

# AUSTRALIAN FOOD AND GROCERY COUNCIL

## AUSTRALIAN COLD CHAIN GUIDELINES FOR FOOD 2013

For the handling, storage and transport of refrigerated foods: fresh, chilled and frozen (including ice cream) for sale in retail and food service outlets.



An initiative of:  
Australian Food and Grocery Council (AFGC)

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This document is intended as a guide only: legal requirements are contained in the Australia New Zealand Food Standards Code and other applicable State and Territory Food or Health laws as relevant to the jurisdiction within which goods are traded.

The information in this document should not be relied upon as legal advice or used as a substitute for legal advice. You should exercise your own skill, care and judgement before relying on this information in any important matter.

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## Preface

It has been estimated that contaminated food caused approximately 5.4 million cases of gastroenteritis annually in Australia<sup>1</sup>, of which some may have been caused by food in which bacteria had grown to dangerous levels because the food was not kept properly chilled for an extended period of time.

Australians are throwing away food which is worth \$5.2 billion a year. This includes more than \$1.1 billion worth of fruit and vegetables and \$872.5 million worth of fresh meat and fish every year<sup>2</sup>. A significant proportion of food waste is the result of bulk food purchases, and the food 'going off'. One contributing factor for food waste is failing to achieve manufacturers' best-before or use by date because of poor Cold Chain management.

Food Standards Australia New Zealand (FSANZ) specifies requirements in the [Australia New Zealand Food Standards Code](#)<sup>3</sup> ([the Food Standards Code](#)) to ensure the safety of foods and enable consumers to make informed choices. The Food Standards Code:

- Specifies microbiological safety limits in foods;
- Mandates the requirement that foods with a shelf-life of less than two years must display either a 'best before' or 'use by' date; and
- Specifies the minimum requirements for food businesses in the hygienic handling and storage of foods to minimise the risk of contamination or deterioration of foods.

## What is the Cold Chain?

Over the last two decades, the distance that foods travel from paddock to plate has increased. The average food is moved in and out of refrigeration control 14 times across the Cold Chain before consumption. In one South Australian study, broccoli took 39 steps along the Cold Chain – having as many as 23 operators and 21 stages involved on the way – to reach consumers<sup>4</sup>.

The Cold Chain consists of a series of businesses engaged in manufacturing, transporting, storing, retailing and serving chilled and frozen foods. The effectiveness of the Cold Chain in maintaining the safety, durability and quality of foods relies on controlling product temperature through each and every step. The delivery and receipt of safe and high-quality food products to consumers requires the food premises at all links in the Cold Chain to understand and meet temperature requirements for chilled and frozen foods.

Food businesses receiving foods are legally required to ensure that foods being delivered are in good condition - free from contamination with packaging not damaged. The Food Standards Code (Standard 3.2.2) requires that potentially hazardous food must be transported under temperature control (if chilled at +5°C or below or if hot at +60°C or above, or if frozen, not partly thawed), and must not have been left outside of temperature control beyond safe time limits. This Guideline does not cover foods that are stored at temperatures above +60°C.

Product temperatures in the range from +5°C to +60°C, as specified in Standard 3.2.2, can support the rapid growth of bacteria and microorganisms. The longer that chilled and frozen products are kept at elevated temperatures, the more rapid the deterioration in product quality and the greater the potential for food-borne illness to occur if products are consumed.

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1. Estimating foodborne gastroenteritis. Australia. circa 2000 (Hall & Kirk 2005)

2. [http://www.ces.org.au/Other%20stuff/Australia\\_Institute\\_What\\_a\\_waste\\_of\\_food.pdf](http://www.ces.org.au/Other%20stuff/Australia_Institute_What_a_waste_of_food.pdf)

3. [www.foodstandards.gov.au](http://www.foodstandards.gov.au)

4. [www.foodprocessing.com.au](http://www.foodprocessing.com.au), Oct 6, 2005

## Revision of the Cold Chain Guide (2013 version)

The *Australian Cold Chain Guidelines for Food 2013* (the Guidelines) are the result of the formal industry review of *The Australian Cold Chain Guidelines 1999* and provide best practice recommendations for transport storage and logistics to ensure the safety and quality of chilled and frozen foods. This document is advisory only and provides additional guidance to requirements of Australian food law.

This 2013 Cold Chain Guide review has made amendments to:

- Provide consistent interpretation of requirements of the Food Standards Code;
- Outlines procedures intended to meet the safety requirements of the Food Standard Code, as well as consistent product quality; and
- Offers clearly designed guidelines to assist the food industry supply chain in transport and logistics requirements, with a focus on food quality guidelines as well as incorporating all vehicle and driver procedures.

Food businesses must comply with Food Standards Code requirements and other relevant legislation in the supply of safe, quality food. In Australia, this legislation includes:

- The [Competition and Consumer Act 2010](#);
- The [Imported Food Control Act 1992](#);
- State and Territory Food Acts; and
- State Fair Trading Acts.

This Guideline is intended to strengthen the Australian Cold Chain for food. It has been designed to ensure the development, implementation and ongoing maintenance of systems that meet essential Cold Chain requirements and to ensure the safety and quality of chilled and frozen foods. The Guideline will assist businesses to avoid negative impacts on food product quality and safety, reducing the risk of food spoilage and avoiding rejection of shipments by receiving businesses, thereby reducing unnecessary food waste by industry and consumers.

## Benefits to the Consumer and the Industry

Today's consumer is looking for safe, durable, quality foods at affordable prices<sup>5</sup>. The last two decades have witnessed a profound change in the eating habits and retail food purchasing patterns of Australian consumers<sup>6</sup>. Convenience foods of every type are well established and continue to enjoy popularity. In particular, refrigerated foods comprise one of the fastest growing segments of the Australian grocery and foodservice industries.

Maintaining consumer confidence in chilled foods, as the basis for continuing sales and profit growth, depends on an efficient and effective system where product safety and quality are protected at each link of the Cold Chain.

The Guidelines recommend practices for the handling of refrigerated foods in each link of the Cold Chain, with the aim of ensuring that products reach the consumer at optimum safety and quality. They do not cover in detail all manufacturing practices that occur prior to the manufactured product being placed into cold storage or final handling by the customer.

Whilst every effort has been made to provide a complete guide for Cold Chain businesses to develop and implement effective food safety plans that may or may not include food quality aspects, the importance of quality training using appropriately written standard operating procedures for all staff involved in the Cold Chain process cannot be overstated.

5. [www.who.int/foodsafety/publications/capacity/en/English\\_Guidelines\\_Food\\_control.pdf](http://www.who.int/foodsafety/publications/capacity/en/English_Guidelines_Food_control.pdf)

6. [www.pc.gov.au/data/assets/pdf\\_file/0019/113761/retail-industry.pdf](http://www.pc.gov.au/data/assets/pdf_file/0019/113761/retail-industry.pdf)

## Training and Education

Those involved in the Cold Chain should:

- Liaise with customers and suppliers to explain the need for the Cold Chain and its purpose;
- Implement an ongoing program of training for personnel covering housekeeping, hygienic discipline and process control requirements, management training in safety and quality, and include retraining and refresher courses to reinforce knowledge; and
- Review policies and operating procedures recommended by Hazard Analysis and Critical Control Points (HACCP) and internal Food Safety Programs.

## SECTION 1:

### Food Safety Requirements

The Australia New Zealand food standards system is a cooperative arrangement between Australia, New Zealand and the Australian state and territories to develop and implement uniform food standards. The system is governed by food legislation in state, territory, New Zealand and the Commonwealth of Australia, including the [Food Standards Australia New Zealand Act 1991](#) (the FSANZ Act).

The FSANZ Act establishes the mechanisms for the development of joint food regulatory measures and creates Food Standards Australia New Zealand (FSANZ) as the agency responsible for the development and maintenance of the Food Standards Code.

Food Safety considerations must be assessed and managed, from raw materials to processed manufactured foods and throughout the supply chain. Examples of different types of food safety risks that should be considered include:

Microbiological risks:

- Including bacteria, fungi, viruses, parasites and microbial toxins.
- An example of microbial contamination risk is fluid leaking from raw chicken meat onto other foods such as fresh fruit, resulting in potential contamination of fruits with food poisoning bacteria.

Chemical risks:

- Including food allergens in one food contaminating other foods and contamination from non-food products.
- An example of chemical contamination could result from the handling of a pallet within a mixed load containing chemicals which could leak onto food products, such as garden sprays, household cleaning chemicals etc.

Physical risks:

- Including naturally occurring objects found in a food, such as bone chips, hair, leaves, seeds, shelf fragments.
- Also foreign objects that could come into contact with the food, such as insects, stones, rodent or bird droppings, glass, metal, plastic, personal effects and packaging components.
- An example of physical object contamination during the cold-chain storage may be the contamination of an open crate of vegetables with glass fragments from broken overhead lighting.

Chapter 3 of the Food Standards Code specifies food safety requirements that apply to food businesses in Australia only, and do not apply in New Zealand. They are:

- Standard 3.1.1 Interpretation and Application
- Standard 3.2.1 Food Safety Programs,
- Standard 3.2.2 Food Safety Practices and General Requirements
- Standard 3.2.3 Food Premises and Equipment
- Standard 3.3.1 Food Safety Programs for Food Service to Vulnerable Persons.

## Food Safety Programs

State or territory authorities may require specific classes of food business to introduce Food Safety Programs.

As described in [Standard 3.2.1](#) under Purpose.

*‘The principle that food safety is best ensured through the identification and control of hazards in the production, manufacturing and handling of food as described in the HACCP system, adopted by the joint WHO/FAO Codex Alimentarius Commission, rather than relying on end product standards alone. This standard enables States and Territories to require food businesses to implement a food safety program based upon the HACCP concepts. The food safety program is to be implemented and reviewed by the food business, and is subject to periodic audit by a suitably qualified food safety auditor.’*

While it is mandatory for some food businesses to implement a food safety program, other food businesses may choose to do so for their own business purposes.

Those food businesses that use HACCP systems need to demonstrate that this preventative approach has been implemented correctly by demonstrating compliance with Standard 3.2.2 through documentation, record keeping and review.

All businesses that handle food intended for sale, or sell food, in Australia are required to comply with state and territory food (or health) acts. This legislation generally does not apply to ‘primary food production’ activities. Consequently, businesses, such as farms, that engage in primary food production are not required to comply with the Food Safety Standards unless they engage in processes involving the substantial transformation of food or the sale or service of food directly to the public. Additionally, in most jurisdictions, the Food Safety Standards do not apply to businesses regulated by any other food production legislation, for example state and territory meat or dairy acts.

Food safety regulations issued nationally through FSANZ now also apply to most parts of the food transport chain. In Australia, when the legislation was fully introduced in 2002, it also classified food transporters as food handling businesses and they must be registered and comply with the various state-based food acts.

It should be noted that, as part of the food safety program, jurisdictions and food safety auditors may require records that demonstrate the program has been followed or that appropriate action has been taken.

The Food Safety Standards do not apply to food businesses in New Zealand. New Zealand food businesses are required to operate under the New Zealand Food Hygiene Regulations 1974 or adopt a Food Safety Programme, under the provisions of the New Zealand Food Act 1981. Certain primary production industries handling meat production in New Zealand are also required to implement a Food Safety Programme.

By following these Guidelines, operators of food businesses in the Cold Chain can establish complimentary systems that help to meet legal requirements.

## SECTION 2:

### Cold Chain Guideline Requirements

#### 2.1 Cold Chain

The Cold Chain consists of the series of businesses engaged in manufacturing, transporting, storing, retailing and serving of chilled and frozen foods. This Guideline covers the flow of chilled and frozen foods from the manufacturer to the consumer. The effectiveness of the Cold Chain in maintaining the safety, durability and quality of foods relies on managing product temperature through each and every step from the manufacturer to the consumer.

Each food business depends on the commitment of each and every link in the Cold Chain to deliver safe, quality products to the consumer. Based on managing the risks associated with multiple transfers of food products in the cold Chain the following rule and guidelines have been developed:

- NEVER WARMER THAN rule (see Section 3)
- MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines (see Section 4).

#### 2.2 Understanding Temperature and Time Relationships

Refrigerated storage of food at low temperature is an excellent method of extending a product's shelf life and useability. This is because temperatures below +5°C slow the natural deterioration and spoilage of fresh foods, and the growth of microbes, keeping foods safer and edible for longer than would otherwise be the case. Refrigeration does not kill microbes, and some bacteria capable of causing illness are able to grow under normal refrigeration temperatures, so there are limits on how long foods can be safely held under refrigeration.

##### Rate of Deterioration

The safety and quality of chilled foods depends very much on the time and temperature history of the product. Every person involved in the handling of chilled or frozen food throughout the Cold Chain has an impact on this history.

Exposing chilled foods to temperatures warmer than +5°C can lead to the rapid growth of microorganisms, resulting in decreased shelf life through spoilage and potentially unsafe food (see Appendix 1). Elevated temperatures can also adversely affect product quality (such as loss of shape and poor texture), especially delicate, perishable produce like fresh horticultural products. Softening, bruising, unwanted ripening, bacterial growth and texture degradation lead to reduced product shelf life, and potentially product loss at the retail level through spoilage or rejection of the consignment.

Standards and regulations for specific requirements in particular industries may conflict with the generic recommendations in this Guideline. For example, the Standing Committee on Agriculture and Resource Management's regulations for the meat industry and some requirements of the Department of Agriculture, Fisheries and Forestry, such as Approved Arrangements for exports <sup>7</sup>.

Before any business decides that a food can be stored or transported at a temperature above +5°C, a thorough validation process must be completed. This will often include a microbiological assessment of safety, a physical test examining quality and an assessment of the impact on shelf life of the product. In the case of processed packaged foods the manufacturer will specify both the shelf life of the product and the temperature conditions

The elevated temperature being set (if validated as safe) should be written into any contract covering storage or transport and in the Food Safety Program.

## Breaking the Cold Chain

A break in the Cold Chain at the critical control points identified – whether caused by failure to follow established procedures or faulty equipment – can result in food which is likely to spoil more rapidly, resulting in food that is unsuitable and potentially unsafe for consumption.

The critical points for food safety and food quality can be found through a process of hazard identification. HACCP analysis of chilled foods typically places an emphasis on the control of microbiological spoilage and the risks posed to vulnerable populations through inadequate temperature control. For example, inadequate temperature control could result in the growth of *Listeria monocytogenes* in dairy products and processed meats that could present a serious health risk, particularly for pregnant women and the elderly.

Where there is a break in the Cold Chain, such as a failure to comply with the MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines, it is essential that corrective actions are recorded. These are valuable for food businesses to demonstrate what was done when food exceeded the MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines, both in dealing with the affected product and in addressing the cause of the problem to prevent it from happening again.

A break in the Cold Chain for chilled foods can reduce shelf life through an increased growth of spoilage organisms such as moulds or psychrophilic bacteria such as *Pseudomonads*. Some spoilage organisms emit a pungent odour which can create doubt about the product's integrity at the consumer level and increase wastage losses across the supply chain.

## SECTION 3:

### NEVER WARMER THAN RULE

These Guidelines refer to the NEVER WARMER THAN rule, which is designed to ensure that safety and quality are maintained throughout the Cold Chain handling process.

The recommended product temperatures that constitute the Cold Chain NEVER WARMER THAN rule are as follows:

- All chilled foods must be stored and handled at temperatures between 0°C and +4°C and ensure the product temperature is NEVER WARMER THAN +5°C unless otherwise specified; and
- Frozen food products (including Ice Creams) must be stored or handled NEVER WARMER THAN -18°C.

Due to problems of heat exchange with other products, either in a cold store or when transported on the same vehicle, some businesses may require products normally stored at room temperature to be transported and delivered at +4°C to ensure the NEVER WARMER THAN +5°C rule does not impact on the chilled food products in a mixed load. See also Section 5.

A supplier and Cold Chain customer must establish in a specification or contract, prior to supply of the product, the conditions, especially of temperature and time that must be in place at all times to ensure the safety and quality of any product when **not** adhering to the NEVER WARMER THAN rule.

It is a prerequisite of HACCP and other food safety programs that records of control points be kept for audit and review. For the cold chain, these records should include temperature of stock taken upon receipt, the temperature of storage areas and display cabinets, and the internal temperature of refrigerated transport vehicles throughout the food supply chain. Manufacturers, owners or authorised representatives must be notified immediately of a breach of the NEVER WARMER THAN rule to establish a course of action for the assessment and possible withdrawal and disposal of damaged or unsafe stock. The above temperature requirements and the means of measurement should be written into all Food Safety Programs and any transport contract arrangements.

The NEVER WARMER THAN temperatures are based on a combination of science that has been validated and an extensive history of safe, quality food delivery at these temperatures.

The NEVER WARMER THAN temperature of -18°C for frozen food is based on the traditional Imperial temperature of 0°F, at which enzymatic activity effectively ceases. As frozen food is warmed above -18°C, the natural enzymes present become increasingly active, which can result in the development of unacceptable off-flavours and, ultimately, the complete deterioration of the food, even though it may still appear frozen.

Ice cream is a complex colloidal system and includes ice crystals in a concentrated unfrozen aqueous phase. These products should be treated as the product most tested on receipt and dispatching (i.e. assessing whether conditions have failed to maintain the product most sensitive to temperature abuse).

Always ensure effective storage and handling practices are being used to maximize product safety, maintain product quality and avoid physical damage from forklifts, pests, chemical leaks, poor hygienic cleaning and / or poor housekeeping.

#### NEVER WARMER THAN rule:

- All products must be kept at temperatures NEVER WARMER THAN the recommended temperature.
- Always keep chilled foods at a temperature between 0°C and +4°C to ensure the product temperature is NEVER WARMER THAN +5°C.
- Always keep frozen foods and ice cream NEVER WARMER THAN -18°C .
- This rule also requires that product dispatched from a manufacturing or processing centre arrives at the next site NEVER WARMER THAN the above temperatures.

#### Variations allowed to the NEVER WARMER THAN rule

The temperature of +5°C may not be applicable for all chilled foods; as some may require higher or lower temperatures to prevent damage or reduction in product quality. In these cases, it is likely that the manufacturer will indicate when special temperature requirements apply.

Note that product temperature can be affected by placing another product which has a different temperature (and significant thermal mass) in the same holding area. This must always be considered before a decision is made to vary from the NEVER WARMER THAN rule.

#### Colder Storage items:

Some foods that require refrigeration for safety and quality reasons may require storage or transportation at temperatures colder than +5°C.

Examples include:

- Some varieties of fish and shellfish and products using these items as ingredients;
- Modified atmosphere packaged meat products; and
- Value added fresh produce (e.g. alfalfa sprouts, washed and packed salads).

#### Warmer Storage items:

Other chilled foods should not be stored or transported at temperatures as cold as +5°C for quality reasons as the foods may be easily damaged from being too cold, or may suffer problems from high moisture condensate.

Examples of these products include:

- A wide variety of fresh produce lines suffer quality problems through the chilling injuries and increased potential spoilage from moisture that condensates in packaged produce, when refrigeration temperatures are lower than the reference distribution temperatures for these fresh produce lines;
- Fermented or cured meats, such as some prosciutto hams and salami-style products, which, by nature of the ingredients and processing conditions may be safe to store even at ambient temperatures, but which may be kept cold to prolong eating quality;

- Processed and mature cheeses. Most natural hard cheese keep best at their ripening temperature, usually 12-15°C. However, many fresh and soft white cheeses need to be stored colder. Some cheeses require a higher humidity; otherwise they can quickly dry out. There is more moisture in soft cheeses than hard varieties;
- Confectionery, particularly chocolates, can be particularly sensitive to too low a temperature, which along with high refrigerator moisture and humidity levels can lead to sugar or fat bloom and off-flavors;
- Specific thaw-baked pastry products can be temperature sensitive; and
- Table spreads may have specified storage temperature requirements.

## SECTION 4:

### MAXIMUM OUT OF REFRIGERATION TIME LIMIT GUIDELINES

In general, all products that leave refrigeration zones within the Cold Chain handling processes should never pass the following MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines.

#### Maximum Out Of Refrigeration Time Limit Guidelines

Chilled and frozen foods that are received in uncontrolled temperature docks or temperature controlled ante-rooms should comply with the MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines, which are set to maintain product safety and product quality, leading to a reduction in shrinkage and consumer complaints.

This guideline applies to most normal operating conditions, however there may be unusual circumstances, such as extremes of ambient conditions, where it may be appropriate to vary the guideline. In these cases it is important that the NEVER WARMER THAN rule is always adhered to.

The recommended tolerances to be established for Ice Creams and other frozen foods at receipt docks or when being put on display at retail levels should ALSO meet FSANZ's:

- Mandatory microbiological limits in Standard 1.6.1; and
- Commodity advisory microbiological limits within the user guide to Standard 1.6.1.

#### For Chilled Foods

Where chilled foods are being un-loaded or dispatched in either ambient (normal temperature) or in +5°C to +15°C air conditioned ante-room (temperature zone) conditions, the food is permitted out of the correct refrigeration storage for a maximum time of 20 minutes.

#### For Frozen foods

- Where frozen foods are being un-loaded or dispatched in ambient (normal temperature) conditions, the frozen food is permitted out of the correct refrigeration storage requirement for a maximum time of 20 minutes;
- Where frozen foods are being un-loaded or dispatched in +5°C to +15°C air conditioned ante-room (air conditioned temperature zone) conditions, the frozen foods are permitted out of the correct refrigeration storage requirement for a maximum time of 60 minutes;
- Where frozen foods are being un-loaded or dispatched in 0°C to +5°C refrigerated ante-room (chilled temperature zone) conditions, the frozen foods are permitted out of the correct refrigeration storage requirement for a maximum time of 90 minutes;
- Ice cream responds more rapidly than other frozen food to temperatures above -18°C, and should be loaded last and unloaded first direct from/to storage freezers whenever possible. Ice cream is permitted out of the correct refrigeration storage requirement for a maximum time of 20 minutes, irrespective of the unloading or dispatch environment.

MAXIMUM OUT OF REFRIGERATION TIME LIMIT GUIDES:

- Maximum of 20 minutes for all chilled foods if no refrigeration controls exist at receipt docks; or
- Maximum of 20 minutes for frozen ice-creams received into air-conditioned (+5°C to +15°C); or
- Maximum of 60 minutes for frozen foods in +5°C to +15°C air-conditioned anterooms; or
- Maximum of 90 minutes for frozen foods in 0°C to +5°C chilled anterooms.

This rule guide must always be considered and must support the NEVER WARMER THAN RULES.

## SECTION 5:

### GUIDE TO MIXED LOADS

Appropriate measures should be taken to ensure effective product temperature separation (where possible). For example, use partitions, locate frozen products adjacent to evaporators and, where possible, use dual temperature vehicles and separate compartments when mixing frozen foods and/or chilled foods with other foods.

Food safety issues may arise when raw products (e.g. uncooked meats) are stored or transported with fully processed ready-to-eat products. Stacking raw product that may leak (e.g. cartons of fresh meats or poultry) on top of ready-to-eat product or fresh foods that may never be cooked can lead to cross-contamination and potentially to serious illness.

Always try to avoid carrying mixed loads of products that demand two or more un-segregated loads with different temperature regimes to minimise temperature loss. This is most likely to be a concern for transport in rural and remote areas, including using barges and other difficult transport delivery situations. It is also important to recognise that transport vehicles are only intended to maintain product temperature. Product should be loaded already chilled or frozen to the intended transport temperature.

Where mixed loads are unavoidable, it is imperative that the temperature integrity of all refrigerated products is protected. The temperature should be maintained to meet the requirements of the product demanding the coldest conditions. Three recommendations follow for these situations:

- Vehicles used to carry mixed fresh ambient, chilled and frozen foods, should have compressors set to no warmer than -22 C. This will protect temperature sensitive frozen goods such as ice cream. However, it is important to note that not all fresh ambient products will be able to be transported under these conditions. Many fresh herbs, fruits and vegetables will be damaged with loss of quality and suitability if frozen and should not be included in a mixed load with frozen foods;
- Vehicles used to carry mixed fresh ambient and chilled goods should have compressors set to no warmer than +4C and no cooler than +2C to protect the chilled products;
- It is recommended that mixed loads be validated using data-loggers or validation checks to confirm and set maximum distances that loads should be carried on the fleet being used due to differences in temperature zones, equipment types and un-segregated food types – fresh, chilled, frozen, ambient or dry goods.

Recognising that different frozen and chilled products may be stored, transported and displayed together, the NEVER WARMER THAN rule requires that the temperatures of different food products do not affect the temperatures of accompanying products. While some fresh foods (e.g. unwashed potatoes, bulk citrus fruits) can be stored warmer than +4°C, they may need to be stored at cooler temperatures to maintain compliance with the NEVER WARMER THAN rule when moving with other chilled foods through the Cold Chain.

To assist the food industry and transport operators meet the NEVER WARMER THAN rule, Table 1 provides a guide to vehicle thermostat settings when transporting various types of mixed loads, including specific requirements for transporting confectionery, especially chocolate and chocolate coated products (such as chocolate coated biscuits).

**Table 1: General guide for thermostat setting used for mixed loads.**

Frozen food -18°C or less	Chilled food 0°C to +4°C	Fresh food +5° to +7°C	Confectionery approx +15°C	Ambient goods +15°C to 30°C	Thermostat setting
			X	X	+15°C (all runs)
		X	X	X	+5°C (all runs)
	X	X	X	X	+2°C (run > 2 hr) +4°C (metro run)
	X	X			+4°C (all runs)
X	X			X	-22°C (all runs)

**X** = food is present on load with Thermostat setting as guideline setting to validate or use.

**Metro run** = run that has frequent delivery stops and distribution centre within 2hours.

**NOTE 1:** The temperature thermostat settings can and may need to vary based on the volumes of different food types being carried. The above is a guide only and may not be suitable under specific circumstances.

**NOTE 2:** Other options may be applied but must be validated to ensure the settings protect frozen foods and protect fresh foods. Options may include thermal protective devices using shrink-wrapping, pallet covers or other segregation options.

Care should be taken when transporting fresh items on a mixed load to ensure cross-contamination of the ready-to-eat or fresh product by leakage from raw product does not occur. Transporting raw and ready-to-eat foods and fresh foods in separate compartments in the vehicle is one possible solution for this issue.

Fresh foods in mixed loads are at risk of being damaged quickly by the thermostat setting of the delivery vehicle:

- Very cold temperature settings can cause freezer burn or affect respiration of fresh foods damaging the outer product (e.g. browning of bananas); and
- Very warm temperature settings can increase respiration rates of fresh fruits and vegetables leading to faster enzymatic and other deterioration processes, leading to loss of product at retail and consumer levels (e.g. wilting lettuce from hot delivery means high leaf wastage pre-sale or post-sale)

Storage and transport of confectionery over an extended time at temperatures below +5°C can be detrimental to confectionery items as they are particularly sensitive to temperature (too high, too low, or large/fast temperature variations). Humidity also plays an important role in product quality, since excessive humidity or dampness can lead to sugar or fat bloom and off-flavours. Consequently some confectionery needs to be stored, handled and distributed in temperature and air humidity controlled conditions.

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The potential food safety dangers of transporting raw and ready-to-eat and fresh products must be considered when a transport business is developing its food safety program and when contracts are being established for services.

Non-food items may sometimes be transported with refrigerated foods especially on food service and route trade vehicles. Care should always be taken to ensure that there are effective layers of protection and segregation between food and non-food items. Avoid potentially dangerous non-food items, such as household cleaning chemicals or gardening products (such as fertilizer and potting mix) being transported in the same load as food items.

### **Garbage and waste should never be transported with refrigerated foods**

Under certain circumstances, damaged unsafe or poor-quality product being returned from customer premises may be transported in the same vehicle as acceptable, safe high-quality product, provided they are clearly marked and isolated onto different pallets or zones. Such circumstances typically include when delivery vehicles are requested to return damaged or out-of-date stock to its origin, or when stock damaged in transit is returned to the cold store or depot. All care should be taken to ensure cross-contamination does not occur if transport under these limited circumstances is required.

Products not fit for their original purpose must be recorded upon collection on approved documentation for returns and be clearly identified or clearly isolated during transport so that safe, high-quality product is never mixed with unsafe, poor-quality product. Goods upon return then must be receipted back at the cold store facility into approved quarantine storage areas for assessment and re-sorting and not mixed with safe quality goods until assessed as safe to do so.

## SECTION 6:

### FOOD HANDLING CONDITIONS

#### 6.1 Stock Rotation

Correct stock rotation is based on the 'first-in' is 'first-out' (FIFO) rule, ensuring that stock which has been in the system longest is moved first by:

- Ensuring that shipping cartons are marked with a recognisable product identification showing pack size and batch or date code.;
- Recording and monitoring date marking or batch codes on product;
- Applying an appropriate receival date code to the product if date code details on the individual shipping cartons are not be visible;
- Ensuring that there is sufficient residual shelf-life available at the time of receipt of stock, taking into account the anticipated holding period in storage, to ensure the product will still be in date when put out for retail sale.

To ensure stock and inventory are correctly rotated with date codes consider recording these in an inventory information management system as appropriate.

#### 6.2 Frozen Goods - Ice Cream

Ice cream and ice cream products are particularly heat sensitive and at risk of quality defects due to fluctuating or elevated storage temperatures above  $-18^{\circ}\text{C}$  and should preferably be stored between  $-22^{\circ}\text{C}$  and  $-30^{\circ}\text{C}$ .

Dairy derived ice cream is an emulsion of fat, milk solids not fat (MSNF), sugar, emulsifier and stabiliser. The aqueous phase contains a concentrated lactose solution along with other sweetener salts. When aerated and quickly frozen, tiny ice crystals are responsible for the smooth product texture, while the MSNF concentration gives the characteristic creamy taste. The texture quality of ice cream and similar frozen products is extremely sensitive to temperature change and any damage is irreversible.

At no time in the Cold Chain, from the manufacturing facility through to cold store, distribution and retail display, to purchase from the retail outlet, should ice cream or ice cream products be allowed to become warmer than  $-18^{\circ}\text{C}$ . The MAXIMUM OUT OF REFRIGERATION TIME LIMITS in this Guideline have been established and validated primarily for the successful control and sale of these sensitive products.

Ice cream should be handled and stored in strict accordance with these Guidelines along with the manufacturer's specifications.

As is the case with all other refrigerated products, it is the responsibility of each individual operator to determine and maintain the environmental temperature requirements and handling practices necessary with these systems to ensure products are NEVER WARMER THAN the specified temperatures.

In view of the specific needs and sensitivity of ice cream products, a separate section has been included in most chapters of this document.

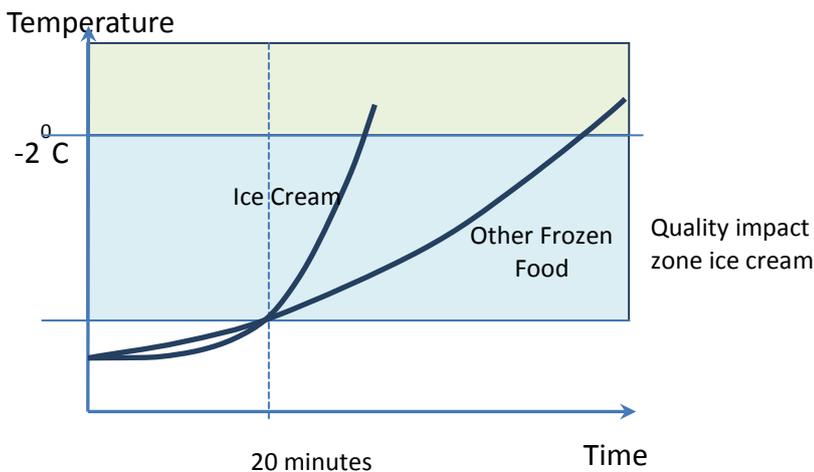
## Heat Shock of Ice Cream

The texture quality of ice cream is irreversibly damaged if the temperature is allowed to cycle into a range above  $-18^{\circ}\text{C}$  and colder temperatures.

Improved technology in ice cream manufacturing now produces smaller sized fat globules in ice cream products. These are very heat sensitive and will easily break down with any raised temperature fluctuations in the Cold Chain. The separation of fat and moisture out of the homogenous emulsion condition into fat and ice layers is a direct result of temperature fluctuations. As a consequence, ice cream becomes icy, granular and hard. This is known as 'heat shock' and frequently results in consumer complaints and stock losses.

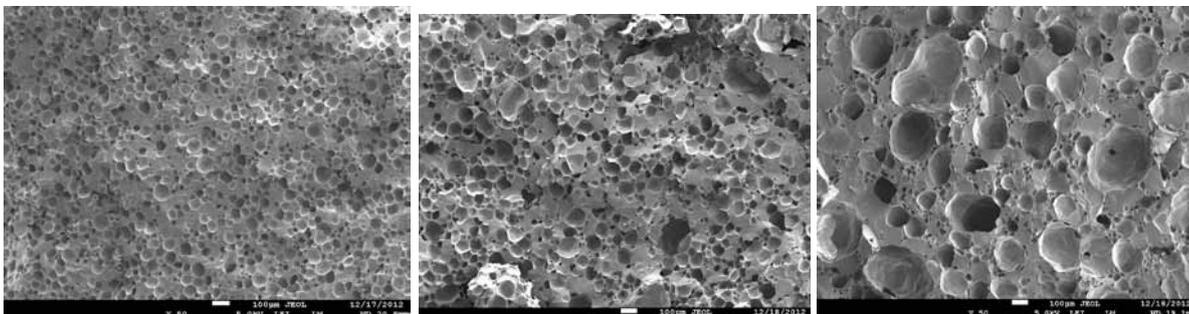
Some manufacturers of ice cream recommend storage of their products at temperatures colder than  $-18^{\circ}\text{C}$  to further avoid heat shock damage to their product.

*TIME versus Product Temperature graphical illustration of the difference in deterioration for ice cream compared to other frozen foods.*



The crucial time point occurs at 20 minutes and differentiates between quality impact and safety impact. Ice cream has a faster deterioration rate than other frozen foods such as frozen chicken or frozen vegetables.

The following SEM images show the progressive increase in crystals size in icecream with increasing temperature.



## SECTION 7:

### STORAGE-LOADING-DISTRIBUTION

#### 7.1 Manufacturing

Control of quality and safety of foods destined for the Cold Chain starts with the growers and manufacturers. The first stage consists of the harvesting, selection, receipt, and preparation, handling and processing of raw materials.

These Guidelines begin with recommendations for the packing and refrigeration of finished food products at manufacturing level (not growing level), as there are many ways for Cold Chain controls at harvest level that may differ from product to product.

##### Chilled Foods

Chilled foods should not be transported at temperatures warmer than +5°C (noting some exceptions in Section 3) and should be delivered with enough remaining shelf life deemed acceptable by the next cold chain recipient.

Potentially hazardous foods include processed fresh fruit and vegetable products, chicken meat, red meat and dairy products, all of which can support the rapid growth of food poisoning bacteria. These chilled foods, with a short shelf life, should be transported and delivered as quickly as possible.

##### Frozen Foods

Ensure an even temperature is obtained throughout the product. In most cases, frozen food has a shelf life of two years and should not be transported until sufficient time has elapsed to achieve a core temperature of -18°C.

Ensure MAXIMUM OUT OF REFRIGERATION TIME LIMITS are being met to reduce the exposure of frozen food and ice cream to temperatures warmer than -18°C and avoid product thawing.

To effectively implement these Guidelines, verify your operations by conducting random checks, frequently monitoring temperatures, confirm staff training, inventory controls and storage procedures are remaining effective.

##### Packaging the Product

Select consumer packs designed to:

- Minimise the risk of microbial, chemical and physical contamination.;
- Maintain product safety and quality through effective insulation;
- Minimise product dehydration and give optimum durability and shelf life;
- Provide storage and product information that is legible to consumers;
- Be food-grade compliant testing against either EU, USA or Australian FSC Standards.

Sourcing and using shipping cartons with:

- Dimensions that minimise the air space within the carton;
- Sufficient structural strength for the demands of storage, handling, and transport;
- Adequate support for the temperature and humidity conditions anticipated through the cold chain handling steps.

## Clearly Identifying the Product

Standards 1.2.1 to 1.2.11 provide the requirements for marking and labelling food products.

Marking the product with a recognisable pack size and batch or date code at the manufacturing stage permits traceability, effective stock rotation and the efficient operation of the Cold Chain.

GS1 is the global organisation dedicated to the design and implementation of global standards for unique identification of all trade items, services, logistic units, consignments, assets, documents, relationships, parties and locations at any point in the supply chain.

These standards are available from [GS1 Australia](#).

In general, always:

- Display a legible code on two adjacent sides or two opposite sides of the packaging;
- Display the word 'frozen' or 'chilled' (or a specific holding temperature) and the product name in a prominent place on consumer packs; and
- Include simple instructions clearly indicating the temperature below which the product must be stored.

## 7.2 Cold Storage Warehousing

The second stage of the Cold Chain includes the receipt, storage and dispatch of chilled foods into cold storage warehouses.

### The Role of the Cold Storage Operator

Effective cold store management helps to ensure the safety and quality of the product, as well as stock rotation. As many of the operations as possible should be performed under temperature-controlled conditions. If this is not possible, operations should follow the MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines.

### Stock Rotation

Cold storage operators should consult with the owners of the goods to ensure that correct rotation procedures are followed if minimum receipt limits are not being met as agreed.

### Receiving Products

Always:

- Identify the product immediately on arrival at the cold store is as ordered;

- Check condition of vehicle before unloading to ensure product has been stored hygienically;
- Check that mixed loads containing hazardous goods have not contaminated foods;
- Record the receipt date / time and conduct at least two product temperatures of each consignment received (must assess actual product and not shipping outers) ;
- Check and record that Use-By, Best-Before, or Packed on Date, or batch codes, are in place to meet the regulatory requirements and also meet the minimum shelf-life limits agreed between both parties; and
- Mark and/ or transfer completed product, after performing above receipt checks, making sure products are moved as quickly as possible to storage areas and ensure that at least the MAXIMUM OUT OF REFRIGERATION TIME LIMITS set within this Guideline are met.

Records should be retained for compliance with food safety program requirements, and will be an important part of traceability and investigation in case of product failure. Typically two years minimum retention is required by auditors and for the purpose of being able to rely on a due diligence defence with food safety regulators.

As a general guideline, all products that leave refrigeration during the Cold Chain delivery-receipt transfer process should never exceed the MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines. In cases where the delivery environment is severe, such as some food service delivery route runs, use of trolleys to transport chilled and frozen foods should be carried out as fast as possible.

Ideally, chilled and frozen foods should be transferred directly from cold areas on vehicles into cold holding areas, but the NEVER WARMER THAN rule and MAXIMUM OUT OF REFRIGERATION TIME LIMITS help to set clear guidelines for staff.

Corrective measures should be defined and agreed upon by both parties in advance to ensure the safety and quality of the product. If a consignment is received outside the appropriate temperature range, the pre-determined corrective measures should be taken, including consultation with the owner of the goods.

### **Air Circulation and Cold Storage**

Cold storage operators should always allow adequate air circulation around packed product on floor stacks, in ante-rooms and/ or on racking to ensure the even distribution of cold air, and control of product temperature.

Never store product in direct physical contact with walls, floors or ceilings.

Products stored on pallets placed direct onto floor spaces in ante-rooms, docks, and cool-rooms or on racking should be designed to be kept a minimum distance of 15 centimetres from walls and floors and 60 centimetres from ceilings. These distances may be varied according to specific needs, provided effective chilled-air circulation is achieved and maintained.

Where racked product storage exists and is located underneath ceiling refrigeration compressors, adequate measures should be in place to protect stock from damage due to water from defrost systems.

### **Temperature Control Regime for Cold Stores**

Achieving and controlling the appropriate temperature is essential when storing chilled foods. See Sections 3 and 4 for clear information on the NEVER WARMER THAN rule and the MAXIMUM OUT-OF-REFRIGERATION-TIME LIMITS.

Accurate thermometers should be used to help maintain the proper environment in the cold store or warehouse. Wherever practicable, use continuous-recorder digital or analogue thermometers. All thermometers should be calibrated regularly (at least annually). See Appendix 1 - Temperature Devices for more information.

To control cold store temperatures effectively:

- Minimise air temperature variation to avoid reduction in quality and reduction in useable shelf life of product;
- Minimise door openings and/ or traffic movement in and out of the cold store;
- Take prompt steps to reduce the product temperature should any increase occur;
- Ensure defrost cycle systems are adequately designed and that alarms are in place and will be triggered to ensure prompt corrective action will be taken;
- Conduct regular checks to ensure compressors, defrost cycles, thermostats and cooling towers are running safely and in good working order;
- Ensure that any damaged walls and door seals that could leak cold air out and allow hot ambient air in are promptly repaired; and
- Ensure optimum stacking patterns and floor layout to facilitate airflow.

## Recording Temperatures in Storage Rooms

Ensure that:

- Each storage room is monitored by a thermometer (preferably a recording thermometer with a linked alarm sensor) that is positioned to indicate the warmest return air temperature in the room;
- Each thermometer is calibrated and has a certified thermocouple accuracy of  $\pm 1$  °C;
- Monitoring is sufficiently frequent to detect trends in the malfunction of temperature controls, and at minimum must record temperature readings twice daily;
- Alarms are provided, and are triggered when a refrigeration/freezer unit is not holding food within the set temperature limits (with a time buffer of up to 30 minutes);
- Alarms are regularly checked to ensure they are operational;
- Charts are retained from recording thermometers for an agreed period (at least two years is recommended for frozen goods) or a period set by the business's auditing authority; and
- There is a validation system in place to demonstrate that it produces consistently accurate results.

This Guideline does not provide procedures for validation of refrigeration systems or for verification of core temperatures of specific foods stored. Corrective actions, thermocouple (alarm sensor), thermometer type, and calibration requirements should be further addressed in Food Safety Programs. Warehouse staff should be encouraged to check and provide information about storage conditions to the relevant personnel within the business.

## Corrective Procedures

Food Safety Programs should specify what corrective actions may be considered in the event of a failure at any stage in managing the product, such as, relocate the product to a functional cold store and re-chill or re-freeze.

If at any stage while at the cold store the product exceeds the NEVER WARMER THAN rule, immediately contact the owner, agent or authorised representative of the goods to confirm which of the pre-determined corrective measures should be taken and / or establish a course of action to assess the acceptability and safety of the affected product.

Corrective action plans must provide for both food safety issues, particularly in potentially hazardous foods, as well as product quality issues. The course of action will vary according to the product concerned and the time and extent of exposure to higher temperatures. Different responses are appropriate where product quality may be affected without affecting product safety, as compared to product which may have potential safety concerns.

The owner of the goods should advise the cold storage operator as to what action to take, which may involve placing the product on hold, rejecting the product or releasing the product for further movement through the Cold Chain.

It is essential that such incidents are recorded, along with what corrective action was undertaken and that the communication with the owner of the goods is accurately logged.

## 7.3 Transport Operations

The third stage of the Cold Chain involves the transportation of chilled and frozen foods to their destinations.

### The Role of the Transport Operator

Transport refrigeration vehicles are 'not usually designed to chill product down to a temperature but are only designed to maintain the existing product temperature. Care must be taken when loading pre-chilled or frozen product into a vehicle which is transporting mixed loads. See Section 5.

Road transportation for the cold chain is carried out in vehicles which have insulated walls, specially designed flow chutes, corrugated floors and fitted with evaporation units which create the cold air necessary to maintain the temperature required for the product. Off-road transportation by rail or ship uses special containers with evaporation units.

All carriers must have appropriate operating procedures for the proper management of chilled and frozen foods during transit. Refrigeration units must be serviceable and capable of maintaining the required product temperature at all times.

- Key items to be included in a Transport Vehicle Operator's Food Safety Program include:
- Thermometers to monitor the temperature of goods;
- Calibration checks on refrigeration compressor units on vehicles;
- Temperature data-loggers to record the frequency of refrigeration performance checks; and/or
- Radio frequency monitoring systems.

### Distribution Vehicles

Distribution vehicles are used for the final delivery to the retail and or food service point of sale location. Such vehicles are often used for multi-delivery work and products may be subject to temperature variation.

This may be influenced by a number of factors other than direct heat transfer through the body of the vehicle including ambient air temperature, compressor defrost cycle timings, load mix, run duration, and the number of door openings.

Distribution vehicles should be designed and operated with adequate refrigeration capacity to ensure that the temperature of products are maintained, taking into account the thermal mass of the load, the maximum loading and the air circulation space. Partitions should be provided to minimise the effect of product temperature drops, and manage the temperature of mixed loads.

Loads should be organised to avoid intermingling of fresh, frozen and chilled food products on the same pallets during distribution runs. Exceptions can be determined based on validation checks. These exemptions are based on checks that demonstrate that faster drop point handling prevents significant temperature loss or out-of-refrigeration-time limits being exceeded on a specific run by intermingling the load.

Each delivery vehicle must monitor and record the air temperature inside the storage area. Typically, chart-recording systems, data-logging monitoring systems and GPS Wi-Fi monitoring systems are used for this purpose.

At all times, avoid exposing product to ambient temperatures and other adverse conditions. Frequent stopping

for deliveries poses significant risks of unnecessarily increasing refrigeration compartment air temperature, and compartment doors should be open for the minimum time necessary to unload goods.

Plastic strips and secondary doors should be provided to reduce heat-gain during door openings. The integrity of door seals and the effectiveness of insulation are also factors in reducing heat-gain during transport.

### **Air Circulation**

The use of an appropriate refrigeration compressor, thermal insulation, and the design of distribution vehicles to allow stacking of cargo are all essential to ensure optimum refrigerated air circulation so that the product arrives at temperatures within the specified range.

Maintenance of compressor systems is essential, and will vary depending on the vehicle type, compressor type, the type of insulation, whether there is a bulkhead and whether strips or a curtain system is in place. Maintenance should be comprehensive, and compressor calibration checks should be carried out according to the specifications of the manufacturer.

### **Refrigeration Plant Operations on Vehicles**

Refrigeration plants (compressors) on vehicles should be frequently maintained and operated to ensure food safety and quality at all times.

Maintenance of vehicle compressor systems will vary depending on the vehicle type, compressor type, the type of insulation, whether there is a bulkhead and whether strips or a curtain system is in place. Maintenance should be comprehensive and compressor calibration checks should be carried out according to the specification of the manufacturer.

## **7.4 Dispatch and Delivery**

The fourth of the Cold Chain involves the control of dispatch and delivery process of chilled and frozen foods to their destinations.

During loading:

Ensure truck is pre-chilled to remove excess heat from insulated walls and temperature checks are set to meet the NEVER WARMER THAN rules;

- Turn off the vehicle's refrigeration plant when the doors are open (these can be automated using door sensors or engine ignition devices);
- Close the doors and turn on the refrigeration plant when loading is completed (these can be automated using door sensors or engine ignition devices);
- Establish efficient defrost cycles using thermostat devices. Manual defrost of a refrigeration unit should only be undertaken after unloading, or when the duration between drops is lengthy. In this case a manual defrost may be needed after delivery, to prevent ice build-up and losses in refrigeration performance; and
- Arrange maintenance corrective actions (as soon as possible) if the equipment is not operating in accordance with specifications.

## Dispatching Product

The temperature of product dispatched from cold stores should be maintained in accordance with the NEVER WARMER THAN rule and the MAXIMUM OUT OF REFRIGERATION TIME LIMIT guidelines. See sections 3 and 4. As noted above, distribution vehicles are not intended to chill product down to a temperature but rather, to maintain the existing product temperature when loaded.

All products that leave refrigeration in the Cold Chain dispatch process from a cold storage warehouse during the Cold Chain transfer processes should never pass MAXIMUM OUT OF REFRIGERATION TIME LIMITS.

Always:

- Complete product load-out movements as quickly as possible so that the temperature of the product remains NEVER WARMER THAN its recommended storage temperature;
- Avoid delays in cross-docking operations to ensure dispatching does not exceed the MAXIMUM OUT OF REFRIGERATION TIME LIMITS ; and
- Record the dispatch date and temperature of each consignment. Temperature checks should be performed on two to three pallets across the entire load, for example the front, middle and or rear pallets of the load. Retain records as required.

Also plan and provide all logistics documentation necessary to transport operators showing:

- An accurate description of the loaded cargo;
- The temperature of the goods released for transport;
- The total weight of the goods to allow for effective legal distribution of the goods on the vehicle;
- An acceptable lead-time to arrange a safe trip plan for its drivers to follow;
- The number of drops that may affect the delivery Cold Chain performance;
- A check that vehicle load restraints have been confirmed as adequate; and
- The set temperature the customer requires for successful delivery.

During transport:

- Carry out periodic temperature verification checks or confirm when receipted at each drop;
- If the product temperature is higher than the owner's specification, take corrective action to maintain product safety and quality;
- Corrective action may include returning the stock to its origin for assessment or reducing the temperature of the vehicle storage compartment to lower the temperature of the product; and
- Care needs to be taken when attempting to reduce a product's temperature so that safety and quality are not compromised. Contact the owner of the goods immediately and agree on the required course of action, allowing for the limitations of the vehicles involved.

## Ice Cream Delivery

Refrigerated vehicles used for the transport of ice cream are to be operated to maintain a maximum product temperature of -18°C. Distribution vehicles carrying mixed temperature product, including ice cream for multi-pallet delivery, must be equipped with refrigeration plants with adequate capacities and airflow to ensure that the product arrives at temperatures within the specified range.

Where such mixed loads are unavoidable, it is imperative that the temperature integrity of all refrigerated products are protected. The temperature should be maintained to meet the requirements of the product requiring the coldest

conditions (Section 5 – Mixed Loads). Mixed loads containing ice cream must give priority to ensuring the ice cream is moved from frozen storage to freezer vehicles with the least possible time exposed to ambient or ante-room conditions.

Route trade and distribution vehicles (generally smaller, servicing more deliveries per day), used to carry ice cream should use plastic strip curtains, secondary doors or some other mechanism to reduce heat gain during loading and unloading.

## Delivery Requirements

If loading vehicles from ante-rooms that are not chilled, refrigerated vehicles should have compressors turned on and be pre-chilled. The wall temperatures of vehicles should be cooled to approximately +5°C to prevent transfer of heat to products from wall cavities.

Before leaving a 'pick-up point', the transport operator should have received notification showing:

- An accurate description of the loaded cargo;
- The temperature of the goods released for transport;
- The total weight of the goods to allow for effective legal distribution of the goods on the vehicle;
- An acceptable lead-time to arrange a safe trip plan for its drivers to follow;
- The number of drops that may affect the Cold Chain performance;
- A check that vehicle load restraints have been confirmed as adequate; and
- The set temperature the customer requires for successful delivery.

The temperature of chilled and frozen foods should be able to be maintained, allowing for multiple drops. Each temperature check should be recorded on the trip log sheet.

Transport operators must ensure that a refrigerated product leaves the cold store and is transported NEVER WARMER THAN and adheres to the MAXIMUM OUT-OF-REFRIGERATION-TIME LIMIT GUIDE. See section 3 and 4 for these guidelines. This is an even more crucial issue for long-distance transport, where goods may be in the vehicle for a longer period of time.

All transport vehicles and containers should be able to have access to accurate thermometers (preferably recording thermometers), which are calibrated regularly as per the Food Safety Standards in the Food Standards Code. Provision of an easy-to-read indicating thermometer is also recommended.

Temperature measuring using indicative 'non-destructive' testing by surface temperature devices and core temperature testing methods are discussed in Appendix 1 – Temperature measurement.

If the recorded receipt temperature of the product, as distinct to the air temperature of the transport unit, is outside the temperature required for the product, then corrective action must be taken, including contacting the owner of the goods (see corrective action above).

Other non-destructive testing may include additional Cold Chain monitoring devices such as:

- RFID passive tags to monitor temperature fluctuations.; and
- Heat Sensitive film onto cartons or packaging that may highlight any temperature abuse (i.e. if gets out of specification).

## Unrefrigerated Vehicles

Vehicles not fitted with cooling units or inadequately insulated vehicles (i.e. unrefrigerated vehicles or vehicles with substandard insulation capacity) are not recommended to distribute fresh, chilled or frozen foods.

If any business uses an unrefrigerated vehicle for the transport of chilled and frozen products, for example, for quick runs between sites, then it must be established that this does not compromise the safety or quality of the product. The product must meet both the NEVER WARMER THAN rule and the MAXIMUM OUT OF REFRIGERATION TIME LIMITS.

Chilled foods permitted to travel out-of-refrigeration would typically be dense foods with a high thermal mass and which are less likely to present a food safety risk, for example UHT packed goods, hard and mature cheeses, confectionery, fats and oils products such as table spreads, whole fruits and vegetables.

## Verification checks

The temperature of the chilled or frozen foods to be transported unrefrigerated should be checked using suitable devices, such as data loggers, so drivers are aware of vehicle and route run temperature conditions, after allowing for multiple customer drops.

Testing checks should determine optimal drops for the types of products being transported and consider variables such as delivery mechanisms being used (such as trolleys), vehicle conditions and seasonal temperature changes.

## SECTION 8:

### RETAIL OUTLETS

The fifth stage of the Cold Chain is the management of chilled and frozen foods on the premises of the retailer.

#### The Role of the Retailer

Retailers must ensure that chilled and frozen foods for sale are kept in conditions that meet the requirements of the Food Safety Standards in the Food Standards Code. The product must arrive from the manufacturing site, processing centre, cold store or wholesaler, and be stored, at temperatures NEVER WARMER THAN:

- +4°C for chilled foods to ensure that the product temperature is NEVER WARMER THAN +5°C, unless otherwise specified; and
- -18°C for frozen foods and ice cream.

#### 8.1 Receiving Deliveries

As transport vehicles are being prepared for unloading, storage areas and laneways leading to storage areas should be checked prior to opening doors so that goods never reach the MAXIMUM OUT OF REFRIGERATION TIME LIMITS.

All vehicles should be recorded onto Inwards Goods Summary check sheets which include checks for vehicle cleanliness, non-food physical contamination risk and temperature.

Records should be kept of the temperature of chilled and frozen foods when they are received.

Always move chilled and frozen foods into the retail display cabinet or buffer stock cold room immediately after unloading from the transport vehicle within the following MAXIMUM OUT OF REFRIGERATION TIME LIMITS:

- maximum of 20 minutes if no refrigeration controls exist at receipt docks; or
- maximum of 20 minutes for frozen ice-creams received for air-conditioned and chilled anterooms;
- maximum of 60 minutes for frozen foods in +5°C to +15°C air conditioned anterooms; or
- maximum of 90 minutes for frozen foods in 0°C to +5°C chilled anterooms.

#### 8.2 Ordering Practices

Retail-refrigerated display cabinets may not be as effective as dedicated cold stores in the maintenance of product temperature due to frequent movements of ambient air into the units and more frequent defrost cycles.

- Operators should base their food ordering on a number of factors to account for the potential impact on product safety and quality such as:
  - Capacity for stock holding of cool-room storage areas;
  - Ability to maintain effective stock rotation practices using clearly observable date code, packed on date or colour coding systems;
  - Available racking to maintain First In-First Out (FIFO) protocols;
- Stock turnover trends of products from retail display cabinets;
- Stock lead times from suppliers or cold store warehouses;
- Length of remaining product shelf life and/or minimum receipt shelf life as pre-agreed with suppliers or cold store operators; and

- Frequency of possible temperature fluctuations associated with exposure to defrost cycles during the time the product may remain in the display cabinet.

## 8.3 Managing Retail Cold Rooms

### Controlling Cold Room Temperatures

All retail cold store management systems must ensure that the product temperature is maintained in accordance with the NEVER WARMER THAN rule for chilled and frozen foods.

Refrigerated cold rooms should, ideally, be equipped with temperature-recording devices linked to suitable alarm devices. As a minimum standard, indicating easy-to-read digital or analogue displayed thermometers should be installed. All types of temperature measuring devices should be calibrated regularly and certified as appropriate (see Appendix 1).

Products must be stored at cold room temperatures NEVER WARMER THAN:

- +4°C for chilled foods to ensure that the product temperature is NEVER WARMER THAN +5°C, unless otherwise specified; and
- -18°C for frozen foods and ice cream.

Always:

- Use a cold store large enough for proper stock rotation and control;
- Ensure that products are stacked off the floor and away from walls and ceilings to ensure good air circulation;
- Defrost the cold store as often as necessary to maintain refrigeration efficiency;
- Keep cold store doors closed to avoid loss of cold air and prevent excessive ice formation, and use a plastic strip curtain or other method to prevent cold air loss; and
- Record the temperature at which the product is held.

## 8.4 Managing Refrigerated Food Retail Display Cabinets

### The Product Load Line

All refrigerated food display units (typically called coffins and/ or display cases) must be marked with a maximum holding product load line. This applies whether the food display unit is horizontal (bin or chest type) or vertical in design.

All products in excess of the load line limitation should be returned to the cold room in the original outer container. Loading product above the load line will seriously affect product temperature, impact on efficiency of defrost cycle systems and quickly prejudice product safety and quality.

Loading of product in freezers or refrigerator cabinets should take into consideration that product should be packed to facilitate even air circulation within the cabinet to maintain product temperature and to provide ease of access to product for customers.

The design of retail display cabinets should allow for cleaning, maintenance access and the potential for product spillage and breakage. Product spills and breakage are a potential source of contamination of other products in the cabinet, and liquids spilled in the cabinet have the potential to block drainage holes and reduce the efficiency of the unit.

## Loading Consumer Packs

Consumer packs are very sensitive to temperature change once removed from the shipping carton and prior to being placed into the appropriate temperature controlled refrigerated display unit.

To avoid loss of safety and quality, products must be kept under refrigerated conditions at all times and should not be left unattended when loading retail display cabinets or marking prices. It is good practice to recommend and keep to an absolute minimum the time chilled and frozen products can spend out of refrigeration while being stacked or loaded into the cabinet in the retail area.

After unloading from the carton, product should be loaded into retail cabinets as soon as possible to maintain core product temperature and should not reach the **MAXIMUM OUT OF REFRIGERATION TIME LIMITS**.

Key Guidelines for stocking retail display cabinets:

- Put frozen foods and ice creams into retail display cabinets immediately to prevent severe quality loss;
- Put chilled 'high risk' potentially hazardous foods (e.g. pre-mixed salads, sprouts, dips) into retail display cabinets immediately to ensure the loading does not breach the **NEVER WARMER THAN** rule; and
- The **MAXIMUM OUT OF REFRIGERATION TIME LIMITS** apply unless the specified temperatures in the **NEVER WARMER THAN** rule are reached.

## Further Processing

If chilled foods are subjected to further processing at the retail level (for example slicing, decanting, portioning or repacking), they should be handled at +4°C or colder to ensure that the product temperature is **NEVER WARMER THAN +5°C** during the further processing stage.

Further processing must be included as part of the food safety program which typically incorporates HACCP principles for all products and processes. If the temperature of the product has risen after the further processing is completed, re-cool the product to +4°C as quickly as possible, preferably in a cool room, prior to placing in the retail display cabinet.

## Controlling Temperatures

Retail display cabinets are not designed to lower product temperatures, therefore all handling and processing steps earlier in the Cold Chain must be controlled to ensure correct product temperature is maintained.

Never display foods that are required to be stored and sold at refrigerated temperatures outside the appropriate refrigerated cabinets.

Each refrigerated food retail display cabinet must have a means to monitor and record temperatures. Thermometers built into the cabinet should indicate the air temperature around the product as a way of indicating maintenance of product temperature. Where practicable, night covers should be employed to conserve energy and maintain product temperature.

## Hot Product Chilling

Where hot foods are being cooled for the purpose of storage and/or transport and may be intended to be reheated for

meal service, or ready-to-eat as a cooked-chilled food, consideration must be given as to whether the hot food is able to support the rapid growth of microbes associated with food borne illness. Such foods are required to be cooled:

- Within two hours – from +60°C to +21°C; and
- Within a further four hours – from +21°C to +5°C.

The hot product chilling process must be validated and confirmed to ensure that the cold rooms can effectively meet these requirements, or if alternatives such as the use of a blast cooling tunnel are needed.

If hot foods are cooled in a conventional cold room, consideration must also be given to the impact this will have on other foods inside the cold room, as the transfer of heat to other product may pose a significant risk, leading to bacterial growth and/ or loss in quality.

Finally, risks of liquid leaking during the chilling process should be accounted for with the use of suitably designed trays that can capture any leaked fluids and prevent cross-contamination. Metal (such as stainless steel as opposed to plastic) trays will transfer temperature more efficiently from the air flow system underneath the product, and they can more easily be cleaned and sanitised.

Note: Refer to [AIFST Cook-Chill Guidelines \(blue book\)](#) for more detailed information.

All retail cold store management must ensure that the product temperature is maintained in accordance with the NEVER WARMER THAN rule and requirements of the Food Safety Standards in the Food Standards Code.

Always:

- Transfer product to the cabinet or cold room quickly to avoid increases in temperature;
- Meet the Out-Of-Refrigeration-Time Limits set in this Guideline; and
- Ensure accuracy of thermometers through regular calibration.

Never:

- Load products into a retail display cabinet if product temperature is warmer than;
- +4°C for chilled foods to ensure that the product temperature is NEVER WARMER THAN +5°C unless otherwise specified; or
- -18°C for frozen food and ice cream; nor
- Place non-frozen food into a retail display freezer cabinet.

## Air Flow

Airflow is a major factor in the effectiveness of a refrigerated display cabinet.

Never:

- Allow products in the cabinet to restrict air-flow. Stock located near heated doors or too close to air intake and outlet vents or in open display cases can be exposed to warmer air.
- Stack products above the product load line;
- Allow poor routine maintenance (such as inoperative fans) or iced coils to restrict the cold air supply; or
- Let defrost cycles and air intake thresholds be set to levels that ensure that products never exceed the NEVER WARMER THAN rule.

## Location of Display Cabinets

Cabinet manufacturers publish strict guidelines for retailers on where to locate and how to maintain refrigerated food retail display cabinets.

Properly designed and positioned display cabinets are more efficient, maintain more consistent temperatures, and reduce electricity costs.

Check:

- The intended design and location for an open display cabinet has accounted for the 'worst case' relative humidity and ambient air temperature conditions (i.e. most display units are built only to support maintenance of product where air temperature reaches a maximum of +25°C and a maximum relative humidity of 65 per cent);
- The intended location is not subject to draughts from nearby docks or door entries and or abnormal heat radiation from electrical equipment or other compressors; and
- Product temperature is being adequately maintained throughout the whole day, and thereby quality and safety is not compromised during planned cabinet defrost cycles.

Avoid:

- Draughts and air currents that can be created by open doors, ventilation or air conditioning grills;
- Excessive radiant heat that can be created by direct sunlight and heating appliances; and
- Placement of signs, tags, debris and stock handling practices that could restrict airflow at inlet and outlet vents of the cabinet.

It is desirable to locate refrigerated display cabinets to encourage customers to make chilled and frozen products their last purchase.

## Rotating Stock

Follow established FIFO procedures or, in certain circumstances, use the oldest dated stock as per the Use-By Date, Best-Before Date or packing date when rotating stock in retail display cabinets and cold rooms.

New stock, after first checking these dates, should be loaded below older stock or at the back of vertical display units.

## 8.5 Corrective Procedures

### Surveillance of Product for Safety and Quality

If any indications of loss of safety and/ or quality are evident, ensure that the product is removed from sale for assessment, the product is identified as 'on hold' and, if necessary, contact the manufacturer. The action taken for products removed from sale may include rejection.

Consult the retail display cabinet manufacturer when establishing if ambient and/ or seasonal environmental retail store controls of temperature and humidity are changeable before:

- Purchasing the type of display unit;
- Setting the optimum defrost management systems;
- Setting air intake threshold levels during operation; and
- Developing alarm management and corrective procedures for retail outlets.

Always use written procedures as a basis for regular staff training.

Managers and staff should be familiar with emergency procedures in case of retail display cabinet failures, power failures or other unforeseen circumstances.

The supplier should be consulted about the continued acceptability and safety of the product if and when any breach to the NEVER WARMER THAN rule occurs.

### **Thawing Frozen Food**

When frozen food is thawed:

- Follow the manufacturer's instructions; and
- Thaw in a refrigerator at a temperature at or colder than +4°C to ensure that the product temperature is NEVER WARMER THAN +5°C.

### **Checkouts / Self-Checkouts**

Shopping for chilled or frozen foods is best left to last and prompt transport of chilled or frozen products from the retailer's shelf-displays to a consumer's home storage is recommended.

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## SECTION 9:

### RETAILER HOME DELIVERIES

Where customer home delivery or collection is provided by a retail outlet, Cold Chain operations must continue through the delivery process.

The person responsible for providing home delivery orders or collection on behalf of the retailer must ensure that the frozen foods and chilled foods are individually separated from each other and completely separated from ambient grocery items. Non-food items, such as chemicals, that could pose a potential hazard should always be separated from food packages into specially marked bags.

Staff at the retail outlet must organise the transfer of chilled and frozen foods immediately to their correct temperature holding areas. Chilled and frozen foods should be placed directly into the correct cool room and/ or into an insulated cool storage location or cooler box. These containers should be held in an allocated area of the freezer room or chilled room until the products are collected for delivery.

Given that ice cream is highly temperature sensitive it should only be transported in refrigerated vehicles, or unrefrigerated vehicles with portable thermoelectric freezers, and not via unrefrigerated vehicles.

Transfer chilled and frozen foods to a holding location or directly to the delivery vehicle when ready for departure.

Load the delivery vehicle in accordance with:

- MAXIMUM OUT OF REFRIGERATION TIME LIMITS;
- Mixed Vehicle Load thermostat setting guides; and
- Temperature requirements as required under the Food Acts and the Food Safety Standards of the Food Standards Code.

All above steps should be initially validated, checked regularly and written into home delivery procedures. Procedures should recommend that the delivery person documents their departure time and arrival time on a Home Delivery Check sheet and conducts random spot checks on temperatures of chilled and frozen foods when removing them from the freezer and upon arrival at the last delivery of the run. These checks should be performed using a calibrated thermometer or data-logger and recorded on a check sheet. Clearly agreed corrective procedures should be implemented where temperature checks indicate that some thawing of food has occurred.

## SECTION 10:

### FOOD SERVICE INDUSTRY

Foodservice involves the preparation of food for immediate consumption out of home or at home (take away). Typical foodservice outlets include canteens, hospitals, airlines, restaurants, kiosks, sandwich and salad bars, and quick service restaurants

#### The Role of Foodservice Provider

Some jurisdictions require key foodservice businesses providing food to the vulnerable groups to document and implement food safety programs, which include issues related to the Cold Chain.

To maintain the appropriate product temperature:

- All chilled foods must be stored and handled at temperatures between 0°C and +4°C and ensure the product temperature is NEVER WARMER THAN +5°C unless otherwise specified; and
- All frozen foods (including ice cream) must be stored and handled NEVER WARMER THAN -18°C.
- This rule requires that product dispatched from a manufacturing or processing centre arrives at the cold store NEVER WARMER THAN the above temperatures.

#### 10.1 Receiving Deliveries

Foodservice facilities should be capable of maintaining all chilled and frozen foods at temperatures NEVER WARMER THAN those outlined above.

After unloading from the vehicle, product should also not exceed the MAXIMUM OUT OF REFRIGERATION TIME LIMITS .

##### For Chilled Foods

- Where chilled foods are being un-loaded or dispatched in either ambient (normal temperature) or in +5°C to +15°C air conditioned ante-room conditions, the food is permitted out of the correct refrigeration storage for a maximum time of 20 minutes.

##### For Frozen Foods

- Where frozen foods are being un-loaded or dispatched in ambient (normal temperature) conditions, the frozen food is permitted out of the correct refrigeration storage requirement for a maximum time of 20 minutes;
- Where frozen foods are being un-loaded or dispatched in +5°C to +15°C air conditioned ante-room conditions, the frozen foods are permitted out of the correct refrigeration storage for a maximum time of 60 minutes;
- Where frozen foods are being un-loaded or dispatched in 0°C to +5°C refrigerated ante-room conditions, the frozen foods are permitted out of the correct refrigeration storage for a maximum time of 90 minutes;
- Ice cream responds more rapidly than other frozen food to temperatures above -18°C, and should be loaded last and unloaded first direct from/to storage freezers whenever possible. Ice cream is permitted out of the correct refrigeration storage requirement for a maximum time of 20 minutes, irrespective of the unloading or dispatch environment. Ice cream responds more rapidly than other frozen food to temperatures above -18°C, and should be loaded last and unloaded first direct from/to storage freezers whenever possible. Ice cream is permitted out of the correct refrigeration storage for a maximum time of 20 minutes, irrespective of the unloading or dispatch environment.

These facilities should also have sufficient space to allow control and rotation of stock.

Chilled and frozen foods should be well wrapped and sealed before being placed in, or returned to, storage.

Always place chilled and frozen foods in storage immediately after receipt. Date stamp or colour code any cases or bulk food service packets that do not bear date coding.

Records should be kept of the temperature of chilled and frozen products when they are received.

## 10.2 Storing and Receiving Stock

Inventory should be managed on a FIFO basis, or where circumstances require, using the oldest stock as per the Use-By Date, Best-Before Date or Packed On date.

Allow sufficient air circulation around refrigerated facilities (including inside cold rooms and display cabinets) to ensure effective temperature control is maintained at all times.

Leave sufficient space between food products to promote free air movement.

### Controlling Temperature

All refrigerated storage facilities should ideally be equipped with recording, and easy-to-read, indicating thermometers linked to suitably designed alarm systems. Ensure the accuracy of thermometers through regular calibration (typically annually). Records should be held for an appropriate period.

#### Always:

- Locate the temperature sensing element in the warmest part of each facility (often near the entrance doorway) and check and record the temperature frequently;
- Avoid excessive build-up of frost, and ensure defrost cycles operate as necessary;
- Protect product during defrosting and, if necessary, move contents to another appropriate facility so the temperature recommended for the food is maintained;
- Remove from storage only the amount of food required for immediate use;
- Minimise the time a product spends outside refrigerated temperatures – this must be determined as part of a food safety program typically based on HACCP principles for the product; and
- Isolate any product identified as no longer meeting the safety and/ or quality standards for assessment and possible rejection.

Never display chilled or frozen foods outside refrigerated cabinets.

Each refrigerated food display cabinet must have a means by which the temperature can be monitored and recorded. Thermometers and data-loggers built into the cabinet should indicate the air temperature around the product as a way of indicating the air and/ or product temperature.

Never load products into a refrigerated display cabinet if cabinet temperature is warmer than:

- +4°C for chilled foods to ensure the product temperature is NEVER WARMER THAN +5°C unless otherwise specified; and
- -18°C for frozen foods and ice cream.

If chilled foods are subjected to further processing in foodservice (for example slicing, decanting, portioning or repacking), maintain the product temperature at +4°C or colder to ensure that the product temperature is NEVER WARMER THAN +5°C during this further processing stage.

Further processing must be included as part of the food safety program which typically incorporates HACCP principles for all products and processes.

### **Further Processing Corrective Action**

If the temperature of the product has risen after the further processing is completed, re-cool the product to +4°C as quickly as possible, preferably in a cool room, prior to placing in the refrigerated display cabinet.

### **Rotating Stock**

Follow established FIFO procedures or, in certain circumstances, use the oldest stock as per the use-by or best-before date or packing date when rotating stock.

### **Thawing Frozen Food**

Frozen food should be thawed:

- According to the manufacturer's instructions;
- In a refrigerator at a temperature at 0°C to +4°C to ensure that the product temperature is NEVER WARMER THAN +5°C ; or
- In a microwave oven or in conventional cooking equipment (in which case, cook the food immediately after thawing is complete).

## Section 11:

### CONSUMER ASSISTANCE AND INFORMATION

Consumers play an important role in the Cold Chain. Product safety and quality can only remain intact if the consumer protects against heating, minimises delay in the transport of products to their home and ensures that the home refrigerators and freezers are working effectively.

Retailers are encouraged to keep chilled and frozen foods separated from foods stored at ambient temperatures. Store layouts should encourage shoppers to purchase chilled and frozen foods last.

Consumers should be encouraged to protect their purchases by keeping chilled and frozen products wrapped in insulating material or placed in a cooler-bag at the point of sale and by transferring them into an insulated container unit within their vehicle until they reach the home refrigerator or freezer.

Ideally, home refrigerators should operate at +4°C and freezers at -18°C. However, with frequent opening of refrigerator and freezer doors during normal household use, it is often difficult to maintain these temperature conditions.

Consumers should be encouraged to use simple thermally sensitive temperature strips or fridge/freezer thermometers to help ensure that the refrigerator or freezer settings are low enough to maintain product safety and optimum quality.

Consumers may attempt to set fridges and freezers at higher temperatures to save on electricity costs. Consumers should be advised of the adverse impact on shelf life, safety and quality of products that this may have, and that this may result in additional costs if the food has to be thrown out.

#### Labelling and Instructions for Use

Labelling packaged products with appropriate handling and storage instructions is an important element in providing consumers with information about ensuring the durability, quality and safety of their products after purchase.

Manufacturers should provide consumers with advice to indicate if chilled or frozen foods:

- Should be taken out of cold storage immediately prior to use; or
- Should be thawed or brought to room temperature; or
- Are suitable to be heated direct from frozen.

If the product is to be thawed, the instructions should be specific in providing advice to thaw either in the refrigerator overnight or using the microwave defrost cycle. Heating instructions should include advice for both conventional and microwave ovens, and any special instructions, considering the type of packaging used.

Manufacturers should consider providing detailed advice and instructions on their website, or through the use of the GoScan mobile app, to supplement the limited information on the label.

The label should also advise about the shelf life of the product once packing is opened and if the product should be stored in the refrigerator. This may apply to ambient temperature products, such as bottled preserves and pickles, as well as chilled and frozen foods.

## Appendix I Useful Links

### Food Australia New Zealand (FSANZ)

FSANZ is a bi-national Government agency responsible for the development and administration of the Australian New Zealand Foods Standards Code. The Code lists requirements for foods such as additives, food safety, labeling and genetically modified foods. Enforcement and interpretation of the Code is the responsibility of state and territory departments and food agencies.

<http://www.foodstandards.gov.au>

### Microbiological Standards

Standard 1.6.1 - Microbiological Limits for Food became part of the Food Standards Code in December 2000. The standard is currently under review, to include more recent scientific evidence about specific food safety concerns, development of preventative food safety standards; food safety programs for high risk businesses and primary production and processing standards.

### Predictive Microbiological Models

For detailed analysis of specific foods and potential spoilage or food poisoning expert advice should be sought. References and predictive models available include:

- ComBase <http://www.combase.cc/index.php/en/>
- Pathogen Modeling Program <http://www.ars.usda.gov/services/docs.htm?docid=6786>
- Growth Predictor & Perfringens Predictor <http://www.ifr.ac.uk/safety/growthpredictor/>
- Seafood Spoilage Predictor Software, Danish Institute for Fisheries Research <http://sssp.dtuaqua.dk/>
- Sym'Previous <http://www.symprevious.net/>

### Food Allergy Risks and VITAL

The Food Industry Guide to Allergen Management and Labelling guide provides advice on allergen management with specific reference to storage, distribution and manufacturing process controls and should be taken into account when considering risks associated with cross contact.

These controls include management of allergenic materials upon receipt at plants requiring segregation and prevention of cross-contamination where spoilage or damage occurs. In manufacturing, the use of VITAL 2.0 (Voluntary Incidental Trace Allergen Labelling) risk-based assessment methodology tool should be adopted to ensure good manufacturing practices, monitoring systems and scheduling production runs take into consideration all elements of allergen cross contamination.

[www.allergenbureau.net](http://www.allergenbureau.net)

### Crisis Management and Product Recall

The protection of the health and safety of consumers is a fundamental requirement and a legal obligation of all companies involved in the production and sale of food and grocery products. Suppliers and retailers must take every precaution to ensure products are safe, of the highest quality, and that labelling information assists consumers in making an informed choice. However, on rare occasions, problems sometimes occur which require the recall or withdrawal of products which fail to meet these requirements.

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The notification of recalls and withdrawals with key trade partners and regulators is an essential element of any integrated recall plan. The method of formal notification of recalls and withdrawals is a decision determined by the recipients, options available include:

The AFGC has developed a Crisis Management Guide to assist companies in developing their own specific crisis plans and integrated recall plans.

[Crisis Management Guide](#)

[GS1 Recallnet](#)

[ECRA Product Recall / Withdrawal Form](#)

## Logistics Delivery Safety

### Chain of Responsibility (CoR)

Businesses that consign, pack, load or receive goods can be held legally liable for breaches of road transport laws. This is the 'Chain of Responsibility' (CoR).

The aim of CoR is to make sure everyone in the supply chain shares equal responsibility for ensuring breaches of road transport laws do not occur. Under CoR laws if you exercise (or have the capability of exercising) control or influence over any transport task, you are part of the supply chain and therefore have a responsibility to ensure road transport laws are complied with. This includes

- Mass (distributed weight of goods on trucks);
- Dimensions (truck design);
- Load restraint (how goods are protected so as not to be damaged and travel safely);
- Driver fatigue mitigation (using Safe Trip Plans); and
- Vehicle maintenance requirements.

For further information visit:

National Heavy Vehicle Regulator <https://www.nhvr.gov.au/>

Australian Logistics Council <http://austlogistics.com.au/>

Refrigerated Warehouse and Transport Association of Australia <http://www.rwta.com.au/>

### Dangerous Goods – Road and Rail

The Australian Dangerous Goods Code sets out the requirements for transporting dangerous goods by road or rail. The National Transport Commission (NTC) publishes the Code known as ADG7.

<http://www.ntc.gov.au>

### Dangerous Goods – Maritime

The International Maritime Organisation (IMO) is the United Nations specialised agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. The IMO developed the International Maritime Dangerous Goods (IMDG) Code as a uniform international code for the transport of dangerous goods by sea covering such matters as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances.

<http://www.imo.org>

## Appendix II: Supplementary Information

### STANDARD 1.6.1 - MICROBIOLOGICAL LIMITS FOR FOOD

This Standard lists the maximum permissible levels of foodborne microorganisms that pose a risk to human health in nominated foods, or classes of foods. This Standard includes mandatory sampling plans, used to sample lots or consignments of nominated foods or classes of foods, and the criteria for determining when a lot or consignment of food poses a risk to human health and therefore should not be offered for sale, or further used in the preparation of food for sale.

<http://www.comlaw.gov.au/Details/F2012C00862>

The microbiological tables below illustrate how microbial growth rates vary according to storage temperature and the difference that only 1°C can make to the growth rates of microorganisms. Minimum temperatures at which food pathogens are known to grow are provided for further information.

Table 1: Indicative minimum temperatures for microbiological growth

MICRO-ORGANISM	INDICATIVE MINIMUM TEMPERATURE (°C)
<i>Yersinia enterocolitica</i>	-1.8*
<i>Listeria monocytogenes</i>	0
<i>Clostridium botulinum</i>	3.0
<i>Bacillus cereus</i>	4 – 5
<i>Aeromonas</i> species	<5
<i>Escherichia coli</i>	7 – 8
<i>Salmonella</i> species	7
<i>Staphylococcus aureus</i>	7
<i>Vibrio cholera</i>	<10*
<i>Shigella</i> species	10*
<i>Clostridium perfringens</i>	6
<i>Campylobacter jejuni</i>	30.5

Source: *Foodborne Microorganisms of Public Health Significance, 6th Edition, March 2003, published by the Food Microbiology Group of the Australian Institute of Food Science and Technology (AIFST) Inc.*

The indicative minimum temperatures specified in Table 1 vary by both the strain of organism and the food matrix. Even within a single species, there can be variations in minimum growth temperatures. Foods with preservatives added, or with reduced water activity, or at reduced pH levels will allow growth at minimum temperatures that are a little higher than those indicated.

**Table 2: Growth Characteristics of Cold Tolerant Pathogens**

	TEMP °C	DOUBLING TIME (HRS)
<i>Aeromonas hydrophilia</i>	1	-
	3	10.594
	4	8.404
	5	6.726
	7	4.424
<i>Clostridium botulinum</i>	1	-
	3	-
	4	23.143
	5	16.028
	7	8.106
<i>Listeria monocytogenes</i>	1	37.968
	3	24.052
	4	19.335
	5	15.646
	7	10.452
<i>Yersinia enterocolitica</i>	1	13.808
	3	10.068
	4	8.654
	5	7.470
	7	5.640

The data presented in Table 2 is derived from the mathematical modelling program ComBase Predictive Models, based on growth conditions with a sodium chloride content of 0.5 per cent, a water activity of 0.995, a pH of 6.5, a carbon dioxide content of 5 per cent.

<http://www.combase.cc/index.php/en/>

This data is provided to demonstrate that for all of the organisms at the static temperatures above, the number of hours required to double in number diminishes rapidly above +4°C.

### Temperature Measurement

Food safety programs should include clear guidance on the measurement methods and techniques; calibration; critical control points; equipment usage and corrective action for the safe and accurate measurement of product and processes along the Cold Chain.

All industry sectors need to be aware of their own industry's regulations before they implement a temperature-testing regime.

“A food business must, at food premises where potentially hazardous food is handled, have a temperature measuring device that -

(a) is readily accessible; and

(b) can accurately measure the temperature of potentially hazardous food to +/- 1°C”

Source: Standard 3.2.2 Food Safety Practices and General Requirements in Division 6, clause 22.

Due to the importance of temperature control for the protection of product safety and quality, the accuracy and implementation of temperature measurement techniques are crucial. The following are some considerations:

- Suppliers should consult the customer to ensure that product can meet in-house temperature specifications at the customer’s site
- Outer carton surface temperature must not be relied upon to determine the temperature of the product contained inside e.g. outer packaging can rise to a higher temperature after removal from cold storage or outer packaging exposed to a burst of colder air could register a lower temperature.
- Critical control points along the supply chain, such as receipt of goods, should be documented and quality systems implemented accordingly,
- Non-compliance with stated temperature requirements should result further action
- Trained operators with knowledge of the required techniques to correctly use measuring device should conduct the procedure,
- Where the Cold Chain has not been maintained, more samples and more stringent techniques may be necessary. This could include opening and testing of more products and assessing core temperatures with temperature probes.
- Businesses should have documented procedures or routines that allow for primary and additional checking where necessary.
- Always use calibrated, reliable, accurate thermometer with a short response time.
- Always ensure that the thermometer being used for core temperatures is cleaned and sanitized (such as using anti-bacterial wipes), so that the temperature testing process does not itself contaminate the food.

## Measuring Devices

**Data Loggers** - A range of temperature data-logger devices are available. Such devices are flexible in their operation, recording and providing information direct to an alarm management system.

**Digital Thermometers** - A flat blade or needle probe is usually the preferred temperature-measuring device as it provides a simple and precise reading.

**Bi-metal Thermometers** - A bi-metal dial thermometer may also be suitable.

**Glass Thermometers** - Mercury-in-glass or alcohol-in-glass thermometers pose a potential hazard due to possibility of glass contamination. They are unsuitable for any product contact testing due to this risk.

**Infra-red (non-contact) Surface Temperature Thermometers** - can be a fast way to take product surface temperatures without having to damage product. Be aware that measuring the temperature of outer packaging does not equate to measuring the temperature of the product and may, at best, be considered indicative.

**Data devices from new technologies** – Emerging technology includes RFID passive tags to monitor temperature fluctuations or heat sensitive film on cartons / packaging that highlight temperature abuse.

## Calibration

Calibration is the procedure whereby equipment used for measurement is checked to ensure it provides accurate readings.

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*“Temperature measuring devices’ states that ‘A food business must, at food premises where potentially hazardous food is handled, have a temperature measuring device that can accurately measure the temperature of the potentially hazardous food to +/-1°C.”*

*Source: Standard 3.2.2 – Food Safety Practices and General Principles in clause 21*

Where a business relies on the accuracy and consistency of equipment to measure a process that is critical to the trade of those goods, it is necessary that the measuring instrument is accurate. This applies to the temperature of goods along the value chain.

Periodically calibrate temperature measuring equipment including:

- Product data loggers, digital thermometers, infra-red surface thermometers;
- Freezer and chiller time and temperature recorders;
- Fixed thermometers in chillers, freezers, trucks and display cabinets, and portable units;
- Compressor units, including vehicles.

Businesses should have corrective action plans to deal with product test problems and instructions outlining how to initiate prompt repairs, replacements or alternate temperature testing equipment. Records of calibration should be kept as proof that the equipment was working accurately at all times.

## Appendix III - GLOSSARY OF TERMS AND DEFINITIONS

<b>Food Standards Australia New Zealand</b>	The federal body responsible for developing national food laws
<b>Audit</b>	A systematic examination of a system to determine whether procedures that have been introduced are being followed and to ensure that the system achieves its aims.
<b>Chain of Responsibility</b>	Heavy Vehicle Transport regulations are nationally being developed across Australia with state authorities to set the agreed standards on Mass, Dimensions, Load Restraints, Driver Fatigue and Vehicle Maintenance.
<b>Chilled Food</b>	Cold Food (less than +5°C), but not frozen.
<b>Cold chain</b>	A series of interdependent operations engaged in manufacturing, transporting, storing, retailing and serving refrigerated food.
<b>Cold store</b>	A food storage premise used for storing refrigerated food (chilled or frozen).
<b>Control Point (CP)</b>	Any point in a process where an aspect of the process can be controlled. See also Critical Control Point.
<b>Corrective action</b>	The action to be taken when the results of monitoring indicate a loss of control, or a step taken to correct a process and bring it and the product back under control.
<b>Critical Control Point (CCP)</b>	A point, step or procedure at which control can be applied and a food safety hazard can be prevented, eliminated or reduced to acceptable limits. A point in a process where loss of control may lead to a food safety problem and harm to the consumer.

<b>Critical limit</b>	The criterion, which separates acceptability from unacceptability. The tolerance limit that must be met to ensure the food is produced safely.
<b>Dangerous Goods</b>	Dangerous Goods handling is covered under the Australian Dangerous Goods Code (version 7 called ADG7). This provides requirements for Transporting of dangerous/hazardous goods using placard signage where the transport of such goods from warehouses to retail outlets has manifests that exceed aggregate quantity of 2000kg(L) of dangerous chemicals' in total on the delivery. See Chapter 7.3 of ADG7 Code for Retail Distribution Loads information
<b>Food</b>	A substance or matter used or capable of being used as food or drink, or intended for or represented for human consumption, including drinks, food additives, processing aids and any other substance regulated by the Food Standards Code.
<b>Food business</b>	A business carrying on a food operation for the purpose of sale of food.
<b>Food premises</b>	A premise, including a vehicle, kept or used for a food operation.
<b>Food Standards Code</b>	Is the collection of Standards adopted into legislation in State, Territory, New Zealand, and is governed through the Commonwealth of Australia Food Standards Australia New Zealand Act 1991 (the FSANZ Act). The standards contained in the <a href="#">Australian New Zealand Food Standards Code</a> are legally binding to all food premises in these jurisdictions.
<b>Frozen Food</b>	Food at a temperature of less than or equal to -18°C.
<b>Hazard Analysis and Critical Control Point (HACCP)</b>	A system that identifies evaluates and controls hazards that are significant for food safety.

<b>HACCP audit table</b>	The plan that lists in one table all the process steps, the control measures, critical limits, monitoring and corrective actions of a HACCP plan.
<b>HACCP plan or Food Safety Program</b>	The whole plan for making safe food that incorporates and applies the seven principles of HACCP. This includes the HACCP audit table, flow charts, raw material and product specifications and other supporting information.
<b>Hazard</b>	The potential to cause harm. Any microbial, chemical or physical property that can pose a risk to food safety.
<b>Perishable food</b>	Food liable to perish or be subject to decay or deterioration.
<b>Potentially hazardous food</b>	Food that has to be kept at certain temperatures to minimise the growth of any pathogenic microorganisms that may be present in the food and to minimise the formulation of toxins in the foods.
<b>Quality (food)</b>	Desirable characteristics in food that may not be related to food safety issues. For example, colour, size, texture and weight.
<b>Ready-to-eat</b>	Food that is ordinarily consumed in the state in which it is sold.
<b>Refrigerated</b>	Stored at or below a temperature of +5°C. Frozen foods would also fall into this category for the purposes of these guidelines.
<b>Safe food</b>	Food that will not cause harm to a person who consumes the food when it is prepared, stored and/or eaten according to its intended use.
<b>Sale</b>	Supply for human consumption, including bartering, supplying for sale, giveaway's, selling for money or gratuities, and so on.

**Stored**

Food or other items put away as a supply for future use.

## Acknowledgments

This publication was produced with the cooperation of industry associations and their member companies. All are committed to the implementation and ongoing maintenance of systems for ensuring the safety and quality of refrigerated products through the early implementation of, and rigorous adherence to, these Guidelines.

The review of the Guidelines was assisted by consultant:

Steven Newton  
Managing Director  
Newton Risk-Stream Consulting Pty Ltd  
Phone: +61 418 405 288.

Australian Food and Grocery Council

Telephone: 02 6273 1466

Facsimile: 02 6273 1477

Website: [www.afgc.org.au](http://www.afgc.org.au)

Email: [info@afgc.com.au](mailto:info@afgc.com.au)

