safe access & egress. Maintenance of workplace and equipment. [3] - Doors gates, etc Prevention of slips, trips, falls. [11] - Designers have a duty to design out hazards to users. [4] - No person shall in any slaughterhouse, stun, or cause or permit to be stunned, any adult bovine animal unless at the time it is stunned it is confined in a stunning pen or in a restraining pen which (in either case) is in good working order. [4] - Slaughterman to be ready before the animal is led into the box. Requires close co-ordination between the stockman moving the animal into the stunning box and the slaughtermen whose job it is to stun the animal.	Plan ahead. Ensure gates and routes are set correctly. Identify points within your animal handling system where cattle regularly stop and refuse to move forward, if only for a few seconds. For example, the use of a lighter colour paint on the side of a race in combination with better lighting are often all that is needed to help improve animal movement past a difficulty. If the animals are moving through the race by themselves, leave them alone – do not goad.
Restraint	Design of restrainer. Struck by the head of an animal. Trapping.	The HSA recommend the fixed-shelf head restraining systems should be used wherever possible to improve shooting accuracy. Experiments with cattle demonstrated that a full width static front shelf allows fractious animals to climb the shelf at the front of the pen.	[6] - Risk assessment. Relevant and comprehensible training. [11] - Designers have a duty to design out hazards to users. [4] - Animals, which are stunned or killed by mechanical means applied to the head, shall be presented in such a position that the equipment can be applied and operated easily and accurately. The Minister may, however, in the case of cattle, authorise the use of appropriate means to restrain head movements.	Remove obstructions / structures which cause parts of the body to be trapped should the animal move. A hold down rail or rails is necessary to ensure adequate restraint when using this style of static head restrainer. A curved metal shelf takes up the space at the front of the pen preventing animals from lowering their heads. The dimensions of the shelf may need to be varied to fit the type of pen and particular notice is needed to ensure that the stunned animal does not get caught up in the front shelf and delay ejection.
Stunning / kill	Attacking animal. Struck by the head of an animal. Crushing. Trapping. Trampling. Being knocked over/down. Kick. Horns. Captive bolt pistols.	Ineffective stun. Animal may not go down at all, or if it does initially, it may get back to its feet. Animals let out of the stun box can move about causing danger. (see PREVENTION & MANAGEMENT OF ESCAPED CATTLE) Uncoordinated reflex activity in stunned animals when shackling & sticking. Unsafe handling of bolt gun can lead to penetrating injuries. Dropping a loaded gun will cause accidental firing. Guns can travel with high velocity over significant distances.	[6] - Risk assessment. Relevant and comprehensible training. [8] - Safe access & egress. Maintenance of workplace and equipment. 11 - Designers have a duty to design out hazards to users. [7] - Correct weapon, correct ammunition, regular maintenance. Operative training. Use of gun/captive bolt in accordance with manufacturer's instructions. [10] – Provide appropriate protective equipment. [10] – A firearms certificate is not required however; operative licensing and training is required. For emergency use, suitable spare equipment and instruments for stunning, slaughter or killing are kept within the slaughterhouse.	Investigate all ineffective stuns Review the amount of post-stun kicking. E.g 0 = no activity 1 = Mild activity 2 = Moderate activity 3 = Severe activity Continual assessment of the animal should be made from stun to death. Keep a spare weapon available to re-stun.

Area/Process	Hazard Description	Contributory Factors	Legislative requirements (where appropriate)	Good Practice
Electrical stun/kill	Electricity @600v AC	Ineffective stun. Animal may not go down at all, or if it does initially, it may get back on its feet and move about causing danger. Uncoordinated reflex activity in stunned animals when shackling & sticking.	[9] - Electrical systems to be maintained to be safe. [6] - Risk assessment. Relevant and comprehensible training. [8] - Safe access & egress. Maintenance of workplace and equipment.	Continual assessment of the animal should be made from the point of stunning through to death. Care should be taken with uncoordinated reflex activity in stunned animals. If stun appears ineffective the animal must be shot with a captive bolt gun and stuck.
Post-stun handling to facilitate bleeding	Cuts & stabs from hand knives. Kick. Trapped hand in shackle noose. Falling shackles.	Restricted space. Slip hazard (blood). Restricted access. Uncoordinated reflex activity in stunned animals when shackling & sticking. Employees may climb over animals which do not roll out properly due to poorly designed or maintained systems.	[6] - Risk assessment. Relevant and comprehensible training. [8] - Safe access & egress. Maintenance of workplace and equipment. [3] - Doors gates, etc Prevention of slips, falls. [10] – Provide appropriate protective equipment.	Trained knife users. Adequate space. Properly designed stun box and cradle. Correct hoist location. Maintenance of equipment and workplace.

Prevention and Management of Cattle Escapes

Escaped animal incidents have the potential to cause serious injury or a fatality. Local procedures should be agreed in advance with the police. These procedures may require assistance being provided by the slaughterhouse. Where an animal escapes into a public place the local police should be contacted immediately as the animal is likely to be distressed and therefore could react aggressively. Local response procedures will vary but, in being contacted, the police can make their necessary operational decisions. In choosing not to call the police a slaughterhouse may unwittingly place themselves and the public at increased risk. The use of firearms is strictly regulated and a slaughterhouse should only use such equipment within the terms of their firearms / shotgun licence as to discharge a firearm in a public place without the authority of the police could render an individual or the organisation at risk of criminal charges being brought against them.

Area/Process	Hazard Description	Contributory Factors	Legislative requirements (where appropriate)	Good Practice
Escape off Site	Attacking animal. Struck by the head of an animal. Crush injury (e.g. animal strikes gate). Trapping. Trampling. Being knocked over/down. Kick. Horns. Traffic accidents. Potential fatality(s).	Inadequate perimeter fencing or cattle grid. Inadequate gates. Inadequate offloading facilities. Inadequate pens / rails - e.g. no secondary gates, low fences. Control of outside drivers not employed by the abattoir. Lack of supervision to ensure procedures are followed.	[8] – Control of risk to others. Keep lairage doors closed. Close internal gate behind cattle before moving vehicle. [6] - Risk assessment Safe handling procedures and training. Policy and emergency plan in case of escapes. [11] - Designers have a duty to design out hazards to users.	Keep lairage doors closed. Provide/use sheeted secondary gates when unloading with a pin in the floor to prevent it opening when cattle push past. Close internal gate behind cattle before moving vehicle. Good perimeter fence. Install a cattle grid at the site entrance. Contact the police and await their arrival. If the animal cannot be driven back safely it may need to be shot where it is. Where a marksman is available offer his services under police. Supervision. Note: the police often prefer this rather than using their own marksman who may be inexperienced in shooting large animals which become dangerous if wounded.

Area/Process	Hazard Description	Contributory Factors	Legislative requirements (where appropriate)	Good Practice
Escape into the yard	Attacking animal. Struck by the head of an animal. Crush injury (e.g. animal strikes gate). Trapping. Trampling. Being knocked over/down. Kick. Horns. Traffic accidents. Potential fatalities. Persons at risk include those not experienced in animal handling.	Inadequate gates. Inadequate offloading facilities e.g. no secondary gates / low fences. Inadequate pens / rails. Animals which have attacked people are very likely to attack other people who approach them, even after a 'cooling off' period. Poor control of outside drivers, visitors and contractors e.g. MHS staff. Lack of training and supervision to ensure procedures are followed.	[8] – Control of risk to employees and others. Keep lairage doors closed. Use sheeted secondary gates when unloaded. Close internal gate behind cattle before moving vehicle. [6] - Risk assessment.	If the animal is calm then let more cattle out and then drive them all together. If the animal is in a location where it can be safely observed and is not able to cause any risk to safety, it may be best to allow it to calm down for a time before attempting to retrieve it. If then animal cannot be moved and has to be killed in *situ*, where possible use a head shot with a captive bolt gun. A captive bolt gun with an extension handle is available for contact guns. These can be useful in situations like this as they give extra reach. In some situations it can be useful to have a rifle or shotgun available. If a beast has attacked or threatened to attack a person whilst escaped, no attempt should be made to move it. It should be shot by a marksman A shotgun is a safer option than a rifle as it has a limited range. A single ball cartridge should be used rather than shot. A risk assessment, procedure for using the shotgun and a firearm certificate will be required. .OV to be informed if time available, permission does not need to be sought.
Escape in the lairage:	Attacking animal. Struck by the head of an animal. Crush injury (e.g. animal strikes gate). Trapping. Trampling. Being knocked over/down. Kick. Horns.	Inadequate gates. Inadequate pens / rails.		Keep lairage doors closed Man escape fences at entrance to race walkway to prevent animal access. In the lairage run more cattle with the escaped animal. Into the plant evacuate all personnel except two or three trained authorised people to deal with escapee. Pen walls/rails to be a minimum of 2m high. 1.8m is not sufficient.
Escape out of the stunning box		Ineffective interlocking allowing the gate into the stun box and the discharge gate to be open together. Cattle have been known to jump out of the box; by design a good deep, secure box will reduce this risk. However existing stunning boxes will vary and it may be necessary to fit a bar over the box. Care should be taken not to create an operative trap when fitting bars. More common is an animal getting up after it is released from the box due to a poor stun. Good stun box design can reduce the risk of a bad shot. The gun and shot used must be matched to the category of animal being slaughtered. Many abattoirs are killing both under thirty-month-old cattle, cows and stock bulls. It may be necessary to use a 0.25 side trigger gun for stock bulls. Poorly designed pens, gates and race e.g. low fences, blind corners, no roll out, no post escapes or bull fighter shields where required. Man walkway not fenced to prevent cattle entry. Personnel gates hinged to open wrong way (should close against stop to prevent animal access). No self close device.	Warning and evacuation procedure. Design of facilities to make use of behavioural characteristics of cattle. Adequate escapes. Safe handling procedures and training. Should an animal manage to get into the plant, evacuate all personnel except two or three trained and authorised people to deal with the escapee. A contingency plan is required for escapes into the slaughter hall. Gun and shot strength should be adequate for category of animal, particularly when slaughtering older cattle, cows and stock bulls.	Interlocking devices to prevent both openings on stun box being open at the same time. Restricting the size of the opening of the side gate will prevent live cattle being able to crawl underneath. Means of containing an animal if it escapes / ineffective stun E.g. - row of posts - gate that can be closed quickly - designing shackling area and bleed area on two levels - Bullfighter type shields in the shackle to provide safe place for personnel. The animal should be shot. An extended cap handle can be useful in this situation.

PROPOSED STEEL TUBE GRADES FOR CATTLE PENS

Introduction

The diameter and thickness of the steel tube or structural hollow section to be used should be specified by the client (the purchaser, designer, supplier, component manufacturer, fabricator or erector, as applicable). A suitable corrosion protection should be applied to achieve the durability required. Any painting, coating or galvanizing should only be carried out after completion of all welding work.

Steel tube grades

As a general guideline, it is recommended that low carbon (mild steel) material grades should be employed with specified minimum yield strength (SMYS) values of either 195N/mm² or 235N/mm². Round, square or rectangular tubes or hollow sections can be used and these may be either hot finished or cold formed.

Appropriate steel tube or hollow section grades should be selected either from National (including European) or International Standards or alternatively suitable equivalent proprietary materials from a reputable tube manufacturer (such as Corus Tubes) may be used. Tubes and hollow sections in accordance with one of the following dimensional and tolerance standards in the table below will generally be suitable:

Material	Dimensional and Tolerance Standard	Material Grade
Circular, square or rectangular hollow sections	BS EN 10210-2	See Note below
	BS EN 10219 – 2	
	BS EN 10255	
	Proprietary Grades	e.g. Corus "Strongbox 235" e.g. Corus "Install" range.
Note: For reasons of formability (bending and shaping), weldability, galvanizing (and also availability and cost), it is recommended that material grades with an SMYS of either 195N/mm² or 235N/mm² are used. However, this does not preclude the use of higher strength materials, providing that the fabrication practices employed take this into consideration.		

Where fabricated components are to be hot dipped galvanised, the purchaser must confirm with the material supplier that the steel composition is suitable. As a general guideline, this means that the silicon content of the steel should ideally either be ≤ 0.05% or in the range 0.15 – 0.25%.

Material Certification

Materials used should, as a minimum, be subject to non-specific testing and inspection and supplied with a Test Report 2.2 in accordance with BS EN 10204 as standard.

Weldability

Low carbon (mild steel) grades with an SMYS of either 195N/mm² or 235N/mm² are generally considered to be readily weldable in accordance with most standard welding methods. Welding guidelines can be found in BS EN 1011 Parts 1 and 2.

Recommended dimensions for hollow sections and tubes

A non-exhaustive list of recommended material dimensions is given below, with a view to indicating those sizes most readily available.

Thickness (mm)	2.3 - 2.6	2.9 - 3.2	3.5 - 3.6	4.0	4.5	5.0
CIRCULAR OD (mm)						
21.3	■	■				
26.9	■	■				
33.7	■	■				
42.4	■	■		■		
48.3	■	■		■		
60.3		■	■	■	■	
76.1	■	■	■	■	■	
88.9		■		■		■
114.3		■	■		■	■
139.7		■				■
SQUARE Dimensions (mm)						
25 x 25	■	■				
30 x 30	■	■				
40 x 40	■	■		■		
50 x 50	■	■		■		■
60 x 60		■		■		■
70 x 70		■	■	■		■
80 x 80		■	■	■		■
90 x 90		■	■			■
100 x 100		■		■		■
RECTANGULAR Dimensions (mm)						
50 x 25	■	■				
50 x 30	■	■				
60 x 40	■	■		■		
80 x 40		■		■		
90 x 50		■	■			■
100 x 50		■		■		■
100 x 60		■	■			■
120 x 60		■	■			■
120 x 80						■

NOTE: Other sizes may be available depending on supply source.

Corrosion Protection

The corrosion protection employed should reflect the durability (life to first maintenance) required for the structure. It is recommended that components be suitably protected against corrosion, after completion of all fabrication work, by one or more of the following treatments:

- Hot dip galvanizing in accordance with BS EN ISO 1461.
- Thermal spray coating of zinc or aluminium in accordance with BS EN 22063.
- Organic powder coating in accordance with BS 1722-16.
- Painting in accordance with BS EN ISO 12944 Parts 1 to 8, as applicable, to meet durability requirement H.

Guidance on the appropriate protective coatings to use in specific environments and recommended minimum coating thicknesses can be found in BS EN ISO 14713.
All loose scale, oil and dirt must be removed from the component surfaces before any protective treatment is applied.

Fabrications, produced from closed tubes or hollow sections, which are to be hot-dipped galvanized must be provided with drain holes of a suitable size.

Maintenance and repair

It is recommended that installations are inspected at regular intervals and that any damage found is investigated and suitably repaired.
The corrosion protection should be inspected as part of the maintenance and repair procedure. Any damaged areas found can be repaired by a procedure acceptable to the client.
For example, hot dip galvanized coatings can be repaired in accordance with the methods set out in BS EN ISO 1461 Clause 6.3. Options include, thermal spraying with zinc or a suitable zinc rich paint e.g. epoxy. The zinc content of a zinc rich paint should conform to BS 4652 (i.e. 80% in the dry film). The coating thickness in the repaired area should exceed that of the local galvanized coating layer. For guidance on suitable proprietary coating repair products and their application, reference should be made to The Galvanizer's Association web site www.hdg.org.uk.

NOTE: Any additional fabrication work carried out following the application of the original corrosion protection will damage the original protective coating so this will have to be made good afterwards.

Additional references

Additional guidance may be found in BS 5502 parts 21 and 22, and in the BS 1722 series of fencing standards, particularly Parts 8 and 12, in BS 5709 covering gates and stiles and in BS 4008 for cattle grids.

REFERENCES & SOURCES OF INFORMATION

Index

[1] Handling beef cattle: Identifying research needs and knowledge transfer opportunities to improve human safety and animal welfare, SAC, Turner S et al.
[2] The Manual Handling Operations Regulations 1992
[3] The Workplace (Health, Safety and Welfare) Regulations 1992
[4] Welfare of Animals (Transport) (England) Order 1997
[5] Welfare of Animals (Transport) (England) Order 2006
[6] Management of Health & Safety at Work Regulations 1992
[7] The Provision and Use of Work Equipment Regulations 1998
[8] Health and safety at Work Act 1974
[9] The Electricity at Work Regulations 1989
[10] The Personal Protective Equipment at Work Regulations 1992
[11] The Construction (Design and Management) Regulations 2007

Stafford K J. 1997. Cattle Handling Skills. Accident Compensation Corporation, Wellington, New Zealand ISBN 0 478 10247-X

Modifying existing cattle handling systems to improve human safety, SAC, TN564, ISBN 1 85482 805 3

Recommendations for the design of new, safe and efficient cattle handling systems, TN565, SAC, ISBN 1 85482 806 1

Safe cattle handling equipment, HSE

Preparing cattle for slaughter, Agriculture information sheet no. 34, HSE

Handling and housing cattle, Agriculture information sheet no. 35, HSE

'Deal with the danger', video, HSE

Handling cattle at abattoirs and markets, Health & Safety Authority, info@hsa.org.uk

Agriculture Information Sheet No 35, Handling and housing cattle, HSE, www.hse.gov.uk/pubns/ais35.pdf

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Feedlot Cattle with Calm Temperaments Have Higher Average Daily Gains Than Cattle with Excitable Temperaments[1] Journal of Animal Science (1997) volume 75: 892-896 B.D. Voisinet, T. Grandin,[2] J. D. Tatum, S. F. O'Connor,[3] and J. J. Struthers Department of Animal Sciences Colorado State University Fort Collins 80523-1171

A comparison of cattle temperament scores by breed type using different types of temperament scoring. J. Baszczak*, T. Grandin, S. Gruber, T. Engles, and J. Tatum, Colorado State University, Fort Collins.

BS1722	Fences – Part 8: Specification for mild steel (low carbon steel) continuous bar fences and hurdles. Part 12: Specification for steel palisade fences. Part 16: Specification for organic powder coating to be used as a plastics finish to components and mesh.
BS 4008	Specification for cattle grids.
BS 5502	Buildings and structures for agriculture – Part 20: Code of practice for general design considerations. Part 21: Code of practice for selection and use of construction materials. Part 22: Code of practice for design, construction and loading.
BS 5709	Gaps, gates and stiles - Specification
BS EN 10210	Hot finished structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions. Part 2: Tolerances, dimensions and sectional properties.
BS EN 10219	Cold formed welded structural hollow sections of non-alloy and fine grain steels Part 1: Technical delivery conditions. Part 2: Tolerances, dimensions and sectional properties.
BS EN 10255	Non alloy steel tubes suitable for welding and threading – Technical delivery conditions.
BS EN 22063	Metallic and other inorganic coatings – Thermal spraying – Zinc, aluminium and their alloys.
BS EN ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods.
BS EN ISO 12944	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 1: General introduction. Part 2: Classification of environments. Part 3: Design considerations. Part 4: Types of surface and surface preparation. Part 5: Protective paint systems. Part 6: Laboratory performance test methods. Part 7: Execution and supervision of paint work. Part 8: Development of specifications for new work and maintenance.
BS EN ISO 14713	Protection against corrosion of iron and steel in structures – Zinc and aluminium coatings – Guidelines.

Other useful publications and guidance

A reference list of relevant publications and guidance has been included in individual notes where relevant. In addition the following publications may be helpful.

HSE Publications:

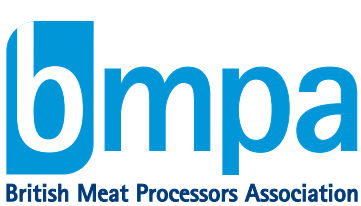
HSG 156	Slips and Trips: Guidance for the food processing industry
HSG 196	Moving food and drink. Manual handling case studies
HSG 232	Sound solutions for the food and drink industries
HSG 252	A Recipe for Safety

These publications are available from

HSE Books,
PO Box 1999,
Sudbury,
Suffolk CO10 2WA.
Tel: 01787 881165

Food Information Sheets (FIS)
available on the HSE website http://www.hse.gov.uk/index.htm

FIS3	Workroom temperatures in places where food is handled
FIS6	Slips and Trips
FIS7	An index of H&S guidance for the food and drink industries
FIS14	Priorities for H&S in the slaughtering industry
FIS15	H&S priorities in the meat processing industry
FIS22	Preventing slips and trips in the food and drink industries
FIS23	Injuries and ill health caused by handling
FIS24	Hygienic design for machinery in food and drink industries
FIS25	Safeguarding flat belt conveyors
FIS26	Safeguarding thermoform, fill and seal machines
FIS27	Safeguarding palletisers and depalletisers
FIS29	Controlling exposure to disinfectants
FIS30	Preventing falls from height
FIS33	Roll cages and wheeled racks



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