

MTMPSR5603B Control cold chain (refrigeration) operations

Unit descriptor	This unit covers the skills and knowledge required to plan and oversee the effective operation of enterprise cold chain and refrigeration systems to ensure product quality and food safety. It also covers ways to manage and reduce the costs of cold chain operations. Cold chain systems and operations are critical to the quality of enterprise products and their efficient management will help minimise the cost of production.
Employability Skills	The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.
Application of the unit	<p>Production managers, plant engineers, quality assurance, maintenance and chiller managers or coordinators may require this range of skills and knowledge.</p> <p>At this level individuals exercise considerable responsibility and accountability within enterprise structures and are required to make primary contributions to the values, goals and operations of the enterprise. They will typically have responsibility for the establishment and review of systems for the site or department. They may work with the assistance of external experts to develop plans and strategies.</p>

ELEMENT

Elements describe the essential outcomes of a Unit of Competency.

PERFORMANCE CRITERIA

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the Range Statement. Assessment of performance is to be consistent with the Evidence Guide.

1	Assess enterprise <i>cold chain system</i> requirements	1.1	Enterprise goals, directions and forecasts are analysed and the implications for <i>cold chain</i> requirements are determined.
		1.2	<i>Enterprise refrigeration systems</i> , cold chain, technical support team and operations are documented.
		1.3	Regulatory requirements relating to the operation and maintenance of <i>refrigeration</i> systems are identified.
		1.4	Enterprise requirements for specialised refrigeration advice and expertise are determined.

	1.5	Optimum refrigeration requirements to maintain quality of products are determined.
	1.6	Performance standards and targets including standards related to cost, quality and waste are established.
2	2.1	Procedures for the hygienic and safe operation and maintenance of refrigeration or cold chain systems are developed according to quality, food safety, manufacturer specifications, and customer and enterprise requirements.
	2.2	Contingency plans and procedures for systems failure or overload are prepared and conveyed to relevant personnel.
	2.3	Emergency procedures and plans are prepared and included in health and safety systems, procedures, training and work instructions.
	2.4	Strategies for communicating and resolving systems problems and failures with <i>stakeholders</i> are prepared.
3	3.1	Performance information requirements and data collection strategies are determined and developed.
	3.2	Monitoring procedures for the operation of refrigeration or cold chain systems are established and maintained.
	3.3	Non-conformances are investigated and corrective actions implemented.
	3.4	Preventative and control procedures are developed and implemented to prevent future non-conformance.
4	4.1	Performance data is analysed and measured against performance standards, including product quality and cost requirements.
	4.2	Energy costs of refrigeration systems are calculated and monitored.
	4.3	Strategies for improving performance and minimising costs are developed and implemented.
	4.4	Refrigeration system requirements are included in budgets and forward planning.

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge required for this unit. Where bold italicised text is used, further information is detailed in the Range Statement.

- Apply calculation skills and budget principles to refrigeration costs.
- Apply relevant ***communication*** and ***mathematical skills*** and processes.
- Assess requirements for enterprise refrigeration or cold chain systems based on enterprise goals, directions and forecasts, detailed product knowledge and regulatory requirements.
- Describe ***strategies for reducing heat loads***.
- Describe the ***impact of humidity*** on eating quality, production and storage of meat and meat products.
- Describe the impact of moisture transfer during chilling and freezing on quality, production and storage of meat and meat products.
- Describe the impact of packaging on chilling and freezing rates of meat and meat product.
- Develop and maintain the operating system. Prepare manuals and procedures for the operation of refrigeration systems, chillers and freezers according to hygiene, safety, quality and customer requirements. This also requires determining corrective actions for systems variations and non-conformances.
- Explain the concept of heat load and the implications for product quality and energy requirements for refrigeration system.
- Explain the impact of ***chilling or chilling rates*** and freezing or freezing rates on quality, production and storage of meat and meat products.
- Explain the thermal properties of meat and meat products and the implications for meat quality.
- Identify and apply relevant ***OH&S*** and ***workplace requirements***.
- Identify enterprise requirements for refrigeration system. This includes evaluating requirements for specialist personnel and expertise for management and maintenance of refrigeration system; and evaluating different methods of chilling and freezing for cost, efficiency and impact on product quality.
- Identify key personnel for the resolution and communication of systems problems and failures.
- Identify the hygiene and sanitation requirements for operation, cleaning and maintenance of cold chain systems.
- Maintain currency of knowledge through independent research or professional development.
- Maintain the quality of products in the cold chain. This requires monitoring chillers or freezers and interpreting refrigeration data to maintain appropriate temperature or humidity for product types and quantities.
- Manage maintenance of enterprise refrigeration systems including the negotiation and preparation of maintenance schedules; monitoring repairs; conformance with regulatory and quality requirements; and replacement requirements.
- Manage refrigeration costs. This requires monitoring the costs of refrigeration including internal or external service models, maintenance costs, lost time costs, product losses and energy costs, minimising energy costs.

- Monitor and report system performance. This requires setting performance standards and measures for refrigeration system, consistent with enterprise goals and products, analysing performance information and making recommendations for ***systems improvement*** for inclusion in enterprise forward planning.
- Operate refrigeration or cold chain systems efficiently. This includes identifying and implementing strategies for reducing heat load in enterprise chiller or freezer, minimising energy costs, maximising availability and minimising down time, maintaining temperatures according to quality and food safety requirements.
- Outline processes and ***methods for chilling and freezing*** meat and meat products and their impact on product quality, food safety and tenderness.
- Outline relevant ***regulatory requirements*** including food safety regulations and the implications for the management of the enterprise refrigeration or cold chain systems.
- Outline the health and safety requirements related to the safe handling of refrigerants and safety in controlled atmosphere and confined spaces.
- Outline the main elements of the compression cycle (compressor, evaporator, condenser, refrigerant) used in refrigeration.
- Prepare safety procedures for chillers or refrigeration systems including emergency plans and procedures for incidents and accidents associated with refrigerants (leaks, spills, etc) and procedures for the safe and efficient operation of equipment (eg forklifts, lights, etc) in chillers and freezers.
- Take action to improve own work practice as a result of self-evaluation, feedback from others or in response to changed work practices or technology.
- Utilise information and communications technology including statistical and modelling software for research, data collection and analysis, and reporting.

RANGE STATEMENT

The Range Statement relates to the Unit of Competency as a whole. It allows for different work environments within the meat industry and situations that may affect performance. This includes any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts. Bold italics wording in the Elements and Performance Criteria, and Required Skills and Knowledge, is detailed below.

Cold chain systems include chillers, freezers and other temperature controlled areas.

Cold chain may extend from point of slaughter to retail outlet and include transportation.

Optimum requirements for ***enterprise refrigeration systems*** may relate to technical requirements (eg heat load transfer and efficiency) for efficient and cost effective systems, and capacity to meet enterprise production and product requirements.

Refrigeration concepts and terms include:

- ambient temperature
 - Biot number: ratio of conductive (internal) resistance to heat transfer to the convective (external) resistance
 - half cooling time
 - surface heat transfer
 - thermal properties of meat including conductivity.
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- Stakeholders** may include:
- company owners, directors, shareholders, financiers
 - competitors
 - management and employees
 - suppliers, customers, consumers
 - unions and employer associations.
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Performance measures for cold chain systems may relate to costs, energy consumption, food safety, product quality and customer specifications.

- Communication** may:
- be formal or informal
 - be inclusive of the cultural, ethnic and social diversity of individuals and groups
 - involve face-to-face, technological and electronic methods
 - involve reading and interpreting workplace-related documentation
 - occur in a variety of sensitive, conflictive, collaborative and supportive environments
 - require analysis and presentation of complex concepts, technical information, mathematical information and other data in simple or complex formats
 - require assertiveness, persuasion and negotiation skills.
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- Mathematical skills** may:
- relate to complex actual and hypothetical technical and financial modelling, calculations, interpretation or analysis
 - be complex and relate to product and product quality, financial operations, personnel, operations, sales and turnover, exports, etc
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- Strategies for reducing heat loads** may include:
- air curtains
 - automatic door closers
 - improved insulation to prevent heat filtration through wall
 - no lights, people, machinery inside
 - plastic strips
 - removal of heat load caused by fans.
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- Impact of humidity** on eating quality, production and storage of meat and meat products includes:
- high humidity, condensation – hygiene, micro-growth or spoilage, reduced efficiency of refrigeration plant – coils, cooling towers, evaporative condensers, reduced efficiency of dryers, slow carcass drying, mould growth processing rooms, worker discomfort, deterioration of paint, equipment, plant, poor carcass
 - low humidity – weight loss, cold storage, thawing, poor carcass appearance, burns and discolouring, slow thawing.
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- Qualities of *humidity* include:
- enthalpy of humid air (heat content of humid air)
 - relative humidity
 - saturation absolute humidity
 - saturation vapour pressure.
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- Effects of *chilling or chilling rates* on product quality include:
- changes in evaporation and therefore weight
 - changes in pH levels
 - changes in repacking density
 - cold shortening and toughening
 - harder to identify source or species
 - microbiological growth
 - oxidative rancidity
 - variable tenderness from external and internal factors.
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- OH&S requirements* may include:
- enterprise OH&S policies, procedures and programs
 - hygiene and sanitation requirements
 - OH&S legal requirements
 - Personal Protective Equipment (PPE) which may include:
 - coat and apron
 - ear plugs or muffs
 - eye and facial protection
 - head-wear
 - lifting assistance
 - mesh apron
 - protective boot covers
 - protective hand and arm covering
 - protective head and hair covering
 - uniforms
 - waterproof clothing
 - work, safety or waterproof footwear
 - requirements set out in standards, codes of practice etc.
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- Workplace requirements* may include:
- enterprise-specific requirements
 - OH&S requirements
 - Quality Assurance requirements
 - Standard Operating Procedures
 - the ability to perform the task to production requirements
 - work instructions.
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Systems improvement may include assessment of alternative refrigeration strategies such as:

- different configurations and types of chillers
 - repair, upgrade or purchase of new equipment and systems
 - use of alternative energy sources or alternative refrigeration service models such as:
 - combination of internal and external expertise
 - external contractors
 - internal personnel.
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Methods of chilling and freezing meat and meat products may include:

- air – natural convection, forced convection, spray chilling
 - air freezing
 - contact freezing
 - cryogenic – gaseous, solid, liquid (liquid nitrogen, solid carbon dioxide)
 - cryogenic freezing
 - direct contact – plate freezing, conduction
 - direct freezing systems
 - liquid immersion – chilled water or glycol solution.
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Regulatory requirements may include:

- animal welfare
 - Australian Standards relevant to the meat industry
 - commercial law including fair trading, trade practices
 - consumer law
 - corporate law, including registration, licensing, financial reporting
 - environmental and waste management, sustainable work practices
 - equal opportunity, anti-discrimination and sexual harassment
 - Export Control Act
 - HB 40.1-2001 The Australian Refrigeration and Air-conditioning Code of Good Practice – Reduction of emissions of fluorocarbon refrigerants in commercial and industrial refrigeration and air-conditioning applications
 - industrial awards, agreements
 - relevant regulations
 - state regulations regarding meat processing
 - taxation.
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EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

Overview of assessment	<p>The meat industry has specific and clear requirements for evidence. A minimum of three forms of evidence is required to demonstrate competency in the meat industry. This is specifically designed to provide evidence that covers the demonstration in the workplace of all aspects of competency over time.</p> <p>These requirements are in addition to the requirements for valid, current, authentic and sufficient evidence.</p> <p>Three forms of evidence means three different kinds of evidence – not three pieces of the same kind. In practice it will mean that most of the unit is covered twice. This increases the legitimacy of the evidence.</p> <p>All assessment must be conducted against Australian meat industry standards and regulations.</p>
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>Competency must be demonstrated through sustained performance over time, at an appropriate level of responsibility and authority under typical operating and production conditions for the enterprise.</p>
Context of and specific resources for assessment	<p>Resources may include:</p> <ul style="list-style-type: none">• a real work environment• relevant documentation such as:<ul style="list-style-type: none">— customer specifications— manufacturer’s instructions and operations manuals— QA manuals— regulatory requirements— workplace policies and procedures• relevant equipment and materials.
Method of assessment	<p>Recommended methods of assessment are:</p> <ul style="list-style-type: none">• a third party referee report of sustained performance at appropriate level of authority and responsibility• assignment focusing on understanding and application of principles and theory to workplace operations• workplace projects with focus on company environment and conditions. <p>Assessment practices should take into account any relevant language or cultural issues related to Aboriginality, gender, or language backgrounds other than English. Language and literacy demands of the assessment task should not be higher than those of the work role.</p>

Guidance information for
assessment

AUS-MEAT (www.ausmeat.com.au).

Meat and Livestock Australia (www.mla.com.au):

- *Coagulase Positive Staphylococci on Beef Carcasses* (1997) PPI 134
 - *Energy Management Brochures* (1998)
 - *Escherichia coli on Beef Carcasses* (1996)
 - *Predictive Microbiology for the Meat Industry* Jul (1999) PPI 131
 - *Safe Beef Carcase – Export Chilling Procedures* (1999)
 - *The Microbiology of Australian Meat* (2000) PPI 133.
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