National Dairy Regulation and Code
Processing Sector Interpretive Guidelines

Revised - March 2006

PART I

Definitions

Term	Definitions
"Accredited laboratory"	• means a laboratory meeting the requirements set by the National Dairy Laboratory Accreditation Programme or the Official Laboratory.
"CIP"	• means Clean in Place.
"Cleaning"	• means the effective removal of soil, followed by the effective removal of the cleaning agents, followed by a sanitizing process designed to destroy most viable micro-organisms.
"Coagulating agents"	• means, with regard to compositional standards, bacterial cultures with or without permitted enzymes.
"Code"	• means the National Dairy Code.
"Commercial sterility"	• means the condition achieved by application of an appropriate treatment that renders the dairy product or the processing equipment free of microorganisms capable of reproducing in the dairy product under the normal non-refrigerated conditions found in storage and distribution.
"Contaminated dairy product"	• means a dairy product which has been exposed to contamination.
"Contamination"	• means exposure to conditions which permit or may permit: a) the introduction of foreign matter including filth, a poisonous substance or pests, or the b) introduction or multiplication of disease causing micro-organisms or parasites, or c) the introduction or production of toxins.

"COP"	• means Clean Out Of Place.
"Critical control point"	• means any point or procedure in a dairy plant where lack of control at that point or procedure may result in a health hazard.
"Critical factors"	• means, with regard to compositional standards, those factors that affect the ability of the process to achieve and maintain established specifications.
"Dairy product"	• means milk, reconstituted milk, butter, cheese, yogurt, condensed milk, evaporated milk, milk powder, dry milk, ice cream, malted milk, sherbet or any other food product manufactured wholly or mainly from milk.
"Fail safe"	• means, with respect to public health safety controlling equipment, the condition where the equipment will immediately and automatically, under all conditions including loss of power or pressurized air, be positioned to ensure there is no risk to public health.
"Fat free"	• means, with regard to compositional standards, ð£.1 g per 100 g of M.F. and not more than .3 g/serving.
"Flow promoting device"	• means any pump or other device which may produce flow.
"Grated cheese"	• means, with regard to compositional standards, cheese that has been dehydrated and ground to small particles.
"HACCP"	• means Hazard Analysis of Critical Control Points.
"HHST"	• means Higher Heat Shorter Time.
"HTST"	• means High Temperature Short Time.
"Light" or "Lite"	• means, with regard to compositional standards, ð³ 25% loss of the ingredient being claimed, (ie. M.F. > 25% less

	fat than the standardized product) and absolute reduction ð³1.5 g fat/serving and have no increase in energy.
"Low fat"	• means, with regard to compositional standards, ð£ 3 g of fat per 100g of M.F. and ð£ 15 g fat/100 g of dry matter.
"M.F."	• means, with regard to compositional standards, Milk Fat.
"Milk solids"	• means, with respect to a dairy product, singly or in combination, and other than water, that has not been altered in its chemical composition.
"Potable Water"	• means water which meets the Canadian Drinking Water Standards.
"Process"	• means to produce, pasteurize, manufacture or package any dairy product.
"Product Contact Surfaces"	• means those parts of the processing equipment which, during the regular operation of a dairy plant, will occasionally or regularly contact dairy products.
"Reduced fat"	• means, with regard to compositional standards, the same as "light".
"RTD"	• means a Resistance Temperature Device which has been approved to be used for that purpose.
"Shredded cheese"	• means, with regard to compositional standards, cheese that has been ground to small particles or cut into strips without dehydration of the cheese.
"STLR"	• means Safety Thermal Limit Recorder.
"Supplies"	• means any item used in the normal operation of a dairy plant and can include items such as cleaning agents, ingredients, packaging and conveyancing materials.

"UHT"	• means Ultra High Temperature.

Part II

2.1	Application and Responsibility
Introduction	Canada's food system is ranked among the best in the world in providing safe and wholesome food. Federal and provincial governments are committed to ensuring that food standards and inspection systems continue to require the highest levels of food safety. In order to reach these goals, national objectives have been established to have one set of harmonized food safety standards which are recognized across the country, have a common legislative base, and are reflective of international developments. Food safety standards must, as well, embody sound scientific risk-based principles of health and safety. To meet these objectives, regulatory requirements are evolving, and while ensuring food safety, must support the competitiveness of industry. Hence, regulations are changing wherever practicable from prescriptive, narrowly defined requirements, to outcome or performance based expectations. Dairy products are an integral part of the nation's food supply. As such, the regulations governing the dairy industry form an integral part of the food safety system. The *National Dairy Code* is intended to provide practical interpretations and guidance for compliance with the legislation and regulations governing the dairy processing sector. The *Code* is therefore not intended to stand alone, but rather to be used in conjunction with relevant statutes, research and other resource material to provide an extensive information base to assist in the production of safe and wholesome dairy products.

2.2	Application and Responsibility
Guiding Principles	The safety of dairy products is a shared responsibility between many stakeholders including producers, processors, retailers, consumers, and various levels of government. The *National Dairy Code* has been developed on the basis of the following guiding principles: • the dairy industry has the primary responsibility for the safety of their products, and to provide a reasonable level of descriptive product information to permit consumers to make informed decisions. • consumers have a right to be informed and are also responsible for safe food handling. • government has a responsibility to: o set and enforce standards for health and safety based on sound scientific risk assessment and management principles; o ensure that dairy product information provided by industry is sufficient and accurate; o provide health and safety information to consumers and industry.

2.3	Application and Responsibility
Outcomes	The primary objective of the *National Dairy Code* is the production of safe and wholesome dairy products based on risk management principles. In addition, there are a number of other expected outcomes: • better knowledge of safe dairy processing practices by all stakeholders. • improved consistency in the interpretation and application of dairy industry regulations by all stakeholders. • the establishment of minimum requirements for the dairy processing industry. • enhanced protection from product misrepresentation and economic fraud. • improved national market access.

2.4	Application and Responsibility
Variances	As a practical and interpretative document, the *National Dairy Code* is not meant to stand alone, but rather to be used in conjunction with legislation and resource materials to assist in the production of safe dairy products. As such, the *Code* is not necessarily a rigid document. As new technology becomes available, operational procedures and equipment standards in a dairy plant may vary from the *Code*. However, these variances will only be considered if the dairy plant licencee can provide sound scientific evidence which clearly demonstrates the variances will: 1) meet the intentions of the standards, principles and requirements in the *Code*, and 2) maintain or improve the level of health and safety of the dairy products.

Part III

3.1	Construction and Maintenance Standards of Dairy Plants
Site and Location	the dairy plant site should be chosen such that it is free from conditions that might interfere with the sanitary operation of the dairy plant, including: • no land use conflicts or potential conflicts with adjacent sites • set reasonably apart from barnyards, waste disposal facilities, incompatible processing facilities, and any offensive trades. Generally a minimum set-back of 30 metres is recommended from potential sources of contamination. However, a greater or lesser distance could be accepted depending on specific site conditions.
Health and Safety Rationale Surrounding facilities should not produce conditions which may contaminate dairy products. This could include excessive dust, foul odours, smoke and other similar conditions.	

3.2	Construction and Maintenance Standards of Dairy Plants
Walls and Ceilings	• shall be smooth, impermeable, washable and light coloured. • suitable materials would include tile, concrete, plaster, sealed brick, or other equivalent materials. • kept in good repair. • clean and free from flaking material. • free of pitting and cracks.
Health and Safety Rationale Properly finished walls and ceilings are more easily kept clean and as such, are more likely to be kept clean. A light coloured finish aids in the even distribution of light and the detection of unclean conditions which can then be corrected.	

3.3	Construction and Maintenance Standards of Dairy Plants

Floors	• floors of all rooms in which dairy products are received, processed or stored shall:
	  o be constructed of sealed concrete or other equally impervious and easily cleanable material,
	  o be smooth and not allow for pooling of liquids,
	  o where applicable, be sufficiently sloped for liquids to drain. Generally a minimum slope of 2% or more is recommended.
	  o floor to wall joints should be coved (generally a 15 cm extension is recommended) and sealed for ease of cleaning and maintenance.
	  o be kept clean and in good repair.
	• floors in storage rooms used for storing dry ingredients or packaging materials, or utility rooms (electrical service, etc.) shall be smooth and cleanable.

Health and Safety Rationale Floors which are constructed of impervious materials will not absorb water or organic matter and, as such, they are more likely to be kept clean. Properly sloped floors facilitate cleaning and sanitizing, and help avoid pooling of liquids which can lead to an unclean environment. A clean processing environment will minimize the risk of contamination of dairy products from environmental sources.	

3.4	Construction and Maintenance Standards of Dairy Plants

Floor Drains	• floor drains shall be provided, where necessary, to effectively prevent accumulation of liquids.
	• drain lines shall be sloped, individually trapped, and properly vented to outside air.
	• floor drains shall be separate from sewage drains to a point outside the plant.
	• equipped with removable covers and located so that they are accessible for cleaning and sanitizing.
	• for equipment discharging large volumes of water, drainage shall be designed to prevent flooding of surrounding areas.
	• shall be constructed such that there is no cross-connection between the drains or drain lines, and
	  o the water supply,
	  o the dairy product lines or equipment, or

	o the CIP system.

Health and Safety Rationale

The accumulation of liquids on the floor of a dairy plant can lead to an unclean environment which increases the likelihood of contamination of the dairy products. Properly designed drains and drain lines can eliminate the accumulation of liquids.

Trapping and venting of drains prevents sewer gases and pests from entering the plant. The provision for the separation of floor drains from sewage drains is to prevent the contamination of the floor drains with human wastes. Human wastes can contain pathogenic bacteria. Contamination of the floor drains with this material increase the likelihood of contamination of the dairy plant environment with this material.

3.5	Construction and Maintenance Standards of Dairy Plants
Overhead Utility Lines	• must be suspended away from work areas or areas of exposed dairy products to minimize the potential for contamination. • where appropriate, insulated to prevent condensation and covered with suitable material for ease of cleaning. • lines carrying contaminated or hazardous materials, such as sewer or floor drain lines, should be located sufficiently distant from any product or product contact surfaces or other appropriate actions must be taken so as to ensure there is no risk of contamination.

Health and Safety Rationale

Conditions such as dripping condensate or excessive dust from overhead utility lines can act as a source of contamination when uncovered or unprotected lines are suspended over work areas or areas of exposed product. When the consequences of contamination are significantly higher, such as in lines carrying hazardous chemicals or highly contaminated materials, then appropriate preventative actions must be taken to eliminate any risk of contamination of dairy products.

3.6	Construction and Maintenance Standards of Dairy Plants
Stairs	• must be located so as to minimize the risk of product contamination. • constructed of impervious materials that are cleanable. • catwalks or mezzanines located over processing areas, and where splashing or dripping could pose a contamination risk

	must be of solid masonry or metal construction. Where appropriate, catwalks and mezzanines must be equipped with raised edges of a height sufficient to prevent the spread of contamination.

Health and Safety Rationale

Stairs, catwalks or mezzanines over or near work areas or exposed product can act as a source of contamination (eg. dust, dripping liquids) of dairy products and as such, preventative measures must be taken to minimize the risk of contamination. Raised edges or properly designed splash guards of a height sufficient to contain any splashing from filling to work areas or exposed product below can be effective in minimizing the risk of contamination. Stairs, catwalks or mezzanines constructed of materials easy to clean are more likely to be kept clean.

3.7	Construction and Maintenance Standards of Dairy Plants
Exterior Openings	• all doors leading to the outside shall be self-closing and tight fitting. • doors, windows and all other openings leading to the outside shall be pest proofed with effective means such as: o screening, o electric screen panels, o fans or air curtains which provide sufficient velocity so as to prevent entrance of flies, o strip curtains, or o any other method which prevents entrance of pests.

Health and Safety Rationale

Freedom from pests in the dairy plant reduces the likelihood of contamination of dairy products. Pests may carry pathogenic organisms on and within their bodies. These pathogens could be spread through the plant, including in the equipment as the pests move about the plant.

3.8	Construction and Maintenance Standards of Dairy Plants
Lighting	• dairy plants shall be supplied with sufficient artificial light to ensure the safe and sanitary production of dairy products. • lighting shall be designed to prevent accumulation of dirt, be cleanable and shielded with shatter proof coverings. • generally, the minimum lighting intensities should be:

	o 550 lux (50 foot candles) in processing areas. o 220 lux (20 foot candles) in all other areas.

Health and Safety Rationale

Adequate lighting promotes cleanliness by facilitating the identification of unclean areas. Shielding of lights to prevent the contamination of dairy products from glass fragments in the event of breakage is an essential public health protection measure.

3.9	Construction and Maintenance Standards of Dairy Plants
Ventilation	• adequate ventilation is required to prevent excessive dust accumulation, odours or build-up of condensation on equipment, walls, and ceilings. • Designed to cause the direction of air flow to be from the processing areas outward to other areas of the plant. • air intakes and outlets shall be located to minimize the chance of contamination. • air intakes and outlets and filters shall be maintained to minimize contamination.

Health and Safety Rationale

Unclean air, excessive dust, odours, or build-up of condensation are all potential sources of contamination for dairy products. Air supplied to the dairy plant should be of sufficient quality so as not to contaminate the equipment or the dairy products, and result in a positive air pressure in the processing areas.

3.10.1	Construction and Maintenance Standards of Dairy Plants
Water Supply	• water supply shall be approved by the local or provincial regulatory agency. • hot and cold water, under adequate pressure, and in sufficient quantities, shall be provided. • water samples shall be tested at a government or accredited laboratory and at a frequency deemed necessary by the regulatory agency. • where non-potable water is used, there will be no possibility of a cross connection between the potable and non-potable systems. • **Only potable water shall be used in contact with product or product contact surfaces.** • there shall be no possibility of a cross connection between the water supply and CIP systems. • where automatic chlorinator systems are used, controls and procedures shall be established to ensure quality control for water potability. These include: o an automatic metering device for adding chlorine in the correct concentration, o at least once daily, tests shall be made using a reliable chlorine test kit to determine the free residual chlorine level. Records of residual chlorine tests shall be maintained

Health and Safety Rationale

An adequate water supply is necessary to ensure effective cleaning and other processing operations. As such, it must be supplied in quantities that encourage adequate rinsing and cleaning. The water supply used in cleaning and other processing operations must be of a safe and sanitary quality in order to avoid the contamination of the dairy equipment, containers, or dairy products.

Cross-connections between the water supply and the CIP system have been known to contaminate the water supply.

Inadequate controls over automatic chlorinator systems could result in a water supply that is non-potable.

3.10.2	Construction and Maintenance Standards of Dairy Plants
Steam	• steam may be used in a plant for cleaning and sanitizing purposes and in manufacturing processes. When the steam enters directly into contact with the product and milk or dairy product contact surfaces, it must be of culinary quality.

	• the water used to produce steam is ultimately a food ingredient. This water should therefore meet potable water regulatory requirements. Corrosion inhibitors and water softeners used in the boiler create a special risk. All agents added to the boiler water should be acceptable for use in **dairy** plants. Operation of the boiler, in particular the treatment of water used to supply the boiler, should be monitored under the supervision of qualified employees or a company specializing in the processing of industrial water. • It is important therefore that plant managers read the label of all agents added to the water and contact the manufacturer to ensure that the additives do not contain the following chemicals: - 2-Amino-2methyl-1-proponal - Cyclohexylamine - Diethylaminoethanol - Morpholine - Octadecylamine - Trisodium nitrilotriacetate - N,N-Bis (2hydrozyethyl>alkyl(inc12-18>18 amine, derived from coconut oil • It is recommended that the samples of condensed steam be checked periodically to ensure safety and quality. Samples should be taken from the steam line between the equipment used for final separation of the steam and the point where the steam enters the product.
Health and Safety Rationale Because culinary steam is used in direct contact with dairy products, the water used in it's production must not be contaminated.	

3.11	Construction and Maintenance Standards of Dairy Plants
Handwashing Facilities	• handwashing facilities shall be provided including hot and cold water, soap in dispensers and sanitary hand drying supplies or devices. • handwashing facilities shall be located convenient to the toilets, and in all processing areas. • electronic or foot operated faucets are recommended wherever practicable.

Health and Safety Rationale

Proper use of hand washing facilities is essential to personal cleanliness and reduces the likelihood of contamination of dairy products. Improper handwashing has been documented as a major contributing factor in outbreaks of foodborne illness.

3.12	Construction and Maintenance Standards of Dairy Plants
Washrooms and Change Rooms	• conveniently located washrooms and change rooms shall be provided exclusively for the use of dairy plant personnel. • washroom and changeroom facilities shall not open directly into an area used for receiving, processing, or storing of dairy products. • washroom and changeroom facilities shall: o have tight fitting, self closing doors, o be kept in a clean condition, in good repair, well ventilated and well lit, o conform to the handwashing requirements in Section 3.11, o have personnel hand washing notices displayed, o all plumbing shall meet the applicable provisions of the provincial or local plumbing codes.

Health and Safety Rationale

Human wastes are potentially dangerous and must be disposed of in a sanitary manner. Pathogenic organisms may be present in the body discharges of active cases or carriers. Properly located sanitary toilet facilities are necessary to protect dairy products, equipment, and containers from fecal contamination which may be carried by insects, hands, or clothing. Toilet facilities, kept clean and in good repair, minimize the opportunities for the spread of contamination by the above means. The provision for these facilities not opening directly into processing areas makes it less likely that contamination will enter these areas via vectors such as air and pests.

3.13	Construction and Maintenance Standards of Dairy Plants
Product Flow and Separation	• dairy plant layout should be such that product flow is in one direction (raw to processing to packaging to storage to shipping). • dairy plant layout should also minimize the flow of personnel between different areas of the plant. • incompatible areas or processes, particularly raw receiving and processing areas, shall be separated so as to preclude the possibility of contaminating finished dairy products.

	• foot baths are recommended at doors leading into sensitive processing areas as one means to reduce contamination of the dairy plant. • foot baths shall be regularly refreshed and maintained. • if foot baths are not used other approved precautionary actions shall be taken to prevent contamination from personnel flow practices.

Health and Safety Rationale

Unnecessary movement of both product and personnel within the dairy plant increase the likelihood of dairy product contamination. As such, movement of product or personnel within the dairy plant should be controlled. As well, if unsanitary operations (eg. cleaning of equipment or receiving of raw milk) are done in close proximity to sanitary operations (eg. packaging of pasteurized finished product), the likelihood of contamination of dairy products increases, thus requiring the separation of incompatible processes. Footbaths are one method of precautionary action to prevent contamination from personnel flow practices. However, if not properly maintained, they can act as a source of contamination.

3.14	Construction and Maintenance Standards of Dairy Plants
Building Exterior	• exterior structure shall be designed and maintained to prevent entry of pests. • areas surrounding exterior of dairy plant shall be: o drained to minimize standing water. o free of uncontrolled vegetation, stored items, garbage, or any other condition in close proximity to the dairy plant that could harbour pests. o maintained to minimize creation of dust.

Health and Safety Rationale

The general surroundings of a dairy plant should not attract rodents, flies and other insects which could then gain access to the dairy plant. Presence of pests in the dairy plant increases the likelihood of dairy product contamination.

3.15	Construction and Maintenance Standards of Dairy Plants
Sewage and Solid Waste Disposal	• sewage disposal systems shall meet all local or provincial requirements. • disposal of sewage and solid wastes shall be done in a sanitary manner and not expose the dairy plant environment or the dairy

	products to risk of contamination.
	• solid waste containers within the plant shall be:
	  o sufficient in number, accessible, and be emptied daily or when full
	  o designed to prevent the attraction of pests or contribute to airborne contamination,
	• garbage storage rooms and containers shall be emptied, cleaned and sanitized on a regular basis.
	• solid waste containers located outside the plant shall be:
	  o equipped with covers and closed when not in use,
	  o maintained in a manner not to attract pests,
	  o emptied, cleaned and sanitized regularly.

Health and Safety Rationale

Frequent and proper disposal of both sewage and solid wastes and the maintenance of waste containers and facilities will minimize the presence of pests inside and outside of the dairy plant. As well, the general dairy plant environment will be more sanitary reducing the likelihood of dairy product contamination.

4.1	Thermal Processing
Introduction	Temperature and time are critical factors required to achieve pasteurization. Failure to achieve pasteurization could result in a microbiological hazard in the food. Part IV of the Regulation will be met by following those time/temperature requirements listed in the Regulation in Appendix 1 - Thermal Processing Parameters for Batch and HTST Pasteurizers. Other time/temperature combinations such as Higher Heat Shorter Time may be approved by the Regulatory Agency.

Health and Safety Rationale

Pasteurization is the only practical, commercial method which, if properly applied to all milk, will destroy all milkborne disease organisms. Pasteurization has been conclusively shown to prevent diseases which may be transmitted through milk. The time and temperature combinations specified by this Code, if applied to every particle of milk, will destroy all milkborne pathogens.

4.2.1	Batch Pasteurization
Recording Chart Information	The following information must be recorded on each chart: • plant name • date and shift (a.m./p.m.). • vat number. • time and temperature of holding period. • the start and end of the pasteurization process. • reading of air space thermometer during the holding period at a given time or reference point indicated on the chart. • reading of indicating thermometer during the holding period at a given time or reference point on the chart. • amount and name of product represented by each batch on the chart. • record of unusual occurrences. • signature or initials of operator. Information must be maintained for a minimum of 1 year, or as determined by the regulatory agency; or until after expiration of the date code if more than 1 year.

Health and Safety Rationale

The information provided by the recording chart provides a permanent record that the proper time and temperature of the pasteurization step has been applied. Should there be a problem or question regarding the safety of a particular batch of a dairy product, this information can be used to help identify the source of contamination.

4.2.2.1	Components of the Batch Pasteurizer
Valves and Connections	Hand/Automatic Valves • inlet and outlet plug type hand valves must be of the leak protector type. Generally leak protector grooves are recommended to be at least 0.5 cm (3/16") wide and 0.25 cm (3/32") deep at the centre. • inlet and outlet plug type hand valves must be provided with stops on the plug and designed such that the operator cannot turn the valve beyond the stop position. • inlet valves which are not plug type hand valves shall have their lines disconnected during heating, holding, cooling and emptying. Outlet valves which are not plug type hand valves shall have their lines disconnected during filling, heating and holding. • outlet valves shall be close coupled. • when the inlet line with a leak protector valve enters above the product and is submerged in product, the line shall be provided with an automatic air relief or vent located at the valve or a hole drilled in the filler pipe, below the vat cover but above the product level. Generally the recommended hole size is 0.32 cm (1/8"). • the pipeline between the inlet valve and the vat shall be sloped to ensure free drainage. • inlet valves located in a position where head pressure can be exerted must have the inlet line disconnected during heating, holding and cooling.

Health and Safety Rationale

Leak protectors on plug type valves are required for two reasons:

To prevent the accumulation of unpasteurized milk in the milk passages of the valve when the valve is in the closed position. During the heating or holding step, milk in these passages may not reach pasteurization temperature. When the valve would be re-opened, this unpasteurized milk could enter the pasteurized product.

To prevent the movement of unpasteurized milk around the valve and then into connecting equipment or product which has been pasteurized. Grooves must be wide enough to prevent clogging.

Stops on plug type valves are required in order to guide the pasteurizer operator in fully closing the valve. Inlet valves must be fully closed so that unpasteurized milk cannot inadvertently enter the batch tank during heating, holding or cooling. Outlet valves are required to be fully closed so that unpasteurized milk cannot inadvertently enter the pasteurized equipment.

Inlet and outlet valves which are not plug type hand valves shall have their lines disconnected during these times to ensure that:

- Unpasteurized milk does not enter the batch pasteurizer via the inlet valve.
- Unpasteurized milk does not enter the pasteurized equipment caused by the movement of unpasteurized milk around the respective valve.

Close coupling ensures that no milk in the space between the pasteurizer wall and the valve is more than 0.5^{0}C colder that the milk in the centre of the pasteurizer at any time during the holding period.

A vent or air relief in the inlet line ensures that the unpasteurized milk in the line is completely emptied into the pasteurizer when the inlet valve is closed.

Free drainage of the inlet line is required to ensure that no unpasteurized milk is left in this line which could inadvertently enter the batch pasteurizer after pasteurization is completed.

Head pressure may cause unpasteurized milk to leak past the inlet valve.

4.2.2.2	Components of the Batch Pasteurizer
Cover (Ports)	• vat pasteurizers shall be designed to prevent contamination from exterior surface drainage into vats. • covers or ports shall be closed during operation. • covers should extend completely over the edges of the vat. • entry points such as those for pipes should be shielded to prevent entry of foreign matter.

Health and Safety Rationale

The pasteurizer must be sufficiently sealed from the exterior environment in order to prevent raw milk or some other contaminating material containing pathogenic bacteria from entering the pasteurizer during the holding or cooling periods.

4.2.2.3	Components of the Batch Pasteurizer
Air Space Temperature Requirements	to meet air space temperature requirements the following methods may be used: • by using elevated pasteurization temperatures. • by use of an airspace heater.

	• by use of culinary steam.

Health and Safety Rationale

Foam and splashed milk are frequently on the surfaces and fixtures above the milk level as well as on the underside of the vat cover. This unpasteurized milk can contain pathogenic organisms. Droplets of this milk, if not subjected to pasteurization temperature for the required time, could drop back into the body of the milk, thus contaminating it. Heating the air above the milk, above pasteurization temperatures, remedies this condition. The air temperature must be at least 3^0C higher than the minimum pasteurization requirements due to the insulative qualities of foam and air.

4.2.2.4	Components of the Batch Pasteurizer
Air Space Thermometer	• shall be located in such a way as to measure the air space above the product. Generally it is accepted that this will be achieved by locating the thermometer at least 5 cm below the underside of the cover and at least 2.5 cm above the product. • shall be either a mercury activated thermometer or a resistance temperature device (RTD) of a sanitary design, contained in a corrosion resistant case, protected against breakage, and permits easy observation. • shall be graduated in 0.5^0C divisions with not more than 9^0 C per 2.5 cm of span. • shall be tested on installation and once every three months in accordance with the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

This thermometer is considered to be the "true" or "legal" measurement of the air space temperature with regard to pasteurization requirements. As such an accurate, readable and properly located air space thermometer helps ensure that minimum air space temperature requirements are achieved.

4.2.2.5	Components of the Batch Pasteurizer
Indicating Thermometer	• shall be either inserted into the product or into a well that extends into the product. • shall be either a mercury activated thermometer or RTD

	resistant case, protected against breakage, and permits easy observation**.** • shall be graduated in 0.5^0 C divisions with not more than 9^0 C per 2.5 cm of span. • shall be tested on installation and once every three months in accordance with the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

This thermometer is considered to be the "true" or "legal" measurement of the product temperature with regard to pasteurization requirements. As such an accurate, readable, and properly located indicating thermometer helps ensure that minimum pasteurization temperature requirements are achieved.

4.2.2.6	Components of the Batch Pasteurizer
Recording Thermometer	• shall be designed, installed and maintained so as to minimize moisture and vibration from affecting its operation and shall provide an accurate record of the temperature and time of the pasteurization process. • shall be either inserted into the product or into a well that extends into the product. • shall be tested on installation and once every year in accordance with the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

Properly maintained and located recording thermometers are necessary in order to furnish an accurate record of the time and temperature of pasteurization.

4.2.2.7	Components of the Batch Pasteurizer
Recording Charts	• shall provide a continuous record of the pasteurization process for each batch. • the following provides the general specifications for adequate chart recording: • For processing temperatures above 72^0C (162^0F) • charts calibrated in 1^0C (2^0F) divisions, spaced not less

	than 1 mm (0.4") apart between 65^0C and 77^0C (150-170^0F) o charts graduated in 15 minute intervals o circular chart to rotate one revolution in not more than 24 hours. • For processing temperatures below 72^0C (162^0F) o charts calibrated in 0.5^0C (1^0F) divisions, spaced not less than 1.6mm (0.0625") apart between 60^0C and 69^0C (140 - 155^0F) o charts graduated in 10 minute intervals o circular chart to rotate one revolution in not more than 12 hours.

Health and Safety Rationale

Recording charts with easy to read time and temperature scale divisions and a readable pen line are necessary in order to furnish an accurate record of the time and temperature of pasteurization.

4.2.3	Components of the Batch Pasteurizer
Process Control	• the holding period time shall start when the indicating thermometer reading has reached the required pasteurization temperature and the air space thermometer reads at least 3^0 C higher than the minimum pasteurization temperature required for that product. • the time of day as depicted on a single reference clock shall be manually recorded on the recording chart indicating the start and completion of the holding period. • no milk or ingredient shall be added to the vat after the start of the holding period. • there shall be continuous agitation during the heating and holding process.

Health and Safety Rationale

In order to ensure that all pathogenic bacteria are destroyed, the dairy product must be held continuously at or above the minimum specified pasteurization temperature for a minimum of 30 minutes. As well, because air or foam in the air space acts as a heat insulator, the air space must be held continuously at least 3^0C above the minimum specified pasteurization for a minimum of 30 minutes.

Experience has shown that recording thermometers are not entirely reliable due to their mechanical complexity and the processing environment. Manual verification of the start

accurate.

Any milk or ingredient added after the start of the holding period would not necessarily be held for a minimum of 30 minutes and thus would not be pasteurized. If milk or ingredients are added after the start of the holding period, then the holding time must begin again provided the product is at or above the minimum specified pasteurization temperature.

Continuous agitation ensures there are no pockets of milk in the vat which may be below the minimum specified pasteurization temperature and that every particle of milk will be held continuously at the proper temperature for the specified period of time.

In addition to time and temperature requirements, HTST pasteurization requires several other critical factors to be present in order to achieve pasteurization. These critical factors include: constant maintenance of a proper pressure relationship within the HTST, proper interwiring of HTST components, and a proper HTST system design. Failure of any one of these factors could result in a microbiological hazard in the food.

4.3.1	HTST Pasteurization
Recording Chart Information	The following information must be recorded on the chart: • plant name. • date and shift (a.m./p.m.). • HTST number. • reading of the indicating thermometer during processing. • the frequency pen will record the position of the flow diversion device during processing. • cut-in and cut-out temperatures for each product type processed where different cut-in and cut-out temperatures are used. • the results of the daily cut-in and cut-out temperature test for each product type processed, read from the indicating thermometer prior to that product being processed. • product type and amount of each product processed. • identification of cleaning cycles. • record of unusual occurrences. • signature or initials of operator. Information must be maintained for a minimum of 1 year, or as determined by the regulatory agency; or until after expiration of the date code if more than 1 year.

Health and Safety Rationale

The information provided by the temperature recorder and recording chart help provide the assurance that the proper temperature of the pasteurization process has been applied. Should there be a problem or question regarding the safety of a particular lot or batch of a dairy product, this information can be used to help identify the source of contamination.

4.3.2.1	Components of the HTST Pasteurizer

Constant Level Tank	• shall be of such a design and capacity that air will not be drawn into the pasteurizer with the product when processing. Generally this is achieved by the bottom of the tank being pitched with at least a 2% downward slope and the top of the outlet pipe being lower than the lowest point in the tank.
	• shall be fitted with a removable cover or inspection port.
	• the overflow level of the tank shall be lower than the lowest product level in the raw product regenerator. Generally the overflow level is defined as:
	  o the unobstructed rim of the tank, or
	  o the highest point of an opening in the side of the tank. The opening must have a diameter that is twice the diameter of the largest raw product inlet connected to the tank.
	• the leak detect, divert, water, and product recycle lines must break at least two times the diameter of the largest return line connected to the tank above the overflow level of the tank.
	• shall be equipped with a sanitary device to control the flow of product into the tank.

Health and Safety Rationale

Air drawn into the pasteurizer may allow the milk particles to move more rapidly through the system thus reducing the holding time.

A suitably designed cover will minimize contamination.

The overflow level is required to be lower than the lowest product level in the raw regenerator in order to allow for free drainage of the raw regenerator into the constant level tank.

The leak detect, divert, water, and product recycle lines must be appropriately positioned to prevent the siphonage of raw product from the constant level tank into these lines.

A sanitary flow control device helps ensure a constant flow of product into the tank providing a constant head pressure to the product leaving the tank and reducing the likelihood of air being drawn into the system.

4.3.2.2	Components of the HTST Pasteurizer

Booster Pump	• must be located and installed so as not to interfere with the proper product pressure relationships or with the holding time.
	• a pressure differential controller or pressure switch (See 4.3.2.13) must be installed when a booster pump is present.
	• except during the cleaning cycle, the booster pump cannot operate unless:
	  o the flow control device is in operation, and
	  o the flow diversion device is in the forward flow position, and
	  o the pasteurized product in the pasteurized product regenerator exceeds by at least two (2) psi the pressure of the product in the raw product regenerator.
	• shall be located between the constant level tank and the inlet of the raw product regenerator.
	• the booster pump cleaning mode, if present, shall be designed and installed to ensure that it cannot be accidentally activated during the pasteurization cycle.
	• the raw product regenerator may be bypassed. These bypass connections must be designed to minimize entrapment of product and prevent free drainage of raw milk into constant level tank. Generally, this is achieved by:
	  o being close coupled, or
	  o designing the bypass valve to permit slight movement of product through the bypass line.
	• shall be tested on installation and at the frequency specified in the procedures outlined in the Test Methods in Section VII.

Health and Safety Rationale

In an HTST, a proper product pressure relationship is maintained when the pressure of the pasteurized product regenerator is, under all conditions, higher than the pressure of the raw product regenerator. Under these conditions, should any cracks or pinholes be present in the plate(s) separating these two sections, then product will flow from the pasteurized product regenerator to the raw product regenerator and not vice versa.

A properly installed pressure differential controller or pressure switch controls the operation of the booster pump which helps ensure a proper product pressure relationship is maintained within the regenerator.

Operation of the booster pump in a properly designed HTST only under these three conditions will ensure that the proper pressure relationship within the regenerator is maintained.

Positioning of the booster pump in another location may result in an improper relationship within the regenerator.

During cleaning mode, the booster pump is designed to operate continuously and under all conditions. Controls designed to maintain a proper pressure relationship within the regenerator are overridden. As such, activation of the booster pump cleaning mode during the pasteurization cycle could result in contaminated product.

Entrapment of product in a raw product regenerator bypass line would result in the product rapidly increasing in temperature. Raw product held at elevated temperatures for a period of time can result in high numbers of bacteria continually seeding the system.

4.3.2.3	Components of the HTST Pasteurizer
Raw Product Regenerator	• shall be located between the constant level tank and the flow control device. • except during the cleaning cycle, the HTST pasteurizer must be designed, installed, and operated to ensure that the pressure in the pasteurized product regenerator is higher (at least 1 psi) than the pressure in the raw product regenerator. • all raw product in the raw product regenerator shall drain freely to the constant level tank in the event of a shutdown. Generally, this is achieved by: o drilling a two (2) mm hole in the raw product channel deflector plates, and o installing the raw product inlet into the lowest point of the raw product regenerator. • all raw sections of a split regenerator must also be free draining. • the plates shall be checked at least annually for perforations.

Health and Safety Rationale

Positioning of the raw product regenerator in another location may result in improper pressure relationships in the regenerator.

As discussed in 4.3.2.2, a proper product pressure relationship within the regenerator is required.

In the event of an HTST shutdown, the pasteurized product regenerator will be maintained at or above atmospheric pressure by meeting the elevation requirement of 4.3.2.17. The raw product regenerator, if free draining, will result in the raw milk being maintained under suction or sub-atmospheric pressure, thus ensuring a proper product pressure relationship is maintained in the regenerator.

All sections of a split regenerator must be considered to ensure that proper product pressure relationships are maintained under all conditions.

The HTST is designed to result in product flow from the pasteurized to the raw section(s) of the regenerator in the event of cracks or pinholes in the plate(s). However, perforations in the plate(s) does increase the possibility of raw product contaminating the pasteurized product.

4.3.2.4	Components of the HTST Pasteurizer

Flow Control Device	• the flow control device shall be designed, installed, and operated to ensure that:
	  o every particle of product is held for at least the minimum holding time, and
	  o except during the cleaning cycle, the pasteurized product regenerator section is at a higher pressure (at least 1 psi) than the raw product regenerator.
	• Only flow control devices approved by the regulatory agency may be used. Generally there are three (3) types that are approved.
	  o positive pump,
	  o homogenizer,
	  o meter based timing system.
	• shall be located upstream of the holding tube.
	• shall be inter-wired with the flow diversion device and the STLR so that it will only operate in the safe forward flow (temperature of the product is above the divert point) or fully diverted position. When a homogenizer is used as a flow control device, a time delay relay may be installed to permit the homogenizer to continue operating during the time it takes the flow diversion device to move from forward flow to diverted flow. This time delay shall be no more than one second.
	• variable speed driving mechanisms shall be designed to permit

	which gives minimum holding time. • no product shall bypass the flow control device during processing. • shall be sealable. • shall be tested on installation, when any alteration is made affecting the holding time, and at the frequency specified in the procedures outlined in the Test Methods in Section VII. • in addition to the above criteria, meter based timing systems shall: o have a flow recorder capable of recording flow at the high flow alarm set point and also at least 19 litres per minute higher than the high flow alarm setting. The flow recorder shall have an event pen which shall indicate the position of the flow diversion device with respect to flow rate. • only magnetic flow meters recognized by the regulatory agency may be used. • have a high flow alarm with an adjustable set point which will automatically cause the flow diversion device to be moved to the divert position wherever excessive flow rate causes the product holding time to be less than the minimum holding time for the product being processed. • have a low flow or loss of signal alarm which will automatically cause the flow diversion device to move to the divert position whenever there is a loss of signal from the meter or the flow rate is below the preset minimum flow rate. • ensure that when the legal flow rate has been re-established following an excessive flow rate, the flow diversion device must remain in the diverted position for no less than the minimum holding time of the product being processed. • have a sanitary product check valve to prevent positive pressure in the raw product regenerator during shutdown conditions. The check valve or normally closed air operated valve must be installed between the magnetic flow meter and the start of the holding tube. • ensure that installation of the individual components in the system shall comply with the following conditions: o the centrifugal and positive displacement pumps shall be located downstream from the raw product regenerator. o the magnetic flow meter shall be placed downstream from the centrifugal pump with no components such as valves or pumps between them. o for single speed centrifugal and positive displacement pumps, a control valve must be placed downstream from the magnetic flow meter and upstream from the holding tube. o the centrifugal and positive displacement pumps and

	the holding tube. o product is not fed into or extracted from the system (ie. cream or skim milk from a separator or other product components) between the centrifugal pump and the flow diversion device. o the magnetic flow meter is installed such that the product has contact with both electrodes at all times when there is flow through the system. Generally, this is most easily accomplished by mounting the flow tube of the magnetic flow meter in a vertical position with the direction of flow from the bottom to the top. o the magnetic flow meter shall be piped in such a manner that at least ten (10) pipe diameters of straight pipe exists upstream and downstream from the centre of the meter before any elbow or change of direction takes place. • ensure that when computers or programmable logic controllers are used, they are installed in such a manner that critical control equipment is not influenced by the computer or programmable logic controller. These devices may however control the speed of an AC variable frequency centrifugal pump provided the high flow alarm is set and sealed to provide for diversion of the flow diversion device wherever the design flow rate is exceeded.

Health and Safety Rationale

In order for the pathogenic bacteria in raw milk to be destroyed, the milk must be held continuously above the specified temperature for the minimum length of time specified in Appendix 1 of the Regulation. The flow control device controls this hold time in an HTST. As such, the flow control device must be designed, installed, and operated to ensure that every particle of milk is held for at least this minimum holding time. As well, the flow control device must not inadvertently influence the proper product pressure relationship in the raw product regenerator as discussed in 4.3.2.2.

The three types of flow control devices that are approved have demonstrated that, if properly installed and operated, they will ensure the minimum holding time requirements are met and that the proper product pressure relationships are maintained in the regenerator.

Positioning of the flow control device in another location may affect the holding time or adversely affect the proper product pressure relationships within the regenerator.

Interwiring with the flow diversion device and the STLR is required to prevent the flow of unpasteurized product into the pasteurized section of the HTST in the event that the flow diversion valve does not set itself firmly against the valve body during a diverted flow caused by a drop in product temperature. Under such a scenario, the flow control device is de-energized, ceasing all flow of any unpasteurized product into the pasteurized section of the HTST. A time delay relay is permitted to allow a homogenizer acting as the flow control device to continue to operate during the normal

homogenizer if it is made to quickly stop then start again.

Sealing of variable speed driving mechanisms prevents the operator from inadvertently increasing the velocity of the system which could result in product receiving below the minimum required holding time.

During shutdown, the pasteurized product in the regenerator is maintained at atmospheric pressure or higher by meeting the elevation requirement of 4.3.2.17. However, any backflow of product through the flow diversion device would lower the pasteurized product level, thus tending to reduce the pressure in the pasteurized product regenerator. The flow diversion device cannot be relied upon to prevent backflow during shutdown because the product may still be at sufficiently high temperature to keep the flow diversion device in the forward flow position. The presence of a bypass on the flow control device, under these conditions, would permit backflow thus risking the loss of a proper product pressure relationship within the HTST.

Meter Based Timing Systems

With a meter based timing system (MBTS), product flow and thus the holding time, is variable. A properly designed flow recorder, with an event pen, provides a record that product flow has been maintained at or above the minimum holding time.

A properly operating high flow alarm will ensure that all product is held for the minimum pasteurization holding time. Product not properly held is diverted.

A loss of signal indicates mechanical difficulties with the flow recorder. Movement to the diverted position ensures that no improperly pasteurized product will enter the pasteurized section of the HTST.

After an excessive flow, a minimum holding time is required to ensure that all particles of product in the holding tube have been held for at least the minimum hold time required.

As with a standard flow control device, backflow through the flow control device during shutdown conditions could result in a loss of proper product pressure relationship within the HTST.

Reasons for individual component installation are as follows:

- Ensure proper product pressure relationships within the regenerator are maintained.
- The magnetic flow meter measures and controls the flow of the centrifugal pump. Any component between the two may result in the flow measured by the flow meter to be inaccurate.
- Positioning of the control valve in this location ensures that:
- The flow measured by the flow meter is accurate, and
- The flow entering the holding tube is that which is measured by the flow meter.
- Positioning of these devices in another location may affect the holding time or adversely affect the proper product relationships within the regenerator.
- Product entering or leaving the system would affect the holding time of product being pasteurized.

- Electrodes in contact with air will produce inaccurate flow meter readings.
- Excessive turbulence, caused by elbows or changes of direction may produce inaccurate flow meter readings.

Control of the critical public health functions must not be under the control of a computer or programmable logic computer that can be inadvertently affected from a remote location.

4.3.2.5	Components of the HTST Pasteurizer
Heating Section	• shall be located upstream from the holding tube. • boiler chemicals and additives shall be approved by the regulatory agency. • heat transfer plates shall contain no imperfections such as pinholes or cracks. • the plates shall be checked at least annually for perforations.

Health and Safety Rationale

Location upstream of the holding tube is necessary in order to heat the milk to pasteurization temperature prior to the holding tube and flow diversion device. Boiler chemicals and additives must be nontoxic because heating medium could leak undetected into the milk through pinholes or cracks.

4.3.2.6 Holding Tube	• shall be designed to provide for the continuous holding of every particle of product for at least the minimum required holding time in the holding tube and sensing chamber. • shall be located downstream from the flow control device and the heating section; and upstream from the flow diversion valve. • shall be provided, including all elbows and the sensing chamber, with a continuous slope of 2% upwards to the flow diversion device. Any piping from the outlet of the heating section to the flow diversion device that has less than the required slope shall not be considered part of the holding tube. • shall be maintained by permanent supports. • shall be free from any form of external heat source. • should be equipped with the necessary fittings for checking the holding time by means of saline solution. Where these fittings are not present, provisions must be made to check the holding time using the calculated method. • shall be tested on installation, when any alteration is made affecting the holding time, and at a frequency as specified in the procedures outlined in the Test Methods in Section VII.

Health and Safety Rationale

As discussed in 4.3.2.4, in order for the pathogenic bacteria in raw milk to be destroyed, the raw milk must be held continuously above the specified temperature for a minimum length of time. This holding time is governed by the flow control device and the holding tube. As such, a properly designed holding tube is required in order to ensure the product is held for a minimum length of time.

Correct positioning of the holding tube helps ensure the product has been held above the minimum specified temperature for a minimum length of time prior to the flow diversion device.

A properly sloped holding tube ensures no air pockets are present in the tube. The presence of air pockets could decrease the holding time by reducing the effective volume for the liquid in the tube.

Proper support of the holding tube is necessary to ensure it remains properly sloped.

The presence of an external heat source could result in the product being held below the minimum specified temperature in the holding tube prior to contact with the flow diversion device.

Means must be provided to verify the holding time of product in the holding tube.

4.3.2.7	Components of the HTST Pasteurizer
Sensing Chamber	• shall be located at the outlet of the holding tube and not more than 45 cm upstream from the flow diversion device. Alternatively, for systems which divert near the legal minimum temperature, it is recommended that a second temperature probe connected to the STLR be installed at the beginning of the holding tube. • shall contain the indicating thermometer probe and the STLR temperature probe. • the indicating thermometer probe and the STLR temperature probe shall be located in close proximity to one another. • only the thermometer fitting openings in the sensing chamber are permitted to be higher than the inlet connection to the flow diversion device.

Health and Safety Rationale

Positioning of the sensing chamber at the end of the holding tube ensures the product has been held at or above the minimum specified temperature for the entire length of the holding tube and sensing chamber. Regarding the recommendation for a second temperature probe, there is evidence which suggests that the response time on the STLR and flow diversion device is not adequate to ensure that no particles of unpasteurized product will enter the pasteurized section of the HTST in the event of a rapid drop in temperature, particularly in high velocity systems. Placement of a second temperature probe at the beginning of the holding tube alleviates this potential problem.

In order to verify, measure, and record the processing temperature, these thermometers must be positioned at the end of the holding tube as described in the previous paragraph.

The purpose of the indicating thermometer is to measure the processing temperature and verify the accuracy of the STLR thermometer. As such, they must be in close proximity to one another.

Required in order to satisfy the provisions of a properly sloped holding tube of 4.3.2.6.

4.3.2.8	Components of the HTST Pasteurizer
Extended Holding Tube	• may be located either upstream or downstream from the flow diversion device. In either position the holding tube without the extension must meet the minimum holding time required. • the extension connection must be close coupled. • the extended hold cycle must either be scheduled for the end of the production day or the HTST must be cleaned before product is processed using only the regular holding tube.

	• if the extended hold is part of the official holding tube, then the extension must have a continuous upward slope of at least 2%.

Health and Safety Rationale

Should the extension be required to ensure minimum holding time, then accidental processing of a product without the extension would result in unpasteurized product. To prevent this occurrence, the holding tube without the extension must meet minimum holding requirements.

Close coupling is required to ensure that trapped product cannot warm up to room temperature resulting in excessive bacterial growth, with subsequent "seeding" of the system.

After processing through the extension, it will contain product or product residue if not washed. If not being used, the temperature in the extension will quickly reach room temperature. As a result bacterial growth will occur. Should the outlet valve of the extension be leaking, the "regular" holding tube will be seeded with the bacteria.

4.3.2.9	Components of the HTST Pasteurizer

Safety Thermal Limit Recorder (STLR)	• shall be designed, installed and operated to:
	  o record the temperature of the product in the sensing chamber.
	  o monitor, control, indicate, and record the position of the flow diversion device.
	  o supply the source of power for the flow control device and the flow diversion device solenoid during forward flow.
	• shall have flow diversion control capability for all products processed. Where a unit pasteurizes two or more dairy products requiring different pasteurization temperatures, separate diversion capabilities for each product must be provided. A single diversion temperature may be used if the diversion control is set for the product requiring the highest pasteurization temperature.
	• all dual or multi diversion STLR's shall be provided with a third pen to record the diversion temperature setting on the chart. When a third arm is not present to track the cut-in/cut-out temperature, the cut-in/cut-out setting shall be verified and recorded on the temperature chart before the product is processed.
	• shall be equipped with a frequency pen and a temperature recording pen that will track together on the chart.
	• the recording chart shall provide an accurate record of the processing temperature. Generally, this is achieved by:
	  o time scale divisions that are not more than 15 minutes

	and spaced not less than 6.4 mm apart at the flow diversion temperature. o pens that produce a line not greater than 0.7 mm wide. o temperature charts graduated 0.5ð°C (1.0ð°F) divisions. o a temperature range or span on the recording chart that is not less than 17ð°C (30ð°F) with the actual diversion temperature being 7ð°C (12ð°F) within the temperature span limits. o where resistance thermal devices (RTD's) are used, they shall be of the fail safe type (utilizing two separate RTD's). o shall be equipped with a positive mechanism to prevent chart slippage and manual rotation. • shall be tested on installation and at a frequency as specified in the procedures in Test Methods in Section VII. • the circular chart must rotate one revolution in not more than 12 hours. • the control panel for the STLR must be sealable.

Health and Safety Rationale

The function of the STLR is to ensure that every particle of milk has been pasteurized at or above the temperature specified in Appendix 1 of the Regulation. The STLR continually and automatically records the temperature of the product in the sensing chamber at the end of the holding tube. Should this temperature fall below the specified minimum temperature, the STLR causes the flow diversion device to move to the diverted position ensuring that no unpasteurized product enters the "pasteurized" side of the HTST. The STLR, in conjunction with the recording chart, provides a continuous record of the temperature of pasteurization as well as the position of the flow diversion device. This information is required, should a question or problem regarding the safety of a particular lot or batch of a dairy product, in order to help identify the source of contamination.

Flow diversion control capability for all products processed is required to ensure that all products are processed at or above their minimum specified temperature.

A record of the diversion temperature setting is required in order to verify that all products have been processed at or above their minimum specified temperature.

The temperature recording pen must track with the frequency pen in order to be able to verify the flow diversion device moves to the diverted position at sub-pasteurization temperatures. Recording charts with easy to read time and temperature scale divisions and a readable pen line are necessary in order to furnish an accurate record of the time and temperature of pasteurization. Fail safe type RTD's ensure temperature accuracy of the STLR. A positive mechanism helps ensure an accurate record of the pasteurization is provided. Sealing of the STLR control panel helps assure that control functions are not inadvertently adjusted.

4.3.2.10	Components of the HTST Pasteurizer
Indicating Thermometer	• shall be located in the sensing chamber in close proximity to the STLR temperature probe. • shall be easily readable. Generally this is achieved by: o positioning of thermometer to facilitate easy observation by the operator. o the column width is magnified to an apparent width of 2 mm. o graduations in at least 0.25°C divisions with not more than 4°C per 25 mm of span. • is either: o a mercury activated, direct reading sanitary design, contained in a corrosion resistant case, protected against breakage with no separation in the mercury column, or o a resistance temperature device (RTD) of the fail-safe type (utilizing two separate RTD's). • shall have a scale span that is not less than 14^0C with the actual pasteurization temperature being 3^0C within the temperature span limits. • shall be tested on installation and at a frequency as specified in the procedures outlined in Test Method in Section VII.

Health and Safety Rationale

This thermometer is considered to be the "true" or "legal" measurement of the product temperature with regard to pasteurization requirements.

The purpose of the indicating thermometer is to measure the processing temperature and verify the accuracy of the STLR thermometer. As such, they must be in close proximity to one another.

The indicating thermometer must be easily readable in order to facilitate the verification of the accuracy of the STLR thermometer.

A properly designed and scaled indicating thermometer is required in order to provide an accurate measurement of the processing temperature.

4.3.2.11	Components of the HTST Pasteurizer
Flow Diversion Device	• shall divert the product when: o the product falls below the minimum pasteurization temperature, or o there is a loss of power, or o there is a loss of air pressure.

	• shall be free of any devices or switches that may jeopardize the safety of the pasteurized product or interfere with the proper operation of the flow diversion device. • shall be located at the highest point at the end of the holding tube and after the sensing chamber. • shall have an operating leak detector with complete leak detection capabilities. This is achieved with: o single stem flow diversion devices equipped with functional and unobstructed leak detect ports, or o dual stem flow diversion devices equipped with separate free draining unrestricted lines back to the constant level tank with a sight glass in the leak detect line. A restrictor is permitted only on the flow diversion line to ensure the minimum holding time is achieved when the HTST is in diverted flow. • the control panel, for the control functions and relays shall be sealable. • flow diversion devices shall include the following time delay relays: o for dual stem devices, a flush time of at least one second for the transitional cavity between the two valves, before the leak detect valve moves from diverted flow to forward flow position. o for dual stem devices, in those systems where there is a restrictor required in the flow diversion line to ensure the minimum holding time is achieved during diverted flow, the flush time for the transitional cavity shall not exceed 5 seconds. o if an "Inspect" mode is present, when the mode switch on the control panel is moved from the "Product" to "Inspect" mode, the flow diversion device immediately moves to the diverted position. There is then a time delay for all flow promoting devices (including the flow control device) to come to a complete stop. After this time delay has occurred, the flow diversion device can then move to the forward flow position without re-activating any of the flow promoting devices. o for those systems where flow promoting devices are not operating during CIP operations, when the mode switch on the control panel is moved from the "Product" to "CIP" mode, the flow diversion device immediately moves to the divert position and remains diverted until all flow promoting devices have come to a complete stop. The CIP system controller then assumes full control over the flow diversion device and no flow promoting device can operate during CIP operation. o for those systems where flow promoting devices are operating during CIP operations, when the mode switch on the control panel is moved from the "Product" to the "CIP" mode, the flow diversion device immediately moves to the divert position and remains there for at least 10 minutes before starting its regular cycle in the

	off and shall not run during the 10 minute time delay. o flow diversion valve response time from forward flow to diverted flow shall not exceed 1 second. o at temperatures below the minimum pasteurization temperatures, the flow control device and the flow promoters shall only operate when the flow diversion device is in the fully diverted position. o stem length of the valve shall be non-adjustable. o if the flow diversion device has external solenoids, then the associated air lines must not be equipped with quick release couplings. o shall be tested on installation and at a frequency as specified in the procedures outlined in the Test Methods in Section VII.

Health and Safety Rationale

In order for the pathogenic bacteria in raw milk to be destroyed, it must be held at or above a minimum specified temperature for a specified length of time. Should the processing temperature fall below this minimum specified temperature, the flow diversion device diverts the product to the constant level tank thus not allowing unpasteurized product to enter the pasteurized section of the system. Diversion of product by the flow diversion device during a loss of power or loss of air pressure is a failsafe step whereby the safety of the finished product is not dependent on the presence of electrical power or pressurized air.

The absence of any overriding devices or switches ensures the flow diversion device will operate properly under any condition.

Product is considered to be pasteurized only after it has been held for the minimum length of time at or above the minimum specified temperature which is measured in the sensing chamber. As such, the flow diversion device must be positioned downstream from the sensing chamber.

Leak detection capability ensures that any product which leaks past the flow diversion valve during diverted flow will either discharge to outside or to the constant level tank and not into the pasteurized side of the system. A restrictor on the flow diversion line is required on some systems to ensure product in diverted flow meets or exceeds the minimum specified holding time.

Sealing of the control panel helps ensure that control functions are not inadvertently adjusted.

Regarding time delay relays:

- A transitional cavity flush time flushes to the constant level tank any unpasteurized product that may have leaked past the flow diversion valve during diverted flow and has pooled in that cavity between the two valves.
- A restrictor in the flow diversion line ensures that product has been held for longer than the minimum specified holding time during diverted flow. This

all parts of the holding tube will have been held for longer than the minimum specified holding time. Because the leak detect line must be unrestricted, minimizing the flush time to 5 seconds (and as such unrestricted and possibly "faster" flow) will ensure that no product will enter the pasteurized side of the system which has not been held for the minimum specified holding time.

- A properly designed "Inspect" mode ensures that flow diversion device will not move to the forward flow position at sub-pasteurization temperatures until all flow has stopped.
- Time delay relay for CIP mode activation ensure that unpasteurized product will not be accidently transferred to the pasteurized side of the system due to inadvertent activation of the CIP mode.

Rapid response of the flow diversion valve ensures no unpasteurized product will enter the pasteurized side of the system during a rapid decrease in product temperature with subsequent movement of the valve from forward to diverted flow.

At sub-pasteurization temperatures, continued operation of any flow promoting device, including the flow control device, with the flow diversion device not in the fully diverted position (not fully seated) could result in unpasteurized product entering the pasteurized side of the system.

If the stem length of the valve was adjustable, it could be adjusted such that the flow diversion device could be in the "not fully diverted position" at sub-pasteurization temperatures while the flow control device continued to operate.

4.3.2.12	Components of the HTST Pasteurizer
Pasteurized Product Regenerator	• shall be located between the flow diversion device and the vacuum breaker. • shall be designed, installed, operated, and maintained in accordance with the Raw Product Regenerator in 4.3.2.3.

Health and Safety Rationale

Proper location is required to ensure that a proper product pressure relationship within the regenerator is maintained under all conditions. See 4.3.2.3 for Health and Safety Rationale.

4.3.2.13	Components of the HTST Pasteurizer
Pressure Differential Controller	• shall be installed and operational in any HTST when a raw product booster pump is present in order to measure the pressures, and in addition control the booster pump to ensure

or Pressure Switch	the proper pressure relationships between the pasteurized product and the raw product in all regeneration sections. • shall be designed, installed, and operated to maintain at least 2 psi higher pressure on the pasteurized product regenerator compared to the raw product regenerator when the HTST is in forward flow. • when a pressure differential controller is used the sensors shall be installed in the following locations: o a raw product sensor between the booster pump and the raw product inlet to the raw product regenerator, and o a pasteurized product sensor located downstream of the outlet of the pasteurized product regenerator but prior to any valves, or flow promoters. • when a pressure switch is used, it shall be installed in the following manner: o a pasteurized product sensor shall be located in the same location as that for a pressure differential controller. o the pressure switch shall be adjusted to allow the booster pump to operate only when the pasteurized product sensor indicates a pressure that exceeds the maximum pressure generated by the booster pump by at least 2 psi. • shall be interwired with the booster pump so that the booster pump only operates when the proper pressure relationship is established between the pasteurized product and the raw product in all regeneration sections. • each regeneration section in a split regeneration system shall be equipped with a separate pressure differential controller or pressure switch. • shall be tested on installation and at a frequency as specified in the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

A proper product pressure relationship within a regenerator, in a system with a booster pump, is required for reasons as discussed in 4.3.2.2.

A 2 psi higher pressure on the pasteurized product regenerator will ensure any leakage is in the direction of pasteurized to unpasteurized product.

Raw product sensor location must be such that the highest possible pressure in the raw regenerator is measured. The pasteurized product sensor must measure the lowest possible pressure in the pasteurized regenerator. Any other variation could result in an improper product pressure relationship within the regenerator.

Correct pasteurized sensor location and proper adjustment of the pressure switch ensures that a proper product pressure relationship within the regenerator is maintained under forward flow.

Booster pump inactivation during periods where the pressure differential is less than 2 psi will result in a 0 psi or slightly negative pressure in the raw regenerator thus maintaining a proper product pressure relationship.

Split regeneration systems must be considered separately, and subsequently properly designed and operated, to ensure that a proper product pressure relationship is maintained in all regeneration sections.

4.3.2.14	Components of the HTST Pasteurizer
Homogenizer	• when acting as the flow control device, shall be interwired in the same manner as a flow control device as outlined in 4.3.2.4 except that the homogenizer may have a time delay of not more than one second which allows the homogenizer motor to remain running during the usual transit time of the flow diversion device. • when not acting as the flow control device and is of lesser capacity than the flow control device it shall: o be installed downstream from the flow control device and upstream from the inlet of the holding tube. o be equipped with a sanitary pressure relief line to the constant level tank or the upstream side of the flow control device originating from a point between flow control device discharge and the homogenizer suction. o be interwired with the flow control device to operate simultaneously. A time delay relay of not more than 1 second can be installed in this interwiring. • when not acting as the flow control device and is of greater capacity than the flow control device it shall: o be located downstream from the flow control device. o be installed either upstream or downstream of the flow diversion device in the following manner: ▪ if upstream, then it must be placed upstream from the inlet of the holding tube. ▪ if downstream, then it must be installed in such a manner that it cannot apply negative pressure on either the pasteurized side of the flow diversion device or negative pressure on the pasteurized product regenerator. o have a recirculation line, of the same size or larger than the inlet to the homogenizer without valves or restrictions.

Health and Safety Rationale cont'd

See 4.3.2.4 for Health and Safety Rationale when acting as the flow control device.

Provisions for a homogenizer not acting as the flow control device of lesser capacity or greater capacity than the flow control device ensure:

- Proper product pressure relationships are maintained within the regenerator.
- Product holding time specifications are not adversely affected.
- Unpasteurized product cannot be transferred through the flow diversion device into the pasteurized section of the system.

4.3.2.15	Components of the HTST Pasteurizer
Separator	• shall be considered a flow promoting device and as such must not influence the required pressure relationship within the regenerator or influence the holding time of the product. • if installed upstream of the flow diversion device, then it shall: o be located upstream of the flow control device. o be interwired with the flow control device to automatically valve out the separator from the system with fail-safe valves. • if installed downstream of the flow diversion device, then it shall: o be interwired with the flow diversion device to automatically valve out the separator from the system with fail safe valves during periods when the system is not in fully forward flow, during a loss of power or air pressure, and when the control panel is switched to the "Inspect" mode. o if also installed downstream from a pasteurized product regenerator then a vacuum breaker shall be installed between the outlet of the pasteurized product regenerator section and the separator inlet. The vacuum breaker in this location must be positioned at least 30 cm above the highest raw product in the system and be positioned upstream of any valve, flow promoting device, or other equipment that might affect the pressure relationships within the regenerator.

Health and Safety Rationale

Provisions for installation of the separator upstream of the flow diversion device ensure that:

- the product holding time is not adversely affected and
- unpasteurized product is not transferred into the pasteurized section of the system in the event that the flow diversion device does not move to the fully diverted position at sub legal temperatures.

Provisions for installation of the separator downstream of the flow diversion device ensure that:

- unpasteurized product is not transferred into the pasteurized section of the system in the event that the flow diversion device does not move to the fully diverted position at sub legal temperatures and
- proper product pressure relationships are maintained in the regenerator.

4.3.2.16	Components of the HTST Pasteurizer
Cooling Section	• the dairy plant licencee shall ensure that the pasteurized product pressure in the cooling section of the HTST is greater than the pressure (at least 1 psi) of the cooling medium under all conditions. Suitable means (such as gauges) must be present to ensure pressure relationships are maintained. • if the pasteurization unit stops for reasons of a power failure, or other cause, or during diversion, the heat transfer fluid pump should also stop. • cooling medium chemicals and additives shall be approved by the regulatory agency. • heat transfer plates shall contain no imperfections such as pinholes or cracks. • the plates shall be checked at least annually for perforations. • cooling medium shall be checked monthly for microbiological safety.

Health and Safety Rationale

Should a crack or pinhole be present in the heat transfer plates, a higher pressure in the pasteurized product will ensure that cooling medium does not leak into the product. Cooling medium chemicals and additives must be non-toxic in the event that cooling medium leaks undetected into the product through pinholes or cracks.

4.3.2.17	Components of the HTST Pasteurizer
Vacuum Breaker	• shall be designed, installed, and operated to ensure a higher pressure in the pasteurized product regenerator than the raw product regenerator under all conditions including forward flow, diverted flow, and shutdown conditions. • shall be located in the pasteurized product line downstream

	above any other raw product in the system. The vacuum breaker shall be positioned prior to any valve, flow promoting device or any equipment that might interfere with the pressure relationships in the regeneration section. • all regeneration sections of a split regenerator must be considered separately with respect to maintenance of pressure relationships.

Health and Safety Rationale

Proper installation of the vacuum breaker ensures that under shutdown conditions, the 30 cm of head pressure provides a minimum of 0.5 psi of pressure differential between the pasteurized and raw sections of the regenerator. This ensures that any leaks due to cracks or pinholes in the regenerator will be from the pasteurized section to the raw section.

4.3.3	Components of the HTST Pasteurizer
Process Control	• no auxiliary pumps or equipment may be installed and operated in conjunction with the HTST pasteurizer that may: o reduce the pasteurization holding time of the product to below the minimum holding time required for that product. o influence the proper temperature and pressure relationships within the HTST. o function as a flow promoting device unless it is interwired with the flow control device. • pasteurized product shall be maintained at a higher pressure than the raw product under all conditions including: o forward flow. o diverted flow, and o shut down conditions. • under all conditions, product shall only be allowed to continue to flow into the pasteurized side of the HTST after it has been subjected to the minimum temperature for at least the minimum holding time.

Health and Safety Rationale

See 4.3.2.2, 4.3.2.4, and 4.3.2.6 for Health and Safety Rationale.

With UHT pasteurization, the critical factors required to achieve pasteurization in a UHT system are the same as those required for HTST pasteurization, namely: time, temperature, maintenance of a proper pressure relationship within the UHT, proper interwiring of UHT components, and a proper UHT system design.

UHT pasteurization is defined as the processing of product on those systems which are capable of rendering a product commercially sterile. After the product has been processed, the product can then be packaged in one of the following ways:

- in an aseptic system which renders the finished product to be shelf stable at room temperature, or
- in a non-aseptic system which requires the finished product to be stored under refrigerated conditions

4.4.1	UHT Pasteurization
Recording Chart Information	The following information must be recorded on the chart: • plant name. • date and shift (a.m./p.m.). • UHT pasteurizer number. • reading of the indicating thermometer during processing. • the frequency pen will record the position of the flow diversion device during processing. • cut-in and cut-out temperatures being used for each product processed. • product type and amount of each product processed. • identification of cleaning cycles. • record of unusual occurrences. • signature or initials of operator. Information must be maintained for a minimum of 1 year, or as determined by the regulatory agency; or until after expiration of the date code if more than 1 year.

Health and Safety Rationale

See 4.3.1 for Health and Safety Rationale.

4.4.2.1	Components of the UHT Pasteurizer
Constant Level Tank	• shall be of such a design and capacity that air will not be drawn into the pasteurizer with the product when processing. Generally this is achieved by the bottom of the tank being pitched with at least a 2% downward slope and the top of the outlet pipe being lower than the lowest point in the tank. • shall be fitted with a removable cover or inspection port designed to minimize contamination. • the inlets and other openings in the cover should be designed to prevent any infiltration of condensed water dripping into the balance tank. • the leak detect, divert, water, and product recycle lines shall break at least two times the diameter of the largest return line above the overflow level of the tank. • shall be equipped with a sanitary device to control the flow of product into the tank.

Health and Safety Rationale

See 4.3.2.1 for Health and Safety Rationale.

4.4.2.2	Components of the UHT Pasteurizer
Booster Pump	if used the raw product booster pump, in addition to the provisions in 4.4.2.3., shall: • be located and installed so as not to interfere with the proper product relationships or with the holding time. • be located between the constant level tank and the inlet of the raw product regenerator. • ensure that if the raw product regenerator is bypassed, these bypass connections shall be designed to minimize entrapment of product. Generally, this is achieved by being close coupled or designing the bypass valve to permit slight movement of product through the bypass line.

Health and Safety Rationale

See 4.3.2.2 and 4.4.2.3 for Health and Safety Rationale.

4.4.2.3	Components of the UHT Pasteurizer
Regeneration Section	if product to product regeneration is used, the following conditions shall be followed: • a pressure differential recorder controller is used to monitor and provide a continuous record of the highest pressure in the raw product side of the regenerator and the lowest pressure in the pasteurized product side of the regenerator. The recorder-controller is interwired with the flow diversion device so that whenever the pressure of the pasteurized product falls to less than 2 psi higher than the pressure of the raw product**,** forward flow of product is automatically prevented. Forward flow of product will not start again until the proper pressure relationship is attained and the system has been returned to a condition of commercial sterility. • a raw product booster pump, if used, may be permitted to run at all times provided the pressure differential recorder-controller is installed and operating as described in the previous paragraph and the flow control device is in operation. • the pressure differential recorder controller shall have scale divisions which shall be easily readable, shall not exceed 2 psi per division and not more than 20 psi per inch of scale. • the pressure differential recorder-controller shall be tested on installation and at a frequency specified in the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

See 4.3.2.2 and 4.3.2.13 for Health and Safety Rationale.

4.4.2.4	Components of the UHT Pasteurizer
Flow Control Device	• shall be located upstream of the holding section. • shall be designed, installed, and operated to ensure that every particle of product is held continuously for at least the minimum period of time required for commercial sterility. • only flow control devices approved by the regulatory agency may be used. When a homogenizer or meter based timing system is used as a flow control device, those provisions in 4.3.2.4 and 4.3.2.14 for these components used in this manner shall also apply. • shall be sealable so as not to exceed the velocity used to calculate the minimum processing parameter for time as outlined in 4.4.3.1. • shall be interwired with the flow diversion device and the divert

	flow controller such that product flow may only occur when: o the product is above the minimum required commercial sterility temperature for the product, or o the flow diversion device is in the fully diverted position. • shall not be excluded from the pasteurizer during processing. • shall be tested on installation, when any alteration is made affecting the holding time, and at a frequency specified in the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

See 4.3.2.4., 4.3.2.14 and 4.4.3.1 for Health and Safety Rationale.

4.4.2.5	Components of the UHT Pasteurizer
Heating Section	where direct addition or exposure to steam is used: • only culinary steam shall be used. • automatic means shall be provided to preclude dilution with water of the finished product. • means shall be provided to ensure the steam completely condensates prior to exposure to the product.

Health and Safety Rationale

The use of culinary steam ensures that harmful chemicals or residues (as may be found in non-culinary steam) are not added to the product.

Unless means are provided to remove water which is added to the product as a result of direct exposure to the steam, the product shall be diluted with water.

Any non-condensed steam or non-condensable gases present in the product in the holding section would result in displacement of liquid product in the holding section. As a consequence, holding time may be reduced resulting in product that has not been held for the minimum specified holding time.

4.4.2.6	Components of the UHT Pasteurizer
Holding Section	• shall be designed and installed to ensure that every particle of

	time required to achieve commercial sterility. • shall be provided, including all elbows, with a continuous slope of 2% upwards. • shall be maintained by permanent supports. • shall be free from any form of external heat source. • where heating is achieved by direct addition of steam into the product, means must be provided to ensure the product remains in the liquid phase in the holding section. Generally, this is achieved by ensuring the pressure of the product in the holding section is maintained at least 10 psi above the boiling pressure of the product, at its maximum temperature in the holding tube. Should the product pressure fall below this differential, then the flow divert device will move to the diverted position. Forward flow of the product will not start again until this proper pressure relationship is attained and the system has been returned to a condition of commercial sterility. • shall be as free as possible of non-condensable gases. Generally, this is achieved by installing a de-aerator on the steam boiler. • when the product temperature in the holding section drops below the minimum process temperature, the product shall be diverted. Forward flow of the product will not start again until the minimum process temperature is attained and the system has been returned to a condition of commercial sterility. • the holding time in the holding section shall be tested on installation and at a frequency specified in the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

See 4.3.2.6 for Health and Safety Rationale.

Regarding the provisions for assurance of liquid phase of the product and the absence of non-condensable gases, see 4.4.2.5 for Health and Safety Rationale.

Diversion of product when product temperature falls below the minimum process temperature ensures that only pasteurized product enters the pasteurized section of the system. The system is required to be returned to commercial sterility because the flow diversion device in UHT systems is located distantly downstream from the end of the holding section.

4.4.2.7	Components of the UHT Pasteurizer
Indicating Thermometer	• shall be located at the end of the holding section is either: o a mercury activated, direct reading sanitary design, contained in a corrosion resistant case, protected

	the mercury column, or o a resistance temperature device (RTD) of the fail-safe type (utilizing two separate RTD's). • shall be easily readable. Generally, this is achieved by: o the column width is magnified to an apparent width of 2 mm. o graduations in at least 0.50^0C divisions with not more than 4^0C per 25 mm of span. o positioning of thermometer to facilitate easy observation by the operator • shall have a scale span that is not less than 14^0C with the actual pasteurization temperature being 3^0C within the temperature span limits. • shall be tested on installation and at a frequency specified in the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

See 4.3.2.10 for Health and Safety Rationale.

4.4.2.8	Components of the UHT Pasteurizer
Temperature Recording Device	• shall be installed in the product at the holding section outlet and before the inlet to the cooler or regenerator. • shall be sealable. • shall be calibrated so that the temperature indicated is ± 1^0C of the temperature of the indicating thermometer at processing temperatures. • interwired with the divert flow controller. • shall be accurate, reliable, and easily readable. Generally, this is achieved by: o time scale divisions that are not more than 15 minutes and spaced not less than 6.4 mm apart at the flow diversion temperature. o pens that produce a line not greater than 0.7 m wide. o a temperature charts graduated in 0.5^0C (1.0^0F) divisions. o a temperature range or span on the recording chart that is not less than 17^0C (30^0F) with the actual diversion temperature being 7^0C (12^0F) within the temperature span limits. o being equipped with a positive mechanism to prevent chart slippage and manual rotation. • shall be tested on installation and at a frequency specified in the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

In conjunction with the recording chart (4.4.1), a properly located and accurate temperature recording device provides a continuous record of the temperature of pasteurization. This information is required, should a question or problem regarding the safety of a particular lot or batch of a dairy product, in order to help identify the source of contamination.

The temperature recording device, interwired with the divert flow controller, ensures that all particles are held at or above the minimum specified temperature prior to entering the pasteurized section of the system.

4.4.2.9	Components of the UHT Pasteurizer
Divert Flow Controller	• shall be set so that during product processing, the forward flow of product shall not occur unless the temperature at the temperature recording device is above the required temperature for the product being processed. When the temperature falls below the required temperature to attain commercial sterility, the product shall divert. • the forward flow of product shall not start until all product contact surfaces between the holding tube and the flow diversion device have attained a condition of commercial sterility. • shall be sealable and tamper-proof. • shall be tested on installation and at a frequency as specified in the procedure outline in Test Methods in Section VII.

Health and Safety Rationale

A proper functioning divert flow controller ensures that only product which has been processed at or above the minimum specified temperatures will enter the pasteurized section of the system.

Commercial sterility between the holding tube and the flow diversion valve is required because during a period of diverted flow, this section of the system would be exposed to non-sterile conditions.

4.4.2.10	Components of the UHT Pasteurizer
Divert Flow Indicator	• shall be sealable and tamper-proof. • shall be installed and maintained to provide accurate record

	of forward of diverted product flow. Generally, this is achieved by installing the divert flow indicator device on the temperature recording device.

Health and Safety Rationale

The divert flow indicator provides information as outlined in 4.4.2.8.

4.4.2.11	Components of the UHT Pasteurizer
Cooling Section	• where cooling sections are used, product pressure shall, at all times and under all conditions, be greater than the pressure of the cooling mediums used. Generally, this is achieved by installing and operating a pressure differential controller as described in 4.4.2.3.

Health and Safety Rationale

See 4.3.2.2 and 4.3.2.16 for Health and Safety Rationale.

4.4.2.12	Components of the UHT Pasteurizer
Flow Diversion Device	shall be designed, installed, and operated to ensure that: • only product which has been held at or above the required product holding temperature shall continue in forward flow. • the flow diversion device shall immediately move to diverted flow when the proper pressure relationships in either the regeneration section (if used) or in the cooling medium are not maintained; or there is a loss of electrical power or air pressure; there is a loss of pressure differential in the holding tube as described in 4.4.2.6. • forward flow shall only resume when all product contact surfaces between the holding tube and the flow diversion device have been returned to a condition of commercial sterility. • it shall be sealable and tamperproof. • it shall be located downstream from the cooling section. • valve response time from forward flow to divert flow does not exceed 1 second. • shall be tested on installation and at a frequency as specified in

	the procedures outlined in Test Methods in Section VII.

Health and Safety Rationale

See 4.4.2.3. and 4.4.2.9 for Health and Safety Rationale.

4.4.2.13	Components of the UHT Pasteurizer
Auxiliary Pumps	• shall include any pumps, homogenizers, separators, or other devices which produce flow through the pasteurizer. • shall be interwired with the flow control device so that these auxiliary pumps may only operate when the flow control device is in operation. • shall be installed and operated to ensure that: o the product flow through the holding tube is not reduced to a time less than that required to achieve commercial sterility. o the proper pressure relationships within all regeneration sections and all cooling sections are maintained.

Health and Safety Rationale

Correct installation of auxiliary pumps ensures that:

- flow through the pasteurizer will not occur if the flow diversion device is not in the fully diverted position at sub legal temperature. This will prevent any unpasteurized product from entering the pasteurized section of the system.
- product holding time is not reduced thus ensuring that all particles of product are held for the minimum specified time.
- with proper product pressure relationships, leakage of product through heat transfer plates will be from the pasteurized section to the raw section.

See 4.3.2.2, 4.3.2.4, 4.3.2.6, 4.3.2.14 and 4.3.2.15 for additional information.

4.4.3.1	Process Control
Processing Parameters	• processing parameters for a minimum time and temperature for product processing acceptable to the regulatory agency shall be established which ensure the product has achieved

	milk (whole milk, partly skimmed milk, skimmed milk) and cream (B.F. >10%) products, processing parameters which will achieve commercial sterility for these products is a total heat treatment which is equivalent, in terms of its effectiveness against heat resistant bacterial spores to a minimum value of F_0=3.0. For flavoured, sweetened or stabilized dairy products, because differences in product formulation can result in varying rates of heat transfer, a more excessive heat treatment to ensure commercial sterility may be required. • where product formulation may affect finished product commercial sterility relative to heat treatment and heat transfer (eg. pH, viscosity, % solids), process parameters for control of product formulation shall be established. • processing parameters for required pressure relationships across product regenerators and the cooling medium shall be established. • processing parameters must be validated by the regulatory agency.

Health and Safety Rationale

With UHT Pasteurization, there are many time and temperature variations that may be used, depending on the product being processed, to achieve a condition of commercial sterility in the exiting product. The time/temperature combination selected by the processor must be demonstrated to ensure commercial sterility in order to be assured of product safety.

Differences in product formulation can affect heat treatment and heat transfer in the product being processed. As such, where differences in product formulation can have such an effect on the commercial sterility of the finished product, adequate control must be demonstrated over product formulation and composition.

Because UHT Pasteurizers can operate at higher pressures that standard HTST pasteurizers, processing parameters selected for pressure relationships across regenerators and cooling medium must be selected to ensure that cross-contamination of product will not occur under any condition.

4.4.3.2	Process Control
Establishment of Commercial Sterility	• prior to forward flow, parameters shall be established which ensure that the portion of the pasteurizer between the outlet of the holding tube and the flow diversion valve attain commercial sterility. Generally, this is achieved by maintaining the system at a minimum prescribed temperature for a continuous minimum length of time. • parameters must be established which ensure that the

	material are commercially sterile prior to processing products intended to be shelf stable at room temperature. As well, parameters must be established to ensure that this condition of commercial sterility in the entire system is maintained and monitored during the processing, storage, and packaging of these products.

Health and Safety Rationale

For establishment of commercial sterility, see 4.4.2.9 for Health and Safety Rationale.

With shelf stable finished product, a condition of commercial sterility is required throughout the system in order to ensure the absence of any viable micro-organisms in the finished product container. The failure at any given point, such as a steam barrier on an aseptic valve, even for a short time, could introduce micro-organisms that could reproduce resulting in a public health risk.

4.4.3.3	Process Control
Aseptic Packaging - Finished Product Testing	• where aseptic packaging systems are used to produce finished product stable at room temperature, procedures shall be established to regularly test finished product for package integrity and bacterial content. The rate of finished product testing shall provide a statistically valid representation of the entire lot packaged. • finished product package integrity and bacterial content testing shall be performed and test results shall meet all requirements prior to distribution of the finished product.

Health and Safety Rationale

With the production of shelf stable finished product using aseptic packaging, depending on the system being used there exists a number of processing and mechanical parameters which, in addition to the establishment of system commercial sterility (see 4.4.3.2), are critical in ensuring the sterility of the product. The failure of any one of these parameters, even for a brief period of time, will result in non-sterile product being packaged. Many of these parameters cannot be automatically or continually monitored and/or controlled. As a result, the finished product must be tested for both package integrity and bacterial content to be confident that each lot is commercially sterile. Bacterial testing requires several days due to required incubation of finished product. As such, satisfactory results must be obtained prior to product being distributed as an effective product recall (due to unsterile product) would be difficult after several days of product distribution.

4.4.3.4	Process Control
Preventative Maintenance	should be performed on a regular basis on UHT pasteurization equipment including: • equipment associated with controlling or maintaining critical public health requirements, and • equipment involved with attaining or maintaining commercial sterility of the system. • maintenance of appropriate records.

Health and Safety Rationale

As described in 4.4.3.3, finished product sterility is dependent upon many parameters. As well, finished product sterility cannot be effectively verified until several days following production. As such, it is conceivable that with a mechanical failure, several days of packaging could occur under non-sterile conditions before the problem is identified through bacterial testing. For this reason, it is highly recommended that a preventative maintenance program be implemented and followed for equipment as described above. A properly designed preventative maintenance program will reduce the risk of mechanical failures.

4.5 Retort processing of dairy products

For retort processing of dairy products, refer to the Health Canada document - "Recommended Canadian Code of Hygienic Practices for Low Acid and Acidified Low Acid Foods in Hermetically Sealed Containers (Canned Foods)" for operational, equipment, and process control parameters and requirements.

5.1.1	Approvals and Licences
Purpose	The purpose of this Division is to outline a framework which provides for the approval and licencing of dairy plants, while recognizing the diverse legal and administrative requirements in the Provinces and Federal Government. Hence while the actual programs may vary from the model framework, they should satisfy the underlying purpose of safeguarding public health through an effective approval and licencing program.

5.1.2	Approvals and Licences
Use for Intended Purposes	The provisions of the Code are intended to apply in their entirety to all new dairy processing plants. In applying the provisions of the Code, the regulatory agency should assess existing facilities and equipment that were in use prior to the effective date of the Code based on the following considerations: 1. Whether the facilities and equipment are in good repair and capable of producing safe dairy products. 2. Whether dairy product contact surfaces are capable of being maintained in a sanitary manner. 3. Where deemed necessary by the regulatory agency, a written agreement specifying time frames for upgrading necessary to ensure the safe production of dairy products.

5.1.3	Approvals and Licences
Variances	The regulatory authority may grant a variance by modifying or waiving the requirements of this Code if in the opinion of the regulatory agency a health hazard will not result from the variance. If a variance is granted, the regulatory authority shall retain the information specified in 5.1.4 in its records for the dairy plant.

5.1.4	Approvals and Licences
Documentation and Justification for Variances	Before a variance from a prescribed procedure in the Code is approved by the regulatory agency, the following information shall be provided by the applicant: • A statement of the proposed variance of the Code requirement citing relevant Code section numbers; • An analysis of the rationale of how the potential public health hazards addressed by the current Code sections will be effectively met by the alternate proposal; and • A HACCP plan, if required by the regulatory agency. • The sound scientific basis or principles upon which the proposed variance would be based upon. If a regulatory agency grants approval to a variance, the dairy plant operator shall ensure that:

	• The equipment or process is operated in compliance with the terms and conditions of the variance. • No changes or deviations are made to the approved variance unless approved by the regulatory agency.

5.1.5	Approvals and Licences
Plan Submission and Approval	Dairy plant operators shall submit to the regulatory authority plans and specifications for review and approval by the regulatory agency before: • The construction of a dairy plant. • The remodelling of a dairy plant or a change to critical operating equipment including thermal processors and CIP systems.

5.1.6	Approvals and Licences
Contents of Plans and Specifications	Plans and specifications for a dairy plant shall generally include sufficient detail that enables the regulatory agency to determine compliance with the provisions of this Code including: plant layout, construction and finishing materials; air, water and waste systems; critical equipment design and specifications, HACCP and sanitation plans; and any other information reasonably required to determine compliance.

5.1.7	Approvals and Licences
Construction Inspection and Approval	The dairy plant operator shall notify the regulatory agency upon completion of construction or alteration of an existing operation. As a general practice, a pre-operational inspection will be conducted by the regulatory agency to ensure the dairy plant has been constructed and equipped in accordance with the approved plans.

5.1.8	Approvals and Licences

Licence to Operate	Approval to operate a dairy plant is confirmed by a variety of formal designations including the issuance of a licence, certificate, permit or registration. The type of formal approval will be determined by the regulatory agency having jurisdiction, but herein referred to as a licence. A regulatory agency will generally issue a licence after: • Submission and approval of a properly completed application form, and • Submission and approval of the plans and specifications, and • A pre-operational inspection verifies that the dairy plant has been constructed in accordance with the approved plans and specifications, and • Where appropriate, payment of any required licence fees. Generally, licences are not transferrable from one person to another, from one dairy plant to another, or from one type of operation to another, if the dairy plant changes from the type of operation specified in the application (eg. change from fluid milk to ice cream).

5.1.9	Approvals and Licences
Inspection of Dairy Plants	After approval, dairy plants are subject to routine follow-up inspections at a frequency established by the regulatory agency. Regulatory agencies will generally prioritize, and conduct more frequent inspections based on their assessment of a dairy plants' compliance history including: • Conformance with HACCP plan requirements for critical control points. • Numerous or repeat violations for non-critical areas. • The condition of the dairy plant, and the age of critical control equipment. • The complexity of operation, including the methods and extent of processing.

5.1.10	Approvals and Licences
Violations of the Code	Dairy plant operators are responsible for ensuring their plants operate in compliance with regulatory requirements, and dairy products are safe and wholesome.

	and wholesome. Regulatory agencies have a legal responsibility to ensure that violations are corrected, and dairy plants operate in compliance with statutory requirements. Generally, inspections are targeted to critical risk areas, and while not limited to will focus on ensuring compliance with the following areas: • Adherence to procedures/parameters as prescribed in the plants' HACCP, sanitation and dairy safety management plans • Critical control equipment is operated within critical limits. • Employee practices and procedures are such that there is no risk to public health. • All ingredients and supplies, including milk, are adequately monitored on receipt and properly stored. • The processing equipment meets the Code's requirements, is adequately maintained and cleaned.

5.2	Operation of Dairy Plants
Training of Employees	• dairy plant process workers involved in the processing of dairy products, cleaning or sanitizing, or any other duties directly related to the processing of dairy products shall complete a training program. Generally, an effective training program includes instruction in the following areas: o pasteurization, reasons for, and the microbiological consequences of inadequate pasteurization. o pasteurization equipment, proper operation and testing thereof. o dairy plant cleaning, equipment cleaning, and the sanitary maintenance of the equipment. o control of post-pasteurization contamination including environmental contamination; personal hygiene and practices; and chemical contamination such as antibiotics, allergens and cleaning chemicals. o other topics that may be specific to the dairy product being processed to take into account factors such as the product's ability to sustain growth of contaminating organisms; the manner in which the product is processed; the conditions under which the product is stored, and the expected shelf life of the product. • the effectiveness of the training program shall be such that all dairy plant process workers shall demonstrate in the conduct of their work the knowledge and skills to enable them to process and handle the dairy products in a manner that ensures the products are free from contamination.

	also be adequately trained to ensure they have the necessary knowledge of dairy product hygiene principles and practices to be able to judge potential contamination risks and take the necessary action to remedy deficiencies. • training programs shall be regularly reviewed and updated as necessary to ensure that all dairy plant process workers remain aware of all procedures necessary to maintain the safety of the dairy products. • where personnel are to be trained in HACCP principles, refer to 5.6.1 for further information on HACCP principles, prerequisites to HACCP, steps in implementing a HACCP program, and training of employees.

Health and Safety Rationale

In a typical dairy plant, personnel are constantly making decisions which could affect the final safety of the product. One of the best assurances that a dairy plant licencee can have that the product will be safe is the employment of personnel that have the necessary knowledge and skills to enable them to process and handle the dairy products in a safe and sanitary manner. As such, an effective and up-to-date training program for dairy plant process workers is critical in order to ensure that the procedures and practices of these personnel are such that the final product will not be contaminated.

5.3.1	Employee Practices
Personal Hygiene and Health - Health Status	• people known, or suspected, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted through food, shall not be allowed to enter a dairy product processing area. • any person so affected shall immediately report illness or symptoms of illness to the dairy plant management. • medical examination of a dairy plant process worker shall be carried out if clinically or epidemiologically indicated.
Illness and injuries	• conditions which shall be reported to dairy plant management so that any need for medical examination and/or possible exclusion from dairy product processing can be considered, include: o jaundice o diarrhea o gastral intestinal infections o viral hepatitis A o vomiting o fever o sore throat with fever

	o visibly infected skin lesions (boils, cuts, etc.) o discharges from the ear, eye or nose.

Health and Safety Rationale

People who do not maintain an appropriate degree of personal cleanliness, who have certain illnesses or conditions or who behave inappropriately, can contaminate dairy products and transmit illness to consumers.

5.3.2	Employee Practices
Practices - **Personal Cleanliness**	• dairy plant process workers shall maintain a high degree of personal cleanliness and, where appropriate, wear suitable protective clothing, head covering, and footwear. Cuts and wounds, where personnel are permitted to continue working, shall be covered by suitable waterproof dressings. • dairy plant process workers shall wash their hands regularly and, in particular, when personal cleanliness may affect dairy product safety, including: o at the start of dairy product processing activities, o immediately after using the toilet, and o after handling raw dairy products or any contaminated material, where this could result in contamination of other dairy products.
Personal Behaviour	• every person engaged in dairy product processing activities shall refrain from behaviour which could result in contamination of the dairy product, for example: o smoking, o spitting, o chewing or eating or o sneezing or coughing over unprotected dairy products. • personal effects such as jewellery, watches, pins or other items shall not be worn or brought into dairy product processing areas if they pose a threat to the safety and suitability of the dairy product.
Visitors	• visitors to dairy product processing areas shall wear protective clothing and adhere to the other personal hygiene provisions in this section.

Health and Safety Rationale

It is essential that personnel employed in the production of dairy products understand their duties relative to dairy product safety. If the operations involved are highly technical in nature, they may require constant vigilance, attention to details, and a high degree of competence on the part of employees.

Inadequate training of personnel, or the absence of an appreciation of the importance of proper employee practices, can contribute to the production of dairy products which may pose a hazard to health.

5.4.1	Milk Sources, Ingredients and Supplies
Raw Milk Receiving - **General Criteria**	the dairy plant licencee shall ensure that: • only raw milk produced on a dairy farm approved by the regulatory agency is received at the dairy plant, • the raw milk is transported by a person approved by the Regulatory Agency for that purpose, • the raw milk carrier vehicle is of suitable design, • adequate means are in place to ensure raw milk temperature is controlled in the carrier vehicle and • written procedures for receiving and handling are followed by trained personnel for each load of raw milk received by the dairy plant.
Raw Milk Receiving Procedures	written procedures for receiving and handling each load of raw milk received shall include: • testing for antibiotics. The presence of antibiotics shall result in rejection of the load. • testing for temperature. Generally, a raw milk temperature greater than 4^0C shall result in rejection of the load. • testing for acidity. Generally, an acidity level of pH 6.6 - 6.8 (T.A.=0.14-0.16) for raw milk or an acidity of pH 6.6 - 6.8 (T.A=0.10-0.12) for raw cream is required in order to accept the load. • a record of the volume and source of the raw milk • cleaning and sanitation procedures as described in 5.6.2 • maintenance of filters and other equipment used for raw milk receiving • segregation of transport personnel from the processing area of dairy plant.

Health and Safety Rationale

and physical hazards. Pathogen contamination and/or recontamination from poor handling procedures and growth of toxins from temperature abuse may cause a health hazard in the dairy product.

5.4.2	Milk Sources, Ingredients and Supplies
Raw Milk Storage - **General Criteria**	the dairy plant licencee shall ensure that: • equipment used in the storage of the raw milk meets the requirements of the Code, • the raw milk temperature is controlled in the storage tanks, • written procedures are followed by trained personnel regarding the storage of raw milk at the dairy plant, and • a written monitoring procedure is in place.
Raw Milk Storage Procedures	written procedures for the storage of raw milk shall include: • regular and frequent monitoring and results of the raw milk temperature. Generally, an increase in temperature over 4^0C requires the raw milk be processed within 2 hours or disposed of. • a provision for regularly testing the accuracy of the thermometers of the storage tanks, • cleaning and sanitation procedures as described in 5.6.2 • a provision for maintaining all storage equipment including agitators, and • a provision to prevent cross-contamination of raw milk and pasteurized product storage.

Health and Safety Rationale

Ineffective storage control of raw milk has the potential to cause biological and chemical hazards. Pathogen contamination and/or recontamination from poor storage procedures and growth of toxins from temperature abuse may cause a health hazard in the dairy product.

5.4.3	Milk Sources, Ingredients and Supplies
Ingredient and Supplies	the dairy plant licencee shall establish procedures which include the following:

Receiving- **General Criteria**	• defines the product, • defines an approval process, • defines how the product will be monitored, and • defines how it is stored and used.
Definition of the product	shall specify the following: • the supply source identification code for the product, • ingredient listing, • common name and true name, • chemical specifications, • physical appearance (taste, texture, and colour), • microbiological specifications where applicable, • storage and handling instructions, • size and type of pack, • shelf life, • precautionary handling specifications where applicable, and • processing instructions where applicable.
Approval Process	the dairy plant licencee shall: • establish a mechanism to approve materials used in a dairy plant which includes an assessment by quality assurance and/or R&D, manufacturing, purchasing, finance and marketing, and • establish a receiving programme to ensure that materials received match those identified on the purchase order and that the quantity received is the same as ordered.
Monitoring	the dairy plant licencee shall ensure that: • a visual inspection which includes delivery vehicles for cleanliness and evidence of the non-compatible materials, pallets, physical damage to outer wraps and materials is performed on each load of ingredients and supplies prior to unloading and/or placement in final storage.
Ingredient and Supplies Receiving - **Quality** **Assurance**	the dairy plant licencee shall: • establish a quality assurance system to monitor the materials to ensure that they meet the specifications prior to production. • establish a quality assurance system to ensure that proper storage and keeping instructions are followed.

Health and Safety Rationale

Ineffective receiving control of ingredients and materials has the potential to cause biological, chemical and physical hazards. Pathogen contamination and/or recontamination from poor receiving procedures such as temperature abuse may cause a health hazard in the dairy product.

5.4.4	Milk Sources, Ingredients and Supplies
Ingredients and Supplies Storage - General Criteria	the dairy plant licencee shall ensure that: • equipment and facilities used in the storage of ingredients and supplies meet the requirements of this Code, • where applicable, storage temperature is adequately controlled, and • written procedures are followed by trained personnel regarding the storage of ingredients and supplies in the dairy plant.
Ingredients and Supplies Storage Procedures	written procedures for the storage of ingredients and supplies shall include: • where applicable, regular and frequent monitoring and recording of storage temperatures, • where applicable, a provision for regularly testing the thermometers used in the storage facilities, • cleaning and sanitation procedures for storage equipment and facilities as described in 5.6.2, • a provision for maintaining all storage equipment including, where applicable, agitators, and • a provision to prevent cross-contamination of raw materials (such as nuts) with finished product storage.
Quality Assurance	the dairy plant is responsible for: • establishing a quality assurance system to ensure that the temperature, humidity, stacking, handling and usage instructions supplied by the supplier are being followed; • establishing a quality assurance system to ensure that the integrity of the materials in storage and throughout the process is maintained. This includes cleanliness of the outer package when it enters the processing area and proper recapping and covering of materials not used; • the critical factors for each material used should be identified at the production area and be part of plant operation procedure; and

	• establishing a system to ensure that materials used on any given day matches the codes, specifications and quantities for the product being used.

Health and Safety Rationale

Ineffective storage control of materials and supplies has the potential to cause biological, chemical and physical hazards. Pathogen contamination and/or recontamination from poor storage procedures and from temperature abuse may cause a health hazard in the dairy product.

5.5	Equipment Standards
Introduction	Equipment standards are necessary to ensure that a minimum standard is established for mechanical and sanitary criteria that all dairy equipment must meet. This helps to ensure the manufacture of safe and wholesome dairy products.

5.5.1	Equipment Standards
Processing Equipment	• product contact surfaces shall be of stainless steel or other corrosion resistant material that is smooth, non toxic, non absorbent and cleanable. These surfaces shall be self draining with no dead ends, impediments to product flow nor sites where contamination may build up. They shall be easily accessible for inspection and for cleaning either in an assembled position or when removed. • rubber, teflon, plastic and other materials which retain their surface and conformation characteristics under operational conditions may be used for gaskets, sight ports, take down jumpers, valve plugs, seals, protective caps for sanitary tube, fitting, vents, O-rings and parts used in similar operations. • plastic materials may be used for protective edges, moving component parts, agitator seals, agitator bearings, protective caps for sanitary tubes, fittings, vents, O-rings, seals or gaskets. • non product contact surfaces shall be of corrosion resistant materials that are smooth, non-absorbent, durable and cleanable. • welded joints shall be resistant to stress, smooth, flush and free from pits, folds, crevices, cracks or other defects. • paper gaskets must be replaced after single use. • where heat exchangers are used for non-pasteurization

	product safety. • the processing equipment shall be of a sanitary design and pose no risk of contamination to the product (eg. oil, leaks, dirt, grease, flaking material, etc.) • CIP spray balls shall be designed to allow for inspection and removal of debris. • processing equipment shall be designed and operated so as to preclude cross connections of any type such as between raw product and pasteurized product; cleaning solutions and product; potable water and product.

Health and Safety Rationale

Proper design, manufacture and the use of proper material is critical in ensuring that the dairy product flowing through dairy processing equipment will not be contaminated.

In the design and manufacture of dairy equipment, consideration of ease of cleaning and sanitizing is also important to ensure equipment surfaces are uncontaminated prior to product contact.

5.5.2	Equipment Standards
Pumps	• pumps shall be designed to be self-draining. • gaskets having product contact surfaces shall be removable; single service sanitary type gaskets may be used and must be replaced after each use. • shaft seals shall be of packless type, sanitary in design.

Health and Safety Rationale

See 5.5.1 for Health and Safety Rationale.

5.5.3	Equipment Standards
Pipelines and Fittings	• in the case of permanently welded pipelines there shall be access points to enable inspection. • pipelines shall be rigid, supported and self-draining. • paper gaskets shall not be used. • removable fittings may be used with or without gaskets and shall be of such design to form flush interior joints with no dead ends.

	• non-CIP'able fittings (instrument fittings, sample cocks, etc.) shall be capable of being disassembled for manual cleaning, sanitizing and inspection.

Health and Safety Rationale

See 5.5.1 for Health and Safety Rationale.

5.5.4	Equipment Standards
Valves	• valves should be self-draining. Those that are not and are not suitable for CIP cleaning shall be easily opened, drained and hand cleaned. • valves that are power actuated shall have at least 25 mm of open space, clear for inspection, between the actuator and the valve.

Health and Safety Rationale

See 5.5.1 for Health and Safety Rationale.

5.5.5.1	Clean in Place Systems
Design and Installation	• the CIP system shall be designed, installed and operated to efficiently clean all CIP cleanable contact surfaces. • CIP solution contact surfaces shall be of stainless steel or corrosion resistant material that is smooth, non toxic and non absorbent. • CIP solution lines leading to product lines shall have permanently installed fittings. The CIP fittings leading to the product lines shall be easily dismantled for inspection. • welded joints shall be smooth and free from pits, folds, crevices, cracks or other defects. • removable fittings may be used with or without gaskets. They shall be designed to form flush interior joints. • pipelines shall be rigid, supported and self-draining. • each cleaning circuit shall be provided with access points to enable inspection. • circuit diagrams of the CIP system shall be available, complete and up to date. • there shall be no cross connections between cleaning solutions

	and products or other liquids. This may be accomplished as follows: o all return lines to CIP tanks shall break to atmosphere in order to prevent back siphonage. o an effective back-flow preventer in the water line leading to the solution tank to avoid cross contamination of the safe water supply with cleaning solutions. • all CIP systems shall be designed to consider suitable flow rates, acceptable times and temperatures and proper solution strengths.

Health and Safety Rationale

See 5.5.5.3 for Health and Safety Rationale.

5.5.5.2	Clean in Place Systems
Components of System	• sufficient cleaning solution shall be present to ensure the primary circulating pump is flooded at all times during the cleaning cycle. • system components to accomplish acceptable CIP results generally include the following: o recording thermometer or recording device installed in the return solution line, o charts or records for each cleaning cycle which record the temperature and time, the solution concentrations, the date and operator's signature, o indicating thermometer installed in the solution tank, o temperature controller installed on solution tanks, o centrifugal type solution and return pumps, o positive deplacement type chemical feed pump, o covered solution and rinse tanks, and o pipelines equipped with line screens or filters.

Health and Safety Rationale

See 5.5.5.3 for Health and Safety Rationale.

5.5.5.3	Clean in Place Systems

Operation	• cleaning instructions as defined in section 5.6.2 shall be posted or easily accessible. • a verification procedure shall be in place to demonstrate cleaning effectiveness.

Health and Safety Rationale

To ensure proper cleaning of dairy processing equipment, effective Cleaned in Place (CIP) Systems consist of components and operational procedures which will provide assurance of acceptably cleaned and sanitized surfaces that are in contact with the dairy products.

5.5.5.4.1	CIP Tanker Truck Systems
Circuit Diagram	The CIP Tanker Truck System shall include: • a circuit diagram which is complete and up-to-date and does not have any cross connections in order to prevent mixing of CIP solutions with the dairy products.

Health and Safety Rationale

See 5.5.5.4.3 for Health and Safety Rationale.

5.5.5.4.2	CIP Tanker Truck Systems
Major Components	Major components necessary to accomplish acceptable CIP results generally include the following: • centrifugal solution and return pumps, • positive displacement chemical feed pumps, • covered stainless steel or corrosion resistant solution and rinse tanks, • properly sloped rigid pipelines and valves equipped with screens or filters, • indicating thermometer on the solution tanks, • recording thermometer and appropriate charts on return solution line, and temperature controller located on solution tanks.

Health and Safety Rationale

See 5.5.5.4.3 for Health and Safety Rationale.

5.5.5.4.3	CIP Tanker Truck Systems
Operation of the System	Operation of the system shall include: • cleaning instructions as defined in section 5.6.2 which are posted and followed which detail connecting/disconnecting information for truck equipment hook-up. • charts/records which include: o each cleaning cycle, o record of the time and temperature, o the date, o the operator's signature, and o a record of solution concentrations. o a program to verify the system's effectiveness which requires: o regular equipment inspection, and o charts verified for time, temperature and solution concentration.

Health and Safety Rationale

A satisfactory CIP tanker wash station is required at each dairy processing facility or milk depot to ensure that dairy product quality and/or safety is not compromised due to improper cleaning and sanitizing of the milk tanker.

5.6.1.1	HACCP Programme
Introduction	Dairy products are highly susceptible to contamination. As such, the dairy plant licencee shall have a written program which will ensure that all dairy products processed and stored in the dairy plant do not result in a health hazard. The use of HACCP is an effective written program designed to prevent contamination from occurring.

5.6.1.2	HACCP Programme
HACCP Principles	The HACCP programme consists of the following seven basic principles: **Principle 1** Conduct a hazard analysis. **Principle 2** Determine the Critical Control Points (CCP's). **Principle 3** Establish critical limit(s). **Principle 4** Establish a system to monitor control of the CCP. **Principle 5** Establish the (deviation) corrective action to be taken when monitoring indicates that a particular CCP is not under control. **Principle 6** Establish procedures for verification to confirm that the HACCP system is working effectively. **Principle 7** Establish documentation concerning all procedures and records appropriate to these principles and their application.

5.6.1.3	HACCP Programme
Prerequisite Programs	Essential to the development of an in-plant HACCP programme is the development and implementation of prerequisite control programmes. The importance of these programmes cannot be understated. Hazards not properly addressed using the HACCP principles are adequately controlled through the effective implementation of these prerequisite programs. Generally, these prerequisite programmes include: **1. Premises** • outside property • buildings • sanitary facilities • water quality programme **2. Receiving and Storage** • receiving of raw materials, ingredients and packaging materials • storage **3. Equipment Performance and Maintenance** • general equipment design • equipment installation • equipment maintenance **4. Personnel Training Programme** • manufacturing controls • hygienic practices • controlled access **5. Sanitation** • sanitation programme • pest control programme **6. Health and Safety Recall** • recall system • recall initiation

5.6.1.4	HACCP Programme
Steps to HACCP	After the development and implementation of the prerequisite control programs, the development of the HACCP program is facilitated by incorporating the seven basic HACCP principles into a step-by-step approach. The step-by-step approach can vary between dairy plants depending on variables such as plant size and complexity, products produced, and the level of dairy plant technical expertise, but generally, these steps include: **1. Assemble HACCP Team** • the dairy processor should assure that the appropriate specific product knowledge and expertise is available for the development of an effective HACCP plan. The team should include a multi-disciplinary group of people. **2. Describe the Product** • a full description of the product should include relevant safety information on composition and method of distribution. **3. Identify the Intended Use of the Product** • the intended use should be based on the expected uses of the product by the end user or consumer. In specific cases, vulnerable groups of the population such as institutional feeding, immune compromised,the elderly and those with allergies should be considered. **4. Construct the Process Flow Diagram and Plant Schematic** • the flow diagram should be constructed by the HACCP Team. The flow diagram should cover all steps in the operation. • when applying HACCP to a given operation, consideration should be given to steps preceding and following the specified operation. **5. On-site Verification of Flow Diagram and Plant Schematic** • the HACCP team should confirm the processing operation against the flow diagram during all stages and hours of operation and amend the flow diagram where appropriate. **6. List the Hazards Associated with each Step - (Principle 1)** • the HACCP team should list all of the hazards that may be reasonably expected to occur at each step from primary production, processing, manufacture, and distribution until the point of consumption.

determine which hazards are of such a nature that their elimination or reduction to acceptable levels is essential to the production of a safe food.

- The team must then consider what control measures, if any, exist which can be applied for each hazard.

7. Apply HACCP Decision Tree to Determine CCP's (Principle 2)

- the decision tree should be used for guidance when determining CCP's. Refer to the schematic on page 100.

8. Establish Critical Limits - (Principle 3)

- critical limits must be specified for each critical control point.
- criteria often used include measurements of temperature, time, moisture level, pH, water activity, pressure, sensory parameters, etc.

9. Establish Monitoring Procedures - (Principle 4)

- monitoring is the scheduled measurement or observation of a CCP relative to its critical limits. The monitoring procedures must be able to detect loss of control at the CCP.
- all records and documents associated with monitoring CCP's must be signed by the person(s) doing the monitoring and by a responsible reviewing official(s) of the company.

10. Establish Deviation Procedures - (Principle 5)

- specific corrective actions must be developed for each CCP in the HACCP system in order to deal with deviations when they occur.
- the actions must ensure that the CCP has been brought under control.
- deviation and product disposition procedures must be documented in the HACCP record keeping.
- corrective action shall be taken when monitoring results indicate a trend towards loss of control at a CCP.

11. Establish Verification Procedures - (Principle 6)

- verification and auditing methods, procedures and tests, including random sampling and analysis, can be used to determine if the HACCP system is working correctly.
- The frequency of verification should be sufficient to confirm that the HACCP system is working effectively.
- Verification activities include:
- review of HACCP system and records
- review of deviations and product dispositions
- confirmation that CCP's are kept under control

	• validation of established critical limits. **12. Establish Record Keeping/Documentation for Principles One through Six - (Principle 7)** • efficient and accurate record keeping is essential to the application of a HACCP system. HACCP procedures should be documented and should be applied as appropriate to the nature and size of the food operation. • CCP Records should include those associated with: • Ingredients • product safety • processing • packaging • storage and distribution • deviation file • modifications to the HACCP system.

5.6.1.5	HACCP Programme
Training	• training of personnel in industry in HACCP principles and applications, and increasing awareness of consumers are essential elements for effective implementation of HACCP. • As an aid in developing specific training to support a HACCP plan, working instructions and procedures should be developed which define the tasks of the operating personnel to be stationed at each Critical Control Point. • These instructions should identify the responsible individual and describe the tasks to be conducted at the Critical Control Point.

Health and Safety Rationale

The Hazard Analysis Critical Control Point (HACCP) system, which is science based and systematic, identifies hazards and measures their control to ensure food safety. HACCP is a tool to assess hazards and establish critical control systems that focus on prevention rather than relying mainly on end-product testing.

5.6.2.1	Sanitation Program
Program	• shall have an effective cleaning and sanitation program for equipment and premises to prevent contamination of dairy products. • the cleaning and sanitation program shall be carried out in a manner that does not contaminate the dairy product or packaging materials during or subsequent to cleaning and sanitizing operations.
Health and Safety Rationale Cleaning and sanitation facilitates the continuing, effective control of microbial hazards, pests and other agents likely to contaminate the dairy product.	

5.6.2.2	Sanitation Program
Program Requirements	• shall have written procedures for a cleaning and sanitation program for all production and storage areas of the dairy plant which includes: o the name of person responsible o areas to be cleaned o the frequency of the activity o the chemicals and concentrations used o mixing instructions for chemical solutions o temperature requirements and o procedures for cleaning and sanitizing. • Special sanitation and housekeeping procedures required during production shall be specified within the written program.
Health and Safety Rationale A thoroughly planned written sanitation program is essential to ensure product safety. It should be available on the premises where the dairy product is being produced. Supervision of the program shall be assigned to individual(s) to assure its implementation and effectiveness.	

5.6.2.3	Sanitation Program

Requirements for Cleaned Out of Place Equipment (COP)	shall have a written cleaning program for COP which specifies: • equipment and utensils to be cleaned, • disassembly/reassembly instructions required for cleaning and inspection, • areas on equipment requiring special attention (eg. vacuum breaker, homogenizer, ingredient feeders, barrel freezer, air lines to the barrel freezer), • method of cleaning, sanitizing, rinsing and drying and • storage location for cleaned and sanitized equipment.
Health and Safety Rationale Equipment and utensils coming into contact with dairy products are designed and constructed to ensure that where necessary they can be adequately cleaned, disinfected and maintained to avoid contamination of the product. For some equipment (COP) it is necessary to be durable, movable, and capable of being disassembled to allow for thorough cleaning, disinfection and monitoring.	

5.6.2.4	Sanitation Program
Requirements for Cleaned in Place Equipment (CIP)	shall have a written cleaning program for CIP which specifies: • lines and/or equipment, • CIP setup instructions, • method of cleaning, sanitizing and rinsing, • any additional disassembly/reassembly instructions and • instructions for inspection.
Health and Safety Rationale CIP should be effective to prevent contamination of the dairy product. At times disassembly may be required for total cleaning and inspection. Instructions are required.	

5.6.2.5	Sanitation Program
Equipment and Chemicals	• equipment shall be designed for its intended use and properly maintained. • chemicals shall be used in accordance with the manufacturer's instructions. • only chemicals acceptable to Health Canada shall be used. • chemicals shall be identified and permanently stored in areas where they do not contaminate ingredients, packaging supplies, single service items or product contact surfaces. • where chemicals are constantly in use in daily production, daily proportions in duly identified containers may be stored in a closed compartment inside the rooms where dairy products are processed.

Health and Safety Rationale

Chemicals shall be deemed safe for use in a dairy plant. Acceptable chemicals are listed in the "Reference Listing of Accepted Construction, Packaging Material and Non Food Chemical Agents" published by Agriculture and Agri-Food Canada or "a letter of no objection" for a chemical is issued by Health Canada.

5.6.2.6	Sanitation Program
Cleaning Facilities	• shall be adequately designed, constructed, and maintained to prevent contamination. • shall be constructed of corrosion resistant materials capable of being easily cleaned. • shall be provided with potable water at temperatures appropriate for the cleaning chemicals used. Generally a minimum of 60°C is recommended when hot water is required. • shall be adequately separated from food storage, processing and packaging areas to prevent contamination.

Health and Safety Rationale

The design and construction of cleaning facilities for the cleaning and sanitation of equipment should incorporate features that prevent hazards that might adversely affect the safety of the dairy product. These features provide suitable environmental conditions, permit adequate cleaning and sanitation, minimize migration of extraneous material, prevent access by pests, and allow employees to fulfil their duties.

Regular maintenance of cleaning facilities is required to maintain adequacy of the premises.

5.6.2.7	Sanitation Program
Monitoring and Verification	• the effectiveness of the cleaning program shall be monitored and verified. Generally this is accomplished by, although not limited to, routine inspection of premises and equipment and/or microbiological testing. • corrective action shall be taken where deficiencies are identified through monitoring.

Health and Safety Rationale

Monitoring and verification of the program will demonstrate the adequacy of cleaning and sanitation.

Verify the effectiveness of the program with means such as pre-operational inspections; microbiological sampling of environment and product contact surfaces; and finished product and/or in-line testing.

5.6.2.8	Sanitation Program

Records	• shall keep records that verify the cleaning program.
	• the records shall include:
	  o date,
	  o person responsible,
	  o findings,
	  o microbiological test results where appropriate and
	  o corrective action taken for deviations.
	• each entry shall be made by the responsible person at the time that the specific event occurred.
	• the completed records shall be signed and dated by the responsible person.
	• shall be maintained for a minimum of one year or until after expiration of the date code if more than one year or as determined by the regulatory agency.

Health and Safety Rationale

Inadequate records do not permit verification of the effectiveness of the sanitation program.

5.6.3.1	Pest Control Program
Program	shall have an effective pest control program in place to ensure the dairy plant: • is free of pests, • is free of conditions which attract or harbour pests, • is protected against entry of pests, • detects any entry of pests, • eliminates pests when present in the plant and • removes any sign of pest activity.

Health and Safety Rationale

A pest control program facilitates the continuing, effective control of pests that are likely to contaminate the dairy products.

5.6.3.2	Pest Control Program
Program Requirements	shall have a written pest control program for the premises and equipment that specifies: • the name of the person responsible, • where applicable, the name of the person or pest control company contracted for the pest control program, • all pesticides used in the dairy plant, their prescribed use, the location where applied, method and frequency of application and control measures, • locations of all traps and • the type and frequency of inspection to verify the effectiveness of the program.

Health and Safety Rationale

A thoroughly planned written pest control program is essential to control pests in the dairy plant to ensure product safety. It should be available on the premises where the dairy product is being produced.

Supervision of the program shall be assigned to individual(s) to assure its implementation and effectiveness.

Periodic inspection is necessary to monitor pest activity and the effectiveness of the program.

5.6.3.3	Pest Control Program
Pesticide Control Measures	• Shall be approved for use in dairy plants in Canada under the Pest Control Products Act and Regulations. • shall be used in accordance with the label instructions. • shall be stored and applied in a manner that does not contaminate the product, utensils, packaging supplies , single service items and product contact surfaces. • treatment of equipment, premises or ingredients to control pests shall be conducted in a manner to ensure that the maximum residue limit of the Food and Drug Regulations is not exceeded in the product. • shall be applied by personnel qualified in their use.

Health and Safety Rationale

Control in the application of pesticides is necessary to ensure the product and packaging materials do not pose a health hazard due to high levels of pesticide residues.

5.6.3.4	Pest Control Program

Pest Control Records	• shall keep records that demonstrate the effectiveness of the pest control program.
	• shall include:
	  o date,
	  o person responsible,
	  o record of pest control activities including pesticide application, fumigation and a map showing placement and effectiveness of traps and
	  o results of the inspection programs and the corrective action taken.
	• each entry on a record shall be made by the responsible person at the time that the specific event occurred.
	• completed records shall be signed and dated by the responsible person.
	• shall be retained for one year after the record is entered.

Health and Safety Rationale

Inadequate records do not permit verification of the effectiveness of the pest control program.

5.6.4.1	Recall Program
Program	• shall have an effective recall program to permit the complete and rapid recall of any lot of dairy product from the market. • shall apply only to conditions where risks to health are identified.

Health and Safety Rationale

Recall is a quick and effective method of removing dairy products that may represent a health hazard to the consumer from the market. It is an action taken by a dairy plant licensee to carry out their responsibility to protect the public health and well-being.

Products that have left the dairy plant can be found in a variety of locations. Depending

on the severity of the hazard, it may be necessary to recall a product to one level of distribution or another. Licensees are expected to directly notify all of their affected customers about the recall. Depending on the nature and depth of the recall, the licensee may require their direct customers to notify subsequent accounts that received the product about the recall.

Recall does not include product withdrawal (a firm's removal from further sale or use, a marketed dairy product that does not violate any act or regulation) or stock recovery (a firm's removal or correction of a dairy product that has not been marketed or that has not left the direct control of the firm).

5.6.4.2	Recall Program
Requirements for the Dairy Plant	shall have written procedures for a recall program that include: • the person or persons responsible (eg. recall coordinator), • the roles and responsibilities for coordination and implementation of a recall, • methods to identify, locate and control recalled product, • a requirement to investigate other products that may be affected by the hazard and that should be included in the recall, • procedures for monitoring the effectiveness of the recall and • instructions for immediate notification of the regulatory agency having jurisdiction. This notification should include: o amount of product produced, in inventory, and distributed, o name, size, code, or lot numbers of dairy product recalled, o area of distribution of dairy product and o reason for the recall.

Health and Safety Rationale

A recall system should ensure that the recall of a dairy product is prompt and can be put into operation at any time. This is accomplished by having a written pre-determined plan or procedure.

5.6.4.3	Recall Program
Product Code Identification	• each prepackaged dairy product shall be identified with permanent, legible code marks which will facilitate recall of the product. Generally this is achieved by providing the following information: o best before date or production date and o identification of the dairy plant. • Identifying marks used and their exact meaning shall be available. • Where used, case identification marks shall be legible and represent the container code within.

Health and Safety Rationale

In order to facilitate a recall, each container shall be permanently marked to identify the manufacturer and the lot with code marks or lot numbers, generally on the label or container. A lot is a quantity of dairy product produced under identical conditions, all packages of which should bear identification marks that identify the production during a particular time interval, and usually from a particular "line" or other critical processing unit.

5.6.4.4	Recall Program

Distribution Records	• shall be available to enable recall of any particular lot of dairy product.
	• The following minimum information is required for distribution records:
	  o product identification and size,
	  o quantity distributed and
	  o customers names, addresses, and phone numbers to the initial level of product distribution.
	• Shall be maintained for a minimum of one year after expiration of the date code or two years after it was released for sale to consumers if there is no expiration date or as determined by the regulatory agency.

Health and Safety Rationale

It is necessary to maintain distribution records for the purposes of a recall.

Records of distribution by lot numbers enable a recall of only those lots where the problem has occurred. A recall of all products may be necessary where lots affected cannot be distinguished from other lots.

5.6.4.5	Recall Program
Recall Capability	• shall be capable of producing accurate information on a timely basis to verify that all affected product can be rapidly identified and removed from the marketplace. This can be demonstrated by identifying the following for the lot tested: o records of customer names, addresses and telephone numbers and o records of production, inventory and distribution. • shall be tested periodically to verify the capability to rapidly identify and remove a lot of potentially affected product from the market and reconcile the amount of product produced in inventory and in distribution. • any deficiencies identified in the recall procedure should be corrected.

Health and Safety Rationale

The purpose of verification is to challenge the effectiveness of the recall program to remove health hazards from the marketplace and to identify areas where improvements are required.

5.6.5.1	Allergen Control
Program	• shall have effective controls in place to prevent inclusion of unlabelled components that may cause adverse reactions.

Health and Safety Rationale

For the purpose of this Code, allergens are defined as any substances capable of producing an abnormal immune response or other adverse reaction in sensitive individuals. Examples of allergenic ingredients are nuts and nut products, eggs and egg products, sulphites (that can be carried over within ingredients like caramel and dried fruits), etc.

Finished product testing for the presence of trace amounts of allergens is not possible in most cases. Control of manufacturing through the implementation of appropriate procedures, rather than testing of finished product is more effective in ensuring that the product does not pose a health hazard for sensitive individuals.

With the incorporation of manufacturing control requirements, the focus is shifted from finished product specifications to defining in advance, the manufacturing practices that achieve acceptable levels of safety. This control is necessary to protect the health of individuals sensitive to specific ingredients and carryover components which are allergens to them.

5.6.5.2	Allergen Control
Product Formulation	• shall keep current written formulae for each product processed. • shall be available for each manufactured dairy product that corresponds to the labelled list of ingredients for that product. • the current written formulae shall contain all details of the formulae information to provide a basis for assessment of ingredients which may cause adverse reactions. Generally this includes information on: o specific ingredients, o food additives, and o ingredients recognized as causing adverse reactions.

Health and Safety Rationale

A current written formula contains essential information as many minor ingredients may result in adverse reactions.

Details of the formulae information provide a basis for assessment of ingredients which may cause adverse reactions.

5.6.5.3	Allergen Control
Production Worksheet	• the production worksheet shall identify all ingredients (including rerun and rework material) to demonstrate control over potential hazards in each batch. • the worksheet forms part of the records and shall be maintained for a minimum of one year or until after expiration of the date code if more than one year or as determined by the regulatory agency.

Health and Safety Rationale

Records and documentation demonstrate control over hazards related to the product formulation.

A well established and designed record keeping system provides the manufacturer with the assurance that each lot was produced according to established procedures. Records are also a means for a regulatory agency to verify compliance with GMPs over a period of time rather than only on a day of inspection. The records required in this section are only those that provide evidence of product safety.

Absence of or inadequate records do not permit verification the dairy plant licensee controls hazards related to product formulation.

5.6.5.4	Allergen Control
Incoming Ingredients Control	• shall control incoming ingredients to ensure the safety of the product. • ingredients shall only be accepted by the dairy plant when they meet the specifications. • a deviation procedure shall be established for non acceptable ingredients.

Health and Safety Rationale

Controls should be in place for the incoming ingredients such that no hazards from allergens may result in the dairy product.

Ingredients that do not meet specifications are a potential hazard to individuals sensitive to specific foods.

If ingredients do not meet specifications, deviation/correction control should be initiated to prevent hazardous ingredients being used in the manufacture of the dairy product.

5.6.5.5	Allergen Control
Returned Dairy Products	• dairy products which have left the licensee's storage and control shall not be reused for human consumption. • returned dairy products shall be segregated outside the process area and stored in a specifically assigned area and identified not to be used until they are disposed of.

Health and Safety Rationale

Dairy products which have left the licensee's storage and control may have been tampered with, temperature abused or potentially contaminated. Controls shall be in place to ensure that dairy products that have left the licensee's storage controls are not later used in manufacturing.

Use of returned dairy products could result in production of a potentially hazardous dairy product.

5.6.5.6	Allergen Control
Contamination	in order to avoid contamination with ingredients which may cause adverse reactions, the dairy plant licensee shall ensure that: • no ingredient substitution occurs during production which could render the product hazardous to sensitive individuals, • internally processed ingredients (ie. rerun and rework material) added to different dairy products do not contain ingredients that may result in adverse reactions unless the finished product label clearly indicates the presence of these ingredients, • controls shall be in place to ensure that when different flavours of dairy products are processed successively, common equipment (such as mix transport lines, freezing machines, molds, novelty lines, and hoppers) is free of undeclared ingredients which may result in adverse reactions that could be carried over into the next production and • controls shall be in place to avoid mixing different ingredients during storage and handling.
Health and Safety Rationale The introduction or occurrence in a dairy product of an allergen not intentionally added to the food and therefore undeclared may compromise product safety. This control is necessary to protect the health of individuals sensitive to specific ingredients and carryover components which are allergens to them.	

5.6.5.7	Allergen Control
Labelling	• shall have control over the composition and labelling of the product such that the correct label is applied and the listed ingredients accurately reflect the composition. • procedures shall be in place to ensure that new labels accurately reflect product formulation and composition. Generally this is achieved by: o new label review, o incoming label accuracy/correctness determination and o label revision when there are formulation changes or substitutions.

Health and Safety Rationale

This control is necessary to protect the health of individuals who may be sensitive to ingredients known to cause food adverse reactions.

Undeclared ingredients may compromise product safety and cause adverse reactions in sensitive individuals.

5.6.5.8	Allergen Control
Deviation Control	• shall have written procedures in place to identify, isolate, and evaluate dairy products when a potential for unlabelled ingredients which can cause adverse reactions is found in the dairy product. • dairy products with deviations in composition or labelling which may affect the safety with respect to food adverse reactions shall be clearly identified, isolated and evaluated.

Health and Safety Rationale

Inadequate deviation control or non adherence to procedures could result in the sale of unsafe product.

Defects or deviations from critical limits or procedures which may affect the safety of the product must be clearly identified, isolated and evaluated.

5.6.5.9	Allergen Control
Corrective Action	• shall be developed to deal with deviations when they occur. • shall ensure that the deviation has been brought under control • shall include proper disposition of the product and prevention of reoccurrence of the deviation.

Health and Safety Rationale

Inadequate corrective action following deviations could result in the sale of unsafe product.

When corrective action is taken due to monitoring, it indicates that a particular CCP is not under control. If corrective action does not address the root cause, the health risk

action to prevent reoccurrence and follow up with monitoring and reassessment to ensure that the action taken is effective.

All corrective actions taken shall be based on good science and not result in a lot of dairy product that may be a hazard to health.

5.6.6.1	Transport of Processed Dairy Products
Transport of Finished Dairy Products	• the following criteria shall be followed in the transport of finished dairy products: • the conveyances or containers shall be designed, constructed and maintained so that they do not contaminate the finished product. This includes, but is not limited to: effective and regular cleaning, effective separation of different dairy products from non-dairy items where necessary, and protection from dust and fumes. • with unfrozen dairy products, the transport temperature shall be maintained at 4^0C or less. In the case of frozen dairy products, the transport temperature should be maintained at -18^0C or less. Means shall be provided to easily check the container temperature. • the conveyances or containers shall not be used to transport other items which may contaminate the dairy products.

Health and Safety Rationale

During the transport of finished dairy products, effective measures must be taken to protect the products from potential sources of contamination. The primary goal is to ensure the product is suitable and safe for consumption upon receipt at it's destination. Adequate temperature maintenance ensures any microbial growth during transport is minimized. The provision for restricting the transport of non-compatible items in conveyances or containers used for dairy products is necessary because these items have been known to contaminate the container through microbial or chemical means which can then subsequently contaminate the dairy products.

5.6.6.2	Transport of Processed Dairy Products
Transport of Bulk, Processed Dairy Products	• the following criteria shall be followed in the transport of bulk, processed dairy products between dairy plants: • the conveyances or containers used for this purpose shall only be used for the transport of other compatible food items. • the transport temperature shall be maintained at 4^0C or less. • the bulk, processed dairy product shall be pasteurized at the plant of receipt.

Health and Safety Rationale

Occasionally dairy products are processed and pasteurized at one dairy plant and then transported in bulk re-usable containers to a second dairy plant for final processing and packaging. Because cleaning cannot be relied upon to remove all traces of the previously transported items, only bulk transporters used to carry food items compatible to dairy products shall be used for the bulk transport of dairy products. Maintenance of the product at 4^0C or less is required to minimize microbial growth and subsequent product contamination. The provision for requiring pasteurization at the plant of receipt, whether or not the product was pasteurized at the originating dairy plant, is necessary because, as previously stated, cleaning cannot be relied upon to remove all traces of the previously transported product. Such traces could subsequently contaminate the "pasteurized" dairy product. Pasteurization at the plant of receipt would return the product to an uncontaminated state.

6.0	Laboratory Methods and Testing
Introduction	• All testing methodologies listed include laboratory methods and testing procedures. With some of the referenced testing methodologies, product standards or limits may be listed as well. For the purpose of this Code, the standards or limits that will be applicable are those as established in the Common Regulatory Base or in the Code.

6.1 Laboratory Methods and Testing

A. Health Canada's Compendium of Analytical Methods provides an up-to-date ready reference of the methods used by the Health Products and Food Branch (HPFB). It includes:

1. Compendium of Methods for the Microbiological Analysis of Foods
   http://www.hc-sc.gc.ca/fn-an/res-rech/analy-meth/microbio/index_e.html

2. Compendium of Methods for the Chemical Analysis of Foods
   http://www.hc-sc.gc.ca/fn-an/res-rech/analy-meth/chem/index_e.html

B. For test methods not available in Health Canada's Compendium of Analytical Methods as above, the Canadian Food Inspection Agency (CFIA) recommends the use of collaboratively studied methods of analysis such as those published in the most recent version of the "Official Methods of Analysis of AOAC International" wherever possible.

Other references for valid recognized methods are:
Codex Alimentarius:
http://www.fao.org/ag/againfo/subjects/en/dairy/guidelines.html

International Dairy Federation:
http://www.fil-idf.org/Content/Default.asp

American Dairy Products Institute
http://www.adpi.org/publications.asp

Also considered appropriate would be methods published in:
Standard Methods for the Examination of Dairy Products, 16th Edition, 1992, American Public Health Association, Washington, D.C..
In house or journal methods with adequate method validation data are another possible option for method selection.

Laboratories should verify that any method used is valid and fit for the purpose of measuring compliance with the standards in the Common Regulatory Base or in the Code.

7.0	Equipment Test Methods
Introduction	• A pasteurization system is made up of a basic pasteurizer and an intricate grouping of components all working together to ensure that every particle of product has been properly pasteurized. • All the tests in this section are designed to ensure that the components are functioning properly.

Health and Safety Rationale

Failure of any component to carry out the function it was designed and installed to do could result in unpasteurized product being offered to the consumer. Consumption of any unpasteurized product could result in illness due to the presence of pathogens that are normally destroyed through proper pasteurization.

7.1	Thermometers

Test 1
 	
Indicating Thermometer-
 	
Temperature
 	
Accuracy
	Application
	
	• pasteurization and airspace indicating thermometers.
	
	Frequency
	
	• upon installation and every three (3) months thereafter.
	
	Criteria
	
	• pasteurization indicating thermometer
	  o accuracy within 0.25°C (0.5°F) in a specified scale range.
	• airspace indicating thermometer
	  o accuracy within 0.5°C (1°F) in a specified scale range.
	
	Apparatus
	
	• a certified test thermometer with accuracy of as determined by the National Bureau of Standards.
	• water bath and agitator.
	• suitable means of heating water bath.
	• indicating thermometer to be tested.

	Method • both the indicating and test thermometers are exposed to water bath of uniform temperature. • indicating thermometer reading is compared to the reading of the test thermometer. **Procedure** • bring up the water bath temperature to within a range of 2°C of the appropriate pasteurization (diversion) temperature or airspace temperature. • maintain rapid agitation throughout the test. • insert the indicating and test thermometer to indicated immersion point during the test. Hold the indicating and test thermometer for five (5) minutes before reading. • compare both thermometer readings at the temperature reading within the test range and record results and thermometer identification. • repeat comparison of readings three (3) times.

7.1	Thermometers
Test 2 **Indicating Thermometer-** **Thermometric** **Response**	**Application** • pasteurization indicating thermometer. **Frequency** • upon installation and once every three (3) months thereafter. **Criteria** • indicating thermometer moves through a 7^{o}C (12^{o}F) range in no more than four (4) seconds. **Apparatus** • test thermometer. • stopwatch. • water bath and agitator. • suitable means for heating the water bath. • indicating thermometer from pasteurizer.

- bucket of ice water.

Method

- measure the time required for the reading of the thermometer being tested to increase $7^{o}C$ ($12^{o}F$) through a specified temperature range (temperature range must include pasteurization temperature). The temperature used in the water bath will depend upon the scale range of the thermometer to be tested.

Procedure

- immerse the indicating thermometer in water bath held at a temperature at least $11^{o}C$ ($19^{o}F$) higher than the minimum scale reading on the indicating thermometer. The bath temperature should be higher than the maximum pasteurization temperature for which the thermometer is used.
- immerse the indicating thermometer in water bath held at a temperature at least $11^{o}C$ ($19^{o}F$) higher than the minimum scale reading on the indicating thermometer. The bath temperature should be higher than the maximum pasteurization temperature for which the thermometer is used.
- immerse indicating thermometer in bucket of ice water for ten (10) seconds to cool it.
- insert indicating thermometer in hot water bath to proper bulb immersion depth.
- start stopwatch when indicating thermometer reads $11^{o}C$ ($19^{o}F$) below bath temperature.
- stop stopwatch when indicating thermometer reads $4^{o}C$ ($7^{o}F$) below bath temperature.
- record the thermometric response time (must be less than 4 seconds).
- repeat the test three times.

NOTE: Continuous vigorous agitation of water baths during the performance of steps 3,4 and 5 is required. Elapsed time between end of step 1, and beginning of step 3 should not exceed 15 seconds so hot water does not cool significantly.

Example

for thermometer used at pasteurization temperature set points of 71.7 and $74.4^{o}C$ (161 and $166^{o}F$) a water bath at a temperature of $78.3^{o}C$ ($173^{o}F$) could be used. $11^{o}C$ ($19^{o}F$ lower than $78.3^{o}C$ ($173^{o}F$) water bath would be $67.7^{o}C$ ($154^{o}F$); $4^{o}C$ ($7^{o}F$ lower than $78.3^{0}C$ ($173^{0}F$) water bath would be $74.3^{0}C$ ($166^{0}F$). Hence, after immersing the thermometer which has been previously cooled, in the $78.3^{0}C$

	67.3^{0}C (154^{0}F and stopped when it reads 74.3^{0}C (166^{0}C). **NOTE:** The test included the pasteurization temperature of 71.7 and 74.4^{0}C (161 and 166^{0}F).

7.1	Thermometers
Test 3 **Recording Thermometer -** **Check Against Indicating Thermometer**	**Application** • all recording and recording/controller thermometers used to record milk temperatures during pasteurization. **Frequency** • upon installation, once a year and daily by the plant operator. **Criteria** • recording thermometer shall not read higher than corresponding indicating thermometer. **Apparatus** • certified or calibrated indicating thermometer. • water bath and agitator. • suitable means to heat the water bath. **Method** • this test requires that a reading of the recording thermometer be compared with that of the indicating thermometer at a time when both are exposed to milk at a stabilized pasteurization temperature while the HTST system is operating and both thermometers are installed in their normal location in the temperature sensing chamber. **Procedure A - Annual Test** • place the indicating or certified thermometer and recorder problem in a circulating water bath at processing temperature. • Stabilize for five minutes. • Read the indicating and recording thermometer. • Record the results. • Adjust the recording response to the same as the indicating

	thermometer if needed. **Procedure B - Daily Test** • With the pasteurizer in normal operation, at a temperature above the minimum pasteurization temperature, read the indicating thermometer when the milk is at a stabilized temperature for five (5) minutes. • Immediately inscribe a line using permanent ink on the recording thermometer chart that intersects the recording temperature arc at the pen location. • Record on the chart the indicating thermometer temperature and initials of the operator or person performing the test. • Record results and make adjustments if required.

7.1	Thermometers
Test 4 **Recording Thermometer -** **Time Accuracy**	**Application** • all recording and recorder/controller thermometers used to record time of pasteurization. **Frequency** • upon installation and at least once a year thereafter. **Criteria** • the recorded time of pasteurization shall not exceed true elapsed time. **Apparatus** • stopwatch. **Method** • comparison of the recorded time over a period of not less than thirty (30) minutes with a stopwatch of known accuracy. For recorders utilizing electric clocks, check cycle on face plate of clock with known cycle; observe that clock is in operating condition.

	Procedure • determine if chart is appropriate to recorder. • verify that mechanism to grip and perforate chart paper is operational. • mark a reference point on the backplate of the recorder at the outer circumference of the chart paper. • with the chart paper removed from the recorder, inscribe a reference mark at the outer edge of the chart, lined up with any printed hour time line. • install chart in the recorder with reference mark on chart lined up exactly with reference mark on back plate. • secure in place. • start stopwatch. • at the end of thirty (30) minutes by stopwatch, inscribe a second reference mark on the chart paper exactly opposite the backplate reference mark. • stop the stopwatch. • compare the time recorded on the chart with the true elapsed time from the stopwatch. • for electric clocks, remove face plate, compare cycle specification on face plate with current cycle utilized.

7.1	Thermometers
Test 5 **Recording Thermometer -** **Temperature Accuracy**	**Application** • all recording and recorder/controller thermometers used to record milk temperatures during pasteurization. **Frequency** • upon installation, at least once a year whenever recording pen- arm setting requires frequent adjustment. **Criteria** • accuracy within ± 0.5^{o}C (1^{o}F), in specified scale range. **Apparatus** • verified pasteurizer indicating thermometer. • three water baths agitator. • suitable means for heating the water bath. • ice.

	Method • the testing of a recording thermometer for temperature accuracy involves the determination of whether or not the temperature pen- arm will return to within 0.5^{o}C (1^{o}F) of its previous setting after exposure to boiling water and melting ice. **Procedure** • heat a container of water to pasteurization temperature. • Adjust the recording pen to read exactly as the previously tested indicating thermometer after a stabilization period of five (5) minutes at pasteurization temperature. The water bath shall be rapidly agitated throughout the stabilization period. • Prepare one water bath by heating to the boiling point. • Maintain temperature. • Prepare a second bath with melting ice. • Place water baths within working distance of the recorder sensing element. • Immerse the sensing element of recorder in boiling water for not less than five (5) minutes. • Remove the sensing element from the boiling water and immerse it in the water heated to pasteurization temperature. Allow a five (5) minute stabilization period for both indicating or certified and recording thermometers. The two readings must be within ± 0.5^{o}C (1^{o}F). The water bath shall be rapidly agitated through out the stabilization period. • Remove sensing element from the bath at operating temperatures and immerse in melting ice for not less than five (5) minutes. • Remove sensing element from ice water and immerse in water at pasteurization temperature. Allow five (5) minute stabilization period for both indicating or certified and recording thermometers. The two readings must be within ±0.5^{o}C (1^{o}F). The water bath shall be rapidly agitated through out the stabilization period. • Record results.

7.1	Thermometers
Test 6 **Milk-Flow Controls -**	**(A) Installation and Inspection Test** Application

Milk Temperatures at Cut-in and Cut-Out	HTST pasteurizers. Frequency • upon installation and once every six (6) months thereafter. Criteria • there shall be no forward flow until pasteurization temperature has been reached. • flow is diverted before temperature drops below minimum pasteurization temperature. • cut-in temperature is higher than cut-out temperature. Apparatus • water bath. • indicating or Certified test thermometer with accuracy of ±0.1^{o}C (0.2^{o}F) as determined by the National Bureau of Standards. • water bottle. Method • observe the actual temperature of the indicating thermometer at the instant forward flow starts (cut-in) and stops (cut-out). Procedure • cut-in temperature (a) while water in water bath is completely flooding the sensing element of the Safety Thermal Limit Recorder and the indicating or certified thermometer, increase the heat gradually so as to raise the temperature of the water or milk at a rate not exceeding 0.5^{o}C (1^{o}F) every 30 seconds. (b) observe the verified indicating or certified thermometer reading at the instant the Flow Diversion Device starts to move. (c) observe that the frequency pen reading is synchronized with the recording pen on the same reference arc. (d) record the indicating or certified thermometer reading. • cut-out temperature.

	while the water is above the cut-in temperature, allow the water to cool slowly at a rate not exceeding 0.5^0C (1^0F) per 30 seconds. Cool water in a water bottle may be used if necessary. (b) observe indicating or certified thermometer reading at the instant forward flow stops. (c) record the indicating or certified thermometer reading.

7.1	Thermometers
Test 6 **Milk-Flow Controls -** **Milk Temperatures at Cut-in and Cut-Out**	**(B) Daily Test** Application • all Safety Thermal Limit Recorders used in connection with HTST pasteurizers. Frequency • daily by the plant operator and whenever a new set-point is selected on a multiple temperature divert unit. Criteria • no forward flow until pasteurization temperature has been reached. • flow is diverted before temperature drops below minimum pasteurization temperature. • cut-in temperature is higher than cut-out temperature. Apparatus • none. Method • observe the actual temperature of the indicating thermometer at the instant forward flow starts (cut-in) and stops (cut-out). Procedure • cut-in temperature.

	(a) with the system operating and while milk or water is completely flooding the sensing element of the Safety Thermal Limit Recorder and the indicating thermometer within the sensing chamber, increase the heat gradually so as to raise the temperature of the water or milk at a rate not exceeding 0.5°C (1°F) every 30 seconds. (b) observe the indicating thermometer reading at the instant the Flow Diversion Device begins to move. (c) observe that the frequency pen reading is synchronized with the recording pen on the same reference arc. (d) record the indicating thermometer reading on the recorder chart; inscribe initials. • cut-out temperature. (a) after the cut-in temperature has been determined and while the milk or water is above the cut-in temperature, allow the milk or water to cool slowly at a rate not exceeding 0.5°C (1°F) per 30 seconds. (b) observe indicating thermometer reading at the instant forward flow stops. (c) record the indicating thermometer reading on the recorder chart; inscribe initials.

7.1	Thermometers
Test 7 **Safety Thermal Limit Recorder -** **Thermometric Response**	**Application** • all Safety Thermal Limit Recorders used in connection with HTST pasteurizers. **Frequency** • upon installation and at least once a year thereafter. **Criteria** • recorder-Controller moves through a specific range 7°C (12°F) in less than five (5) seconds. **Apparatus**

	• verified indicating thermometer. • Stopwatch. • Water baths and agitator. • Suitable means for heating the water bath. **Method** • measure the time interval between the instant when the recording thermometer reads 7°C (12°F) below the cut-in temperature and the moment of cut-in by the controller. This measurement is made when the sensing element is immersed in rapidly agitated water bath maintained at exactly 4°C (7°F) above the cut-in temperature. **Procedure** • check and, if necessary, adjust the pen-arm setting of the recording thermometer to be in the proper reference arc, and to agree with the indicating thermometer reading at pasteurization temperature. • determine the cut-in temperature of controller (Test 6). • remove the sensing element and allow it to cool at room temperature while vigorously agitating bath to insure uniform temperature. • heat the water bath to exactly 4°C (7°F) above the cut-in temperature while vigorously agitating bath to insure uniform temperature. • immerse Safety Thermal Limit Recorder bulb in bath. Continue vigorous agitation during 6 and 7 below. • start stopwatch when the recording thermometer reaches a temperature of 7°C (12°F) below the cut-in temperature. • stop stopwatch when the Flow Diversion Device begins to move. • record results.

7.2	Holding Time
Test 8 **Salt Conductivity Test**	**Application** • to all HTST pasteurizers employing a holding time of sixteen (16) seconds or longer. NOTE: Certain regulatory agencies may grant an individual plant permission to use a shorter hold time in conjunction with a required higher pasteurization temperature, or permission to use a lower pasteurization temperature in conjunction with a longer required hold

	place of sixteen (16) seconds. **Frequency** • upon installation and annually thereafter. • whenever seal on speed setting is broken. • whenever any alteration is made affecting the holding time, the velocity of the flow (such as replacement of pump, motor, belt, driver or driven pulleys, or decrease in number of HTST plates), or the capacity of holding tube. • whenever a check of the capacity indicates a speed up. **Criteria** • every particle of milk shall be held for the minimum legal hold time at least sixteen (16) seconds in both the forward and diverted flow positions. **Apparatus** • electrical conductivity measuring device. • table salt (sodium chloride). • device used for injecting brine into the holding tube. • stopwatch. • 36 litre (8 gallon) can. • wrenches. **Method** • the holding time is determined by timing the interval for an added trace substance to pass through the holding tube. Although the time interval of the fastest particle of milk is desired, the conductivity test is made with water. The results found with water are converted to the milk flow time by formulation since a pump may not deliver the same amount of milk as it does water. **Procedure A** • for systems with a positive displacement pump used as the Flow Control Device • examine the entire system to insure that all flow promoting equipment is operating at maximum capacity and all flow impeding equipment is operating at maximum capacity and all flow impeding equipment is so adjusted or bypassed as to provide minimum resistance to the flow. There shall be no leakage on the suction side of the timing pump. • adjust variable speed pump to its maximum capacity (preferably with a new belt and full size impellers). • check homogenizers for seals and/or gears or pulley identification.

- install one electrode at the inlet (lowest point) to the holding tube and the other electrode at the holding tube outlet. Close the circuit to the electrode located at the holding tube inlet.
- operate the pasteurizer using water at pasteurization temperature, with Flow Diversion Device in forward flow position.
- quickly inject saturated sodium chloride solution (approximately 50 mL) into the holding tube inlet.
- start the stopwatch with the first movement of the indicator of a change in conductivity. Open the circuit to the inlet electrode and close the circuit to the electrode at the holding tube outlet.
- stop the stopwatch with the first movement of the indicator of a change in conductivity.
- record the holding time.
- repeat the test six or more times, until successive results are within 0.5 seconds of each other. The average of these tests is the holding time for water in forward flow. When consistent results cannot be obtained, purge the equipment, check instruments and connections, and check for air leakage on suction side. Repeat tests. Should consistent readings not be obtained, use the fastest time as the holding time for water.
- repeat steps (4) through (9) for the holding time in diverted flow.
- with the pump at the same speed and equipment adjusted as in (1) above, time the filling of a 36 litre (8 gallon) can with a measured weight of water using the discharge outlet with the same head pressure as in normal operation. Average the time of several trials.
- since Flow rates of the large capacity units make it very difficult to check by filling a 36 litre can, it is suggested that a magnetic flow meter be hooked up into the system or a calibrated tank of considerable size be used.
- repeat procedures (12) using milk or a dairy products to be pasteurized through this unit.
- compute the holding time for milk or milk products from the following formula by weight, using the average specific gravity. Compute separately for forward flow and diverted flow. Holding time for milk = $(1.032\ (TM_w)/W_w)$ (by weight in which:

  1.032 = specific gravity for milk.

  T = average holding time for water

  Mw = average time required to deliver a measured weight of product.

  W_w = average time required to deliver an equal weight of water.

  The holding time for milk may also be computed from the following formula by

and diverted flow.

Holding time for milk = $T(M_v)/W_v$) (by volume), in which:

T = average holding time for water.

Mv = average time required to deliver a measured volume of product.

W_v = average time required to deliver an equal volume of water.

- record results

Procedure B

- for systems with a magnetic flow meter system used as a flow control device.
- examine the entire system to insure that all flow promoting equipment is operating at maximum capacity and all flow impeding equipment is so adjusted or bypassed as to provide minimum resistance to the flow.
- adjust the set point on the Flow Alarm to its highest possible setting.
- adjust the set point on the Flow Controller to a flow rate estimated to yield an acceptable holding time.
- install one electrode at the inlet (lowest point) to the holding tube and the other electrode at the holding tube outlet. Close the circuit to the electrode located at the holding tube inlet. Operate the pasteurizer using water at pasteurization temperature, with Flow Diversion Device in forward flow position.
- quickly inject saturated sodium chloride solution (approximately 50 mL) into the holding tube inlet.
- start the stopwatch with the first movement of the indicator of a change in conductivity. Open the circuit to the inlet electrode and close the circuit to the electrode at the holding tube outlet.
- stop the stopwatch with the first movement of the indicator of a change in conductivity.
- record the holding time.
- repeat the test six or more times, until successive results are within 0.5 seconds of each other. The average of these tests is the holding time for water in forward flow. When consistent results cannot be obtained, purge the equipment, check instruments and connections, and check for air leakage on suction side of the pump, located at the raw product supply tank. Repeat tests. If six consecutive readings cannot be achieved within 0.5 seconds, in forward and diverted flow, the pasteurizing system is need of repair.
- repeat steps (4) through (9) for the holding time in diverted flow.

	• with the flow controller at the same set point as in (3) above, time the filling of a s 36 litre (8 gallon) can with a measured weight of water using the discharge outlet with the same head pressure as in normal operation. Average the time of several trials. (Since flow rates of the large capacity units make it very difficult to check by filling a 36 litre can, it is suggested that a magnetic flow meter be hooked up into the system or a calibrated tank of considerable size be used). • record results.

7.2	Holding Time
Test 9 **Calculated Method**	**Application** • to all HTST pasteurizers employing a holding time of 16 seconds or longer. **Frequency** • upon installation and annually thereafter. • whenever seal on speed setting is broken. • whenever any alteration is made affecting the holding time, the velocity of the flow (such as replacement of pump, motor, belt, driver or driven pulleys, or decrease in number of HTST plates), the capacity of holding tube. • whenever a check of the capacity indicates a speed up. **Criteria** • Eery particle of milk shall be held for the minimum legal hold time in both the forward and diverted flow positions. **Apparatus** • tape measure. **Method** • determine the efficiency factor using the Reynolds number for water and all products to be processed at the maximum flow rate. Also determine flow rate ratio (product:water). Use the smallest efficiency factor and the determined flow rate ratio to calculate the required holding tube length. **Procedure**

- determine the inside diameter in metres of the holding tube (Table 1).

- calculate the velocity of the product using the following equation:

  $V = F/A$

  where: V = Velocity (m/s).

  F = Flow rate (litres/hr or litres/sec or m^3/s).

  A = Area* (m^2).

  *Use the inside diameter (Table 1) of the tube to calculate the area.

- determine the Reynolds number at the maximum flow rate for water and all products to be processed using the following formula:

  Reynolds number (Re) = $(p \times V \times d)/\mu$

  where: p = fluid density (kg/m^3).

  V = velocity (m/s).

  d = tube inside diameter (m).

  μ = viscosity (kg/sec.m) (Table 2).

- to calculate the efficiency factor (E):

  E=0.75 when Re is greater than 8000

  E=0.5 when Re is less than 8000.

- determine the flow rate ratio (r) using the method outline in Test 8, steps 11 and 12 and the following formula:

  flow rate ratio (r) = $M_v)/W_v)$.

  where M_v = average time required to deliver a measured volume of product.

  W_v = average time required to deliver an equal volume of water.

  For large pasteurizers this should be

	instead of 36 litres can. • calculate the minimum holding length using the following formula: L = (t x V)/(E x r). where: L = length (m). t = minimum holding time(s). V = velocity (m/s). E = efficiency factor. r = flow rate ratio. • calculate the target salt test using the following formula: target salt test in seconds - L/V. where: L = Length (m). V = velocity (m/s).

TABLE 1

HOLDING TUBE DATA

ASSUMING 16 swg PIPE

OUTSIDE DIAMETER		INSIDE DIAMETER (d)			AREA ()		VOLUME (Q)	
in.	Cm	in.	Ft	cm	ft^2	cm^2	Imp.gal./ft	l/m
1	2.54	0.872	.073	2.2215	.0042	3.853	.0262	.3853
1.5	3.81	1.372	.114	3.485	.0103	9.539	.0643	.9539
2	5.08	1.872	.156	4.755	.0191	17.758	.1192	1.7758
2.5	6.35	2.372	.198	6.025	.0307	28.511	.1916	2.8511
3	7.62	2.872	.239	7.295	.0450	41.800	.2808	4.1800
4	10.16	3.872	.323	9.835	.0818	75.97	.5104	7.5970

TABLE 2

DENSITY AND VISCOSITY VALUES

PRODUCT		DENSITY (p)		VISCOSITY (μ)	
TYPE	TEMP	g/l	lb/ft^3	cP	lb/ft.s
Milk	72°C	1.012	63.15	0.515	0.000346
Cream (40%)	75°C	.9826	61.3	3.4	0.00228
Ice Cream Mix	80°C	1.1	68.64	150	0.1008

NOTE: These figures incorporate a safety factor in recognition of the potential variances in product formulations and batching procedures.

7.3	Flow Diversion Device
Test 10 **Leakage Past Valve Seat(s)**	**Application** • to all Flow Diversion Devices used with HTST pasteurizers. **Frequency** • upon installation and at least once every six (6) months thereafter. **Criteria** • raw milk must not leak past the Flow Diversion Device into pasteurized milk channels. **Apparatus** • suitable tools for disassembly of Flow Diversion Device and sanitary piping. **Method** • observe the valve seat(s) of the Flow Diversion Device for leakage. **Procedure** • while operating the system with water, place the Flow Diversion Device in the diverted flow position. • Disconnect the forward flow piping of a single stem device and verify that the valve seat does not leak. On a dual stem device, remove the leak detect pipe or observe carefully through the sight glass. • Check the leak escape ports of a single stem device to ensure that they are open. • Record results.

7.3	Flow Diversion Device
Test 11 **Operation of Valve Stem(s)**	**Application** • to all Flow Diversion Devices used with HTST pasteurizers where a stem packing nut is used. **Frequency** • upon installation and at least once every six (6) months thereafter. **Criteria** • the Flow Diversion Device valve stem(s) move(s) freely when the stuffing box nut is fully tightened. **Apparatus** • suitable tools for disassembly of Flow Diversion Device and sanitary piping. **Method** • observe Flow Diversion Device valve stem(s) for ease of movement. **Procedure** • tighten the stuffing box nut as much as possible. • Operate the HTST and place the Flow Diversion Device in forward and diverted flow several times. • Observe that the Flow Diversion Device valve stem(s) move(s) with ease. • Record results.

7.3	Flow Diversion Device
Test 12 **Device Assembly, Single Stem Device**	**Application** • to all single stem Flow Diversion Devices used with HTST pasteurizers. **Frequency** • upon installation, at least once every six (6) months thereafter and whenever the micro-switch is reset or replaced. **Criteria** • the Flow Control Device and all other flow promoting devices located between the constant level tank and vacuum breaker stop or are isolated from the system when the Flow Diversion Device is improperly assembled. **Apparatus** • sanitary fitting wrench. **Method** • observe function of Flow Control Device when Flow Diversion Device is improperly assembled. **Procedure** • with the HTST system in operation with cold water and the Flow Diversion Device in diverted position unscrew by one-half turn, the 13H hex nut which holds the top of the valve to the valve body. This should de-energize the Flow Control Device and all other flow promoters. This test should be run with no piping connected to the forward flow port of the flow Diversion Device since there can be sufficient force from the piping to keep the forward flow port tightly clamped even though the hex nut is loosened. • with the HTST system in operation with cold water and Flow Diversion Device in diverted position, remove the connecting key located at the base of the valve stem. The flow Control Device and all other flow promoters should be de-energized. • record Results.

7.3	Flow Diversion Device
Test 13 **Device Assembly, Dual Stem Device**	**Application** • to all dual stem Flow Diversion Devices used with HTST pasteurizers. **Frequency** • upon installation, at least once every six (6) months thereafter and when micro-switch is re-set or replaced. **Criteria** • the Flow Control Device and all other flow promoters stops or are bypassed when the Flow Diversion Device is improperly assembled. **Apparatus** • tools to dismantle Flow Diversion Device. **Method** • observe function of Flow Control Device and all other flow promoters when Flow Diversion Device is improperly assembled. **Procedure A** • while the pasteurizer is not operating, with the Flow Diversion Device in diverted flow, remove one actuator clamp. . move the Flow Diversion Device to the forward flow position using the "INSPECT" position of the selector switch and disconnect stem from actuator. • move the Flow Diversion Device to the diverted flow position using the "PROCESS" position of the selector switch and turn on the Flow Control Device. The Flow Control Device and all other flow promoters should not run or are bypassed. • reassemble the Flow Diversion Device by moving it to the forward flow position and reconnecting the stem to the actuator. • move the Flow Diversion Device to the diverted flow position and replace the actuator clamp. • repeat the procedure for the other actuator. • record results. **Procedure B**

	• with the flow Diversion Device in the diverted flow position, move the micro-switch away from the contact groove in the valve stem. Observe that the Flow Control Device and all other flow promoting devices are stopped or by-passed. • repeat the test for leat detect valve. **Procedure C** • with the HTST pasteurizer system in forward flow, insert a nut into the diversion valve quick exhaust port. • Reduce the processing temperature below the cut-out temperature. • Observe that the diversion valve does not immediately move to the fully diverted position, that all flow promoters stop and separator is by-passed. • Repeat the test for leat detect valve.

7.3	Flow Diversion Device
Test 14 **Manual Diversion**	**Application** • HTST system with a booster pump. **Frequency** • upon installation and at least once every six (6) months thereafter. **Criteria** • when Flow Diversion Device is manually diverted, booster pump stops, frequency pen records a diverted flow position, green light goes out, red light comes on and pressure differential is maintained. **Apparatus** • none. **Method** • observe the response of the system to manual diversion. **Procedure** • with HTST system in operation and the Flow Diversion Device in the forward flow position, press the manual diversion button. Observe that the flow diversion valve assumes the divert position, and the booster pump stops. The frequency pen should record a diverted flow position, and the green light go out while the red light comes on. The pressure differential between raw and pasteurized milk in the regenerator should be maintained. • activate the manual button diversion while operating the HTST system at its maximum operating pressure. Confirm that the spring tension of the Flow Diversion Device is capable of diverting the system at maximum operating pressure. • operate the HTST system in forward flow and activate the manual divert button until the raw side pressure reaches zero (0) psi. Release the manual divert button and observe that the pressure differential between raw and pasteurized milk in the regenerator is maintained.

7.3	Flow Diversion Device
Test 15 **Response Time**	**Application** • to all Flow Diversion Devices used with HTST pasteurizers. **Frequency** • upon installation and at least once every six (6) months thereafter. **Criteria** • the Flow Diversion Device moves from the fully forward to the fully diverted position in no more than one second. **Apparatus** • stopwatch. • water bath. **Method** • determine the elapsed time between the instant of the activation of the control mechanism at cut-out temperature on declining temperature and the instant the Flow Diversion Device takes the fully diverted flow position. **Procedure** • place the temperature sensing probe of the Safety Thermal Limit Recorder into the water bath. • with water bath at a temperature above cut-out temperature, allow the water to cool gradually. At the moment the cut-out mechanism is activated, start the watch and the moment the Flow Diversion Device takes the fully diverted position, stop the watch. On a dual stem device, both valves should move simultaneously. • record results. The response time interval must not exceed one second.

7.3	Flow Diversion Device
Test 16 **Valve Flush Time Delay**	**Application** • to all dual flow diversion devices in which product may be pocketed between the two valve seats while the valve is in diverted flow position. **Frequency** • upon installation and at least once every six (6) months thereafter. • whenever the seal on the time delay relay is broken. **Criteria** • there shall be a flush of the transitional cavity between the two valves of at least one (1) second. If a restrictor is installed in the divert line, the delay shall be no longer than five (5) seconds. **Apparatus** • stopwatch. **Method** • when the flow diversion device moves from the diverted flow position to the forward flow position, the cavity located between the two valve bodies shall receive an adequate flush to remove stale product, but this flush should not compromise the required hold time. **Procedure** • operate the pasteurizer in diverted flow position. • raise the temperature to a point above the cut-in temperature. • at the instant the divert (first) valve begins to move into its "forward flow" position, start the stopwatch. • at the instant the leak detect valve begins to move, stop the stopwatch. • record the results and adjust the time delay relay if necessary (and seal the time delay relay or its enclosures).

7.3	Flow Diversion Device
Test 17 **Time Delay Interlock With Flow Control Device**	**Application** • to dual stem Flow Diversion Devices with a manual forward switch. **Frequency** • upon installation and at least once every six (6) months thereafter. **Criteria** • to verify that the system cannot enter a manually induced forward flow position while the Flow Control Device is running or any flow promoting device located between the constant level tank and the vacuum breaker is active. **Apparatus** • none. **Method** • determine that the Flow Diversion Device does not assume a manually induced forward flow position while the Flow Control Device is running or any flow promoting device located between the constant level tank and the vacuum breaker is active. **Procedure** • with the system running in forward flow, move the control switch to the "INSPECT" position and observe that the following events automatically occur in sequence: • the Flow Diversion Device immediately moves to the diverted flow position and the Flow Control Device is turned off. • the Flow Diversion Device remains in the diverted flow position while the Flow Control Device is running down. • All flow promoting devices are either de-energized or by-passed. • After the Flow Control Device stops running, the Flow Diversion Device assumes the forward flow position. All flow promoting devices remain de-energized or by-passed. • Record the results and seal the timer or enclosure.

7.3	Flow Diversion Device
Test 18 **CIP Time Delay Relay**	**Application** • to all HTST pasteurizer systems in which it is desired to run the Flow Control Device and/or other flow promoting device during the CIP cycle. **Frequency** • upon installation and at least once every six (6) months thereafter. • whenever the seal on the time delay relay is broken. **Criteria** • when the mode switch on the Flow Diversion Device is moved from "Process Product" to "CIP", the Flow Diversion Device shall move immediately to the diverted position and remain in the diverted position for at least 10 minutes before starting its normal cycling in the CIP mode. Simultaneously, the booster pump shall be turned off and shall not run during the 10 minute time delay. **Apparatus** • stopwatch. **Method** • adjust the set point on the time delay relay equal to or greater than 10 minutes. **Procedure** • operate pasteurizer in forward flow with the mode switch on the Flow Diversion Device in the "Process Product" position, at a flow rate below the value at which holding time was measured, using water above pasteurization temperature. • move the mode switch on the Flow Diversion Device to the "CIP" position. The Flow Diversion Device shall move immediately to the diverted position and the booster pump shall stop running. • Start the stopwatch when the Flow Diversion Device moves to the diverted position. • Stop the stopwatch when the Flow Diversion Device moves to the forward flow position for its initial cycle in the CIP mode or when the booster pump starts. • Record the results. The time delay must be at least 10 minutes.

7.4	Pressure Differential
Test 19 **Pinholes** **Check -** **Dye Recirculation Procedure**	**Note:** Other alternate tests (e.g. spraying dye, freon method, pressure method) are also acceptable. **Application** • All heat transfer plates of HTST pasteurizer. **Frequency** • at least once a year. **Criteria** • to check for pinholes in the heat transfer plates. **Apparatus** • connections and fittings to circulate the back side of all non-product surfaces of plates (i.e. hot water, chill water and glycol sections) and raw side of regenerator in one complete circuit. **Method** • circulate potassium permanganate solution on both sides of heat exchanger plates. A pinhole in plate will show dye on 2 plates - the one with the leak and the one opposite. **Procedure** • Clean up HTST in a normal manner. • Make necessary connections to circulate the back side of all non-product surfaces of plates (hot water, chill water and glycol sections). This should be accomplished with one circulation to clean all sections at one time. • fill constant level tank with water. Begin pumping water to flush back side of plates until water runs clear. • Direct flow to constant level tank to start circulation. • Clean both sides of the plates properly with a recommended procedure. Flush thoroughly with warm or hot water. • Open up the heat exchanger. Inspect each plate for proper cleaning. Plates which are not cleaned will need hand scrubbing to get clean. • if plates are clean leave plates spread apart and spaced to allow to dry. **All plates must be dry and clean before proceeding to the next step.**

	• Close up the heat exchanger. Hook-up to circulate non-product side of plates as well as raw side of the regenerator in one complete circuit. • Add water to constant level tank - do not turn on pump. • Mix in potassium permanganate dye in constant level tank using a stirring rod. (Approximately 3.5 kg per 1000 litres water). • Begin pumping potassium permanganate solution and adding water is necessary to keep constant level tank from running dry. Stop adding water when level in constant level tank is satisfied. • Add approximately 4.5 litres liquid caustic solution (or 2.5 kg caustic powder mixed in 5 litres water) to constant level tank. • Heat to 82^{o}C. Turn off the steam supply once this temperature is reached. • Circulate for 30 minutes. Do not be concerned with drop in temperature during remainder circulation period. • Pump dye solution to floor drain until constant level tank runs dry. **Do not add water.** • Shut off pump when reservoir runs dry. • Disconnect connections. Allow the heat exchanger to drain. Rinse off the floor and outside of the heat exchanger while the heat exchanger is draining. • Open up the heat exchanger and allow to drain completely. Rinse any dye solution trances from exterior of equipment, floor etc. Inspect each pair of product plates. • a hole in the heat exchanger will show potassium permanganate dye on 2 plates i.e. the one with leak and one opposite. • it will be necessary to manually dye check both plates to determine which is leaking. • After all plates have been inspected reconnect and circulate Oxalic acid at the rate of 100 mL per 45 litres of water through same circuit as the potassium permanganate dye solution to neutralize the dye. Heat to 60^{o}C. Use Oxalic acid solution from the constant level tank to clean dye from all areas where splattering has occurred. • Connect the heat exchanger up for normal product clean-up and re-clean with normal procedure.

7.4	Pressure Differential
Test 20 **Pressure Differential**	**Application** • to those pressure differential controllers having pneumatically driven pointers, used to control the operation of booster pumps on HTST pasteurizers.

Controller	on HTST pasteurizers. **Frequency** • upon installation and at least once every three (3) months thereafter. **Criteria** • to verify that the booster pump shall not operate, unless the product pressure in the pasteurized side of regenerator is at least 1 psi (7 kPa) granter than the product pressure in the raw side of the regenerator. **Apparatus** • optional - Pneumatic testing device. **Method** • the pressure differential controller is checked and adjusted to prevent operation of the booster pump, unless the product pressure in the pasteurized side of the regenerator. **Procedure A** • loosen the connections at both pressure sensors and wait for any liquid to drain through the loose connections. Observe that both pointers are within ±0,5 psi of zero pis (0 kPa). • remove both sensors from the process and mount them in a tee, either at the discharge of the booster pump, or connected to the pneumatic testing device. Note the difference between the sensor readings. The change in elevations of the sensors may have caused some change in the zero readings. • turn on the booster pump switch and depress the test push button to operate the booster pump. Observe that the difference between the sensor readings is within 1 psi (7 kPa) of that observed before pressure was applied. • turn off the booster pump switch and return the pressure sensors to their normal process locations. • manually move and hold the white pointer (raw side of the regenerator) at the normal operating pressure of the booster pump. • press the test button while manually moving the orange pointer (pasteurized side of the regenerator) upscale until the pilot light turns on, then slowly move the orange pointer downscale until pilot light turns off. • observe that the pilot light does not turn on until the orange pointer is at least 2 psi (14 kPa) higher than white pointer, and the pilot light turns off when the orange pointer is no less than two 2 psi (14 kPa) higher than the white pointer.

	• if necessary, adjust the differential setting. **NOTE:** The test may also be completed using a pneumatic testing device capable of producing differential pressures on the probes. This device should be capable of performing and be operated in a manner so as to duplicate the conditions described above. **Procedure B** • follow steps 1) and 2) in procedure A. • operate the HTST system in forward flow. • reduce the pressure in the pasteurized product regenerator section by slowly opening the back pressure control valve, or increase the raw product pressure by slowly opening the flow control valve (if present) located between the booster pump and the raw product pressure sensor. • observe that the booster pump stops and pressure differential controller pilot light goes out when the pasteurized product pressure is no less than 2 psi (14 kPa) higher than raw product pressure. The booster pump cut out point is indicated by sudden decrease in raw product pressure. **NOTE:** The 2 psi (14 kPa) differential represents the sum of the 1 psi (y kPa) differential required between raw and pasteurized product in the regenerator, plus the 1 psi (7 kPa) imprecision permitted between the two pressure sensors. Should the pasteurized milk regenerator outlet be at the bottom of the HTST, the pressure differential must be increased by the head pressure within the HTST pasteurizer. **NOTE:** This test may also be completed by using a pneumatic testing device consisting of two independently adjusted pressure connections to simulate raw and pasteurized product pressure conditions.

7.4	Pressure Differential
Test 21 **Pressure Gauges - Displays**	**Application** • pressure display of the pressure differential controller and to all pressure gauges used on the HTST pasteurizer to monitor pressure. **Frequency** • upon installation and at least once every six (6) months thereafter, and whenever the gauges are adjusted or repaired.

	Criteria • required pressure gauges and displays shall be accurate. **Apparatus** • pneumatic testing device. • pressure gauge of known accuracy. **Method** • verify the accuracy of required pressure gauges and displays with an accurate gauge. **Procedure** • pressure gauge of known accuracy is connected to one outlet of test apparatus. • Pressure gauge or display sensor being checked is connected to the second outlet of the sanitary tee. • Air is bled into system through third outlet and comparative readings are made through the normal operating range for that gauge or display. • Record the results.

7.4	Pressure Differential
Test 22 **Booster** **Pumps - Interwired with Flow Diversion Device**	**Application** • to all booster pumps used for HTST pasteurizer systems. **Frequency** • upon installation and at least once every six (6) months thereafter, and after any change in the booster pump or switch circuits. **Criteria** • the booster pump shall be wired so it cannot operate if the Flow Diversion Device is in the diverted position. **Apparatus** • pneumatic testing device.

	• sanitary pressure gauge. • suitable means of heating the water bath. **Method** • determine if the booster pump stops by dropping the temperature and causing the Flow Diversion Device to divert. **Procedure** • Connect pasteurization pressure sensor to the tee of the testing device with the other end of the tee capped. • Turn on the air supply to provide an adequate pressure differential. • Place the Safety Thermal Limit Recorder probe in the hot water bath, which is above the cut-in temperature. • Cap the Safety Thermal Limit Recorder probe and pasteurized sensor port. • Turn on the Flow Control Device. At this time, the booster pump should start to run. • Turn off the Flow Control Device. The booster pump must stop. • Ensure that the pressure differential remains adequate and Flow Diversion Device remains in forward flow position. • Record the results.

7.4	Pressure Differential
Test 23 **Booster** **Pumps – Interwired with Pressure Differential Controller**	**Application** • to all booster pumps used for HTST pasteurizer systems. **Frequency** • upon installation and at least once every six (6) months thereafter, and after any change in the booster pump or switch circuits. **Criteria** • the booster pump shall be wired so it cannot operate if the pasteurized product pressure in the regenerator does not exceed, by at least 1 psi (7KPa), the product pressure in the raw side of the regenerator.

	Apparatus • Pneumatic testing device. • Sanitary pressure gauge. • Suitable means of heating the water bath. **Method** • Determine if the booster pump stops when the pressure differential is not properly maintained in the regenerator. **Procedure** • Connect pasteurization pressure sensor to the tee of the testing device with the other end of the tee capped. • Turn on the air supply to provide an adequate pressure differential. • Place the Safety Thermal Limit Recorder probe in the hot water bath, which is above the cut-in temperature. • Cap the Safety Thermal Limit Recorder probe and pasteurized sensor port. • Turn on the Flow Control Device. At this time, the booster pump should start to run. • Decrease the air supply to the testing tee until the pressure is less than 2 psi (14 kPa) of the pressure on the raw milk pressure sensor. The booster pump must stop. • Ensure that the Flow Diversion Device remains in the forward flow position and the Flow Control Device continues to operate. • Record the results.

7.4	Pressure Differential
Test 24 **Booster Pumps – Interwired with Flow Control Device**	**Application** • To all booster pumps used for HTST pasteurizer systems. **Frequency** • upon installation and at least once every six (6) months thereafter, and after any change in the booster pump or switch circuits. **Criteria** the booster pump shall be wired so it cannot operate if the

	Flow Control Device is not in operation. **Apparatus** • Pneumatic testing device. • Sanitary pressure gauge. • Suitable means of heating the water bath. **Method** • Determine if the booster pump stops when the Flow Control Device is off. **Procedure** • Connect pasteurization pressure sensor to the tee of the testing device with the other end of the tee capped. • Turn on the air supply to provide an adequate pressure differential. • Place the Safety Thermal Limit Recorder probe in the hot water bath, which is above the cut-in temperature. • Cap the Safety Thermal Limit Recorder probe and pasteurized sensor port. • Turn on the Flow Control Device. At this time, the booster pump should start to run. • Turn off the Flow Control Device. The booster pump must stop. • Ensure that the pressure differential remains adequate and the Flow Diversion Device remains in forward flow position. • Record the results.

7.5	Meter Based Timing Systems
Test 25 **High Flow Alarm**	**Application** • to all HTST pasteurizers using a Magnetic Flow Meter System to replace a positive displacement Flow Control Device. **Frequency** • Upon installation and at least once every six (6) months thereafter. • Whenever seal on the flow alarm is broken. • whenever any alteration is made affecting the holding time, the velocity of the flow or the capacity of the holding tube.

	• Whenever a check of the capacity indicates a speed-up. **Criteria** • when flow rate equals or exceeds the value at which the holding time was measured, the Flow Diversion Device shall assume the diverted position, even though temperature of the milk in the holding tube is above pasteurization temperature. **Apparatus** • None. **Method** • adjust the set point of the flow alarm so that the flow is diverted when the flow rate equals or exceeds the value at which holding time was measured. **Procedure** • Operate pasteurizer in forward flow, at the flow rate at which holding time was measured, using water above pasteurization temperature. • Adjust set point on the alarm slowly downward until the frequency pen on the Flow Recorder indicates that an alarm condition has occurred. • Observe that the Flow Diversion Device moved to the diverted position while water passing through the system remained above pasteurization temperature. Verify that the frequency pen on the Flow Recorder records the duration of the high flow condition. • Record the set point of the flow alarm, the occurrence of flow diversion, and the temperature of water in the holding tube.

7.5	Meter Based Timing Systems
Test 26 **Loss of Signal Alarm**	**Application** • to all HTST pasteurizers using a Magnetic Flow Meter System to replace a positive displacement Flow Control Device. **Frequency** • Upon installation and at least once every 6 months thereafter.

	• Whenever seal on the Flow Alarm is broken. • Whenever alteration is made affecting the holding time, the velocity of the flow or the capacity of the holding tube. • Whenever a check of the system indicated a speed-up. **Criteria** • forward flow occurs only wen flow rates are below the Flow Alarm set point and above the Loss of Signal Alarm set point. **Apparatus** • None. **Method** • by observing the actions of the frequency pen on the Flow Recorder and position of the Flow diversion Device. **Procedure** • Operate the pasteurizer with the Flow Diversion Device in the forward flow position, at a flow rate below the Flow Alarm set point and above Loss of Signal Alarm set point, using water. • Disrupt power to the magnetic flow meter or decrease the flow through the flow meter below the Low Flow Alarm set point. • Observe that the frequency pen of the Flow Recorder records an alarm condition for the duration of the loss of signal or low flow condition, and that the Flow Diversion Device moves to the diverted flow position for the duration of this condition. • Record the results.

7.5	Meter Based Timing Systems
Test 27 **Flow Cut-in and Cut-out**	**Application** • to all HTST pasteurizers using a Magnetic Flow Meter System to replace a positive displacement Flow Control Device. **Frequency** • Upon installation and at least once every 6 months thereafter. • Whenever seal on the flow alarm is broken. • whenever any alteration is made affecting the holding time, the velocity of the flow or the capacity of the holding tube.

	• Whenever a check of the capacity indicates a speed-up. **Criteria** • forward flow occurs only when flow rates are below the Flow Alarm set point and above the Loss of Signal Alarm set point. **Apparatus** • None. **Method** • by observing the Recorder readings along the action of the frequency pen on the Flow Recorder. **Procedure** • Operate pasteurizer in forward flow, at a flow rate below the Flow Alarm set point and above Loss of Signal Alarm set point, using water above pasteurization temperature. • Using the Flow Controller, increase flow rate slowly until the frequency pen on the Flow Recorder indicates an alarm condition (flow cut-out point). The Flow Diversion Device will also assume the diverted position. • Observe the reading of flow rate from the Recorder, the instant flow cut-out occurs, as indicated by the frequency pen of the Flow Recorder. • With the pasteurizer operating on water above the pasteurization temperature, with the Flow Diversion Device diverted because of excessive flow rate, slowly decrease flow rate until the frequency pen on the Flow Recorder indicates the start of a forward flow movement (flow cut-in point). Because of the time delay relay described in Test 28, the Flow Diversion Device will not move immediately to the forward flow position. • Observe the reading from the Recorder, the instant flow cut-in occurs, as indicated by the frequency pen of the Flow Recorder. • Record the results.

7.5	Meter Based Timing Systems
Test 28 **Time Delay Relay (Flow Recorder)**	**Application** • to HTST pasteurizers using Magnetic Flow Meter System to replace a positive displacement Flow Control Device. **Frequency** • Upon installation and at least once every six (6) months thereafter. • Whenever seal on the flow alarm is broken. • Whenever any alteration is made affecting the holding time, the velocity of the flow or the capacity of the holding tube. • Whenever a check of the capacity indicates a speed-up. **Criteria** • following a flow cut-in, as described in the test for flow cut-in and cut-out, forward flow shall not occur until all the product in the holding tube has been held at or above pasteurization temperature for a least the minimum holding time. **Apparatus** • Stopwatch. **Method** • Set time delay equal to or granter than the minimum holding time. **Procedure** • Operate pasteurizer in forward flow, at a flow rate below the Flow Alarm set point and above the Loss of Signal Alarm set point, using water above pasteurization temperature. • Using the Flow Controller, increase flow rate slowly until the frequency pen on the Flow Recorder indicates an alarm condition, and the Flow Diversion Device moves to the diverted position. There shall be no time delay between the movements of the frequency pen and the Flow Diversion Device. • With the pasteurizer operating on water above the pasteurization temperature, with the Flow Diversion Device diverted because of excessive flow rate, slowly decrease flow rate. • Start the stopwatch the instant the frequency pen on the Flow Recorder indicates the end of the alarm condition. Stop the stopwatch the instant the Flow Diversion Device starts

	to move to the forward flow position. • Record the results.

7.6 - Appendices to Equipment Test Methods

APPENDIX 1: TESTING APPARATUS SPECIFICATIONS

1. TEST THERMOMETER

Type: Mercury-actuated; readily cleanable; plain front enamelled back; length 305 millimetres (12 inches); immersion point to be etched on stem; mercury to stand in contraction chamber of $0^{o}C$ ($32^{o}F$).

Scale Range: At least $7^{o}C$ ($12^{o}F$) below and $7^{o}C$ ($12^{o}F$) above the pasteurization temperature at which the operating thermometer is used, with extensions of scale on either side permitted; protected against damage at $149^{o}C$ ($300^{o}F$).

Temperature Represented by Smallest Scale Division: $0.1^{o}C$ ($0.2^{o}F$).

Number of degrees per 25 Millimetres (inch of Scale: Not more than 4 Celsius degrees or not more than 6 Fahrenheit degrees.

Accuracy: Within $0.1^{o}C$ ($0.2^{o}F$), plus or minus, through specified scale range. The accuracy shall be checked against a thermometer which has been tested by the National Bureau of Standards.

Bulb: Corning normal or equally suitable thermometric glass.

Case: Suitable to provide protection during transit and periods when not in use.

2. GENERAL PURPOSE THERMOMETER

Type: Pocket type; mercury-actuated.

Magnification of Mercury Column: To apparent width of not less than 1.6 millimetre (0.0625 of an inch).

Scale Range: $1^{o}C$ ($30^{o}F$) to $100^{o}C$ ($212^{o}F$), with extension on either side permitted. Protected against damage at $105^{o}C$ ($220^{o}F$).

Temperature Represented by Smallest Scale Division: $1^{o}C$ ($2^{o}F$).

Number of Degrees per inch of Scale: Not more than 29 Celsius degrees or not more than 52 Fahrenheit degrees.

Accuracy: Within $1^{o}C$ ($2^{o}F$), plus or minus, through the specified scale range.

Case: Metal, provided with a fountain pen clip.

Bulb: Corning normal or equally suitable thermometric glass.

3. ELECTRICAL CONDUCTIVITY MEASURING DEVICES

Type: Wheatstone bridge, Galvanometer, Milliammetre, manual or automatic.

Conductivity: Capable of detecting change produced by the addition of 10 ppm of sodium chloride, in water of 100 ppm of hardness.

Electrodes: Standard.

Automatic Instruments: Electric clock, time divisions not less than 0.2 of a second.

4. STOPWATCH

Type: Open face, indicating fractional seconds.

Accuracy: Accurate to 0.2 of a second.

Hands: Sweep hand (if applicable), one complete turn every 60 seconds or less.

Scale: Divisions of not over 0.2 of a second.

Crown: Depression of crown or push button starts, stops and resets to zero.

8.1	Application and Rationale
Introduction	Compositional Standands should: • **harmonize nomenclature** and composition standards for milk and milk products of both provincial and federal standards and regulations where both exist. • ensure that all milk and milk products are **treated fairly**, regardless of final destination in Canada and regardless of which province or territory of Canada the milk and milk products originated. • **reduce inspection requirements** as all milk and milk products will meet the same criteria for production and sale. • establish simple and **clear definitions** of milk and milk products which are defensible • allow for **improved market access** within Canada. • **protect** milk and milk products from product misrepresentation and **economic fraud**. • be **consistent across product categories** as much as possible to avoid consumer confusion.

8.2	General Labelling Requirements
Scope	in this Part, the following are included - common name, composition, permitted ingredients and additives, labelling requirements and suggested sizes.
Composition	These requirements apply to all sections for products. Additional requirements are listed under each section. • notwithstanding the requirements for fat, and solids, dairy products may contain less than the minimum milk fat as described in the product name when it contains descriptive terminology that meets the requirements of the Food and Drugs Act and Regulations with respect to claims and statements; and the Guide for Food Manufacturers and Advertisers (1988) as amended from time to time, published by the Department of Consumer and Corporate Affairs, with respect to the use of the terms permitted in the Guide including light and lite, reduced fat, low fat, fat free and calorie reduced. • shall be made from milk which has been pasteurized or

	been approved by the regulatory agency.
Permitted Ingredients and **Additives**	These requirements apply to all sections for products. Additional requirements are listed under each section. • permitted additives listed as per Division 16, B.16.000, Tables I to XV of the Food and Drugs Act and Regulations. These requirements apply to all sections for products. Additional requirements are listed under each section. • name of the product; • name and address of the manufacturer; or • name and address of the person for whom the product was manufactured as well as the factory's identification number as accepted by the regulatory authority or the registration number of the plant; • percentage declaration of fat followed by the expression milk fat or abbreviation M.F. on all products except butter and ice cream; • the percentage fat shall be shown on the main panel, whenever "light or lite", "reduced fat", "low fat" and "fat free" are used for all dairy products; • the volume/weight of the product in litres or millilitres or grams and kilograms; • labelling of all ingredients in descending order of percentage used; • method of storing the product - keeping instructions; • lot number if the "best before date" or expiry date as prescribed by B.01.007 of the Food and Drug Act and Regulations is not indicated on the container; • source of milk, if other than cows milk.

8.3.1	Compositional Standards for Ice Cream Mix
Common **Name -** **Ice Cream Mix**	**Composition** • shall be the unfrozen food composed of milk, cream or other "dairy product", singularly or in combination, sweetened with permitted sweetening agents; and • shall contain a minimum of 36% solids by weight and 10% milk fat by weight in plain flavours and a minimum of 36% solids by weight and 8% milk fat in the case of mix with added cocoa and syrups shall in the case of fat-reduced products contain a minimum of

	33% solids by weight. **Permitted Ingredients and Additives** may contain: • egg • a flavouring preparation • cocoa or chocolate syrup • permitted food additives • salt • fruit juice • up to 1% added edible casein or edible caseinates. **Labelling** • name of the product - Ice Cream Mix • the volume of the product in litres or millilitres. **Suggested Sizes** • any metric unit.

8.3.2	Compositional Standards for Ice Cream
Common Name - Ice Cream	**Composition** • shall be the frozen food obtained by the freezing of ice cream mix, with or without the incorporation of air. • shall contain a minimum of 36% total solids by weight with a minimum of 180 g/Litre of which 50 g/L is solids from Milk Fat and shall have a minimum Milk Fat of 10% by weight • in the case of Ice cream with Cocoa, chocolate syrup, fruit, nuts and/or confections, the ice cream shall contain a minimum of 36% total solids by weight with a minimum of 180 g/Litre of which 40 g/L is solids from Milk Fat and shall have a minimum Milk Fat of 8% by weight. • shall in the case of fat reduced product contain a minimum of 33% solids by weight. **Permitted Ingredients and Additives** may contain: • cocoa or chocolate syrup • fruit, nuts and confections

	• fruit juice. **Labelling** • name of the product - Ice Cream • the volume of the product in litres or millilitres. **Suggested Sizes** • 200 mL or less (any metric size in whole numbers) • 225 mL, 250 mL, 500 mL, • 1L, 2L, 4L and any size of metric in bulk containers • two or more single portions each containing 200 mL or less may be packed together in any metric container if the number and size of the single portions are declared on the container.

8.3.3	Compositional Standards for Sherbet
Common Name - Sherbet	**Composition** shall contain: • not more than 5% milk solids, including milk fat, and • not less than 0.35% acid determined by titration and expressed as lactic acid. **Permitted Ingredients and Additives** may contain: • water • permitted sweetening agents • fruits or fruit juice • up to one percent added edible casein or edible caseinates. **Labelling** • name of the product - Sherbet • the volume of the product in litres or millilitres. **Suggested Sizes** • 200 mL or less (any metric size in whole numbers) • 225 mL • 250 mL

	• 500 mL • 1L • 2L • 4L and any size of metric in bulk containers • two or more single portions each containing 200 mL or less may be packed together in any metric container if the number and size of the single portions are declared on the container.

8.3.4	Compositional Standards for Sherbet
Common Name - Milk Shake Mix	**Composition** • shall be the unfrozen, pasteurized combination of milk, cream or other dairy products. • shall contain: o not less than 23% total solids o not less than 3% milk fat M.F. **Permitted Ingredients and Additives** may contain: • egg • sweetening agents • flavouring agents • cocoa or chocolate syrup • permitted food additives • up to 1% added edible casein or edible caseinates. **Labelling** • name of the product - Mik Shake Mix **Suggested Sizes** • any metric unit

8.4.1	Compositional Standards for Cream and Whipping Cream
Common Name - **Cream and Whipping Cream**	**Composition** • is the fatty liquid prepared from milk by separating the milk constituents in such a manner to increase the milk fat content • cream shall contain a minimum of 10% milk fat • whipping cream shall contain a minimum of 32% milk fat **Permitted Ingredients and Additives** may contain: • a pH adjusting agent • a stabilizing agent • in the case of whipping cream which has been heat treated (Thermized) to a temperature greater than 100 degrees C, the following ingredients and food permitted ingredients: o skim milk powder in an amount not exceeding 0.25% o glucose solids in an amount not exceeding 0.1% o calcium sulphate in an amount not exceeding 0.005% o xantham gum in an amount not exceeding 0.02% o microcrystalline cellulose in an amount not exceeding 0.2%. **Labelling** • name of the product - Cream or Whipping Cream • other modifiers such as table cream, coffee cream, half and half may be optional qualifiers. • the expression UHT shall be used when the product has been submitted to an ultra high temperature process. **Suggested Sizes** • 15 mL, 125 mL, • 170 mL (sterilized creams) • 250 mL, 500 mL, • 1 L, 2 L, 4 L and any size greater than 4 litres in multiples of 1 L.

8.4.2	Compositional Standards for Egg Nog
Common Name - Egg Nog	Composition • shall be the milk product which contains: • eggs • milk • cream • shall contain not less than 3.25% Milk Fat • shall contain not less than 23% total milk solids. Permitted Ingredients and Additives may contain: • sweetener • milk products • flavour • food colour • stabilizing agents which do not exceed 0.5% by weight. Labelling • name of the product - Egg Nog • the volume of the product in litres or millilitres. Suggested Sizes • 200 mL • 250 mL • 375 mL • 500 mL, • 1 L • 2 L • 4 L and any size greater than 4 litres in multiples of 1 L.

8.4.3	Compositional Standards for Milk
Common Name - Milk	**Composition** • shall be the liquid secreted by the mammary gland of a mammal • shall contain not less than 3.25% milk fat • shall contain not less than 8.25% solids non-fat from milk • shall contain not less than 10% solids non fat milk solids when added milk solids are claimed • shall contain added Vitamin D to a level to provide a reasonable daily intake of at least 300 International Units and not more than 400 International Units in milks • shall in the case of milks below 3.25% milk fat have added Vitamin A in such an amount that a reasonable daily intake contains not less than 1200 International Units and not more than 2500 International Units of Vitamin A • may be skimmed to meet the qualifiers used • shall not have any added water to the milk. **Permitted Ingredients and Additives** • milk (fortified or not) and (naming the flavour) milk may be treated with lactase and may contain lactic bacteria Lactobacillus acidophilus or Bifidobacterium bifidum, Bifidobacterium longum, Bifidobacterium infantis, and Bifidobacterium breve • fortified (added solids) partially skimmed milk may contain powdered milks, evaporated milks or mixture of these products. • in the case of (naming the flavour) milk may contain: o salt o a stabilizing agent and no more that 0.5% starch o food colour o flavouring preparation o sweetening agent. **Labelling** • name of the product - Milk • other terms such as partially skimmed and skimmed may also be used • milk with added solids may be called "Milk with added solids" or "Milk Plus" or "Milk Extra" or similar terms if a description on the package explains the term • shall contain source of the milk if not from the genus bos (Cow) next to the term milk • (Naming the flavour) Milk in the case of a flavour having been added • in the case of lactase treated milk the following descriptors may

	and the level of lactose reduction below the claim • the expression UHT Milk shall be used when the product has been subjected to the ultra high temperature process • added vitamin declaration • in the case of goat's milk, a declaration of the percentage of fat may be replaced by an indication of the minimum and maximum milk fat content. Suggested Sizes • 125 mL • 150 mL • 200 mL • 250 mL • 375 mL • 500 mL • 1 L • 2L, 4 L, and any size greater than 4 litres in multiples of 1 L.

8.4.4	Compositional Standards for Dairy Beverage
Common Name - Dairy Beverage	**Composition** • shall contain at least 51% milk product by volume **Permitted Ingredients and Additives** may contain: • fruits • vegetables or nuts • fruit pulp • vegetable pulp • fruit or vegetable juice • carbon dioxide • bacterial cultures • salt • pH adjusting agents • stabilizers • sweeteners • flavour and • lactase. **Labelling** • name of the product - Dairy beverage

	• (Naming the flavour) Dairy Beverage in the case of a flavour having been added • in the case of lactase treated milk the following descriptors may be used where applicable - "lactose reduced", "low in lactose" and the level of lactose reduction below the claim • added vitamin declaration • the volume of the product in litres or millilitres. **Suggested Sizes** • 125 mL • 150 mL • 200 mL • 250 mL • 375 mL • 500 mL • 1 L • 2L • 4 L, and any size greater than 4 litres in multiples of 1 L

8.4.5	Compositional Standards for Skim Milk Powder
Common Name - **Skim Milk Powder or (%Milk Powder)**	**Composition** shall contain: • maximum milk fat 1.2% - Canada 1, 1.29% - Canada 2 • maximum moisture 4.0% - Canada 1, 5.0% - Canada 2 • Titrable Acidity (min) 0.11% - Canada 1, 0.11% - Canada 2 • Titrable Acidity (max) 0.15% - Canada 1,> 0.15% - Canada 2 **Permitted Ingredients and Additives** **Labelling** • name of the product - Skim Milk Powder • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg • 2.5 kg • and any size in multiples of 1 kilogram.

8.4.6	Compositional Standards for Partly Skimmed Milk Powder
Common Name - Partly Skimmed Milk Powder or (% Milk Powder)	**Composition** shall contain: • minimum milk fat 1.3% - Canada 1, 1.3% - Canada 2 • maximum milk fat 25.9% - Canada 1, 25.9% - Canada 2 • maximum moisture 4.0% - Canada 1, 5.0% - Canada 2 • Titrable Acidity (min) 0.11% - Canada 1, 0.11% - Canada 2 • Titrable Acidity(max) 0.15% - Canada 1,> 0.15% - Canada 2 **Permitted Ingredients and Additives** **Labelling** • Name of the product - Partly Skimmed Milk Powder • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg • 2.5 kg • and any size in multiples of kilogram.

8.4.7	Compositional Standards for Whole Milk Powder
Common Name - **Whole Milk Powder or (% Milk Powder)**	**Composition** shall contain: • minimum milk fat 26.0% - Canada 1, 26.0% - Canada 2 • maximum moisture 2.5% - Canada 1, 5.0% - Canada 2 • maximum moisture 3.5% by instantizing process - Canada 1 • Titrable Acidity (min) 0.11% - Canada 1, 0.11% - Canada 2 • Titrable Acidity (max) 0.15% - Canada 1,> 0.15% - Canada 2 **Permitted Ingredients and Additives** **Labelling** • name of the product - Whole Milk Powder • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg • 2.5 kg • and any size in multiples of 1 kilograms.

8.4.8	Compositional Standards for Buttermilk Powder
Common Name - Buttermilk Powder	**Composition** shall contain: • minimum milk fat 2.0% - Canada 1, <2.0% - Canada 2 • maximum milk fat 12.0% - Canada 1, 12.0% - Canada 2 • maximum moisture 4.0% - Canada 1, 5.0% - Canada 2 • Titrable Acidity (min) 0.08% - Canada 1, 0.08% - Canada 2 • Titrable Acidity (max) 0.18% - Canada 1, > 0.18% - Canada 2 **Permitted Ingredients and Additives** **Labelling** • name of the product - Buttermilk Powder • the weight (mass) of the product in grams or kilograms;. **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg • 2.5 kg • and any size in multiples of 1 kilogram**.**

8.4.9	Compositional Standards for Whey Powder
Common Name - Whey Powder	**Composition** shall contain: • minimum milk fat 1.2% - Canada 1, >1.2% - Canada 2 • maximum moisture 4.5% - Canada 1, 5.0% - Canada 2 • Titrable Acidity (min) 0.11% - Canada 1, 0.11% - Canada 2

	2 **Permitted Ingredients and Additives** **Labelling** • name of the product - Whey Powder • the weight (mass) of the product in grams or kilograms; **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg • 2.5 kg • and any size in multiples of 1 kilogram**.**

8.4.10	Compositional Standards for Acid-Type Whey Powder
Common Name - Acid-Type Whey Powder	**Composition** shall contain: • minimum milk fat 1.2% - Canada 1, >1.2% - Canada 2 • maximum moisture 4.5% - Canada 1, 5.0% - Canada 2 • Titrable Acidity (min) 0.30% - Canada 1, 0.30% - Canada 2 **Permitted Ingredients and Additives** **Labelling** • name of the product - Acid-Type Whey Powder • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg

	• 2.5 kg • and any size in multiples of 1 kilogram**.**

8.4.11	Compositional Standards for Blended Skim Milk and Whey Powder
Common Name - **Blended Skim Milk and Whey Powder** **Or** **Blended Whey and Skim Milk Powder**	**Composition** Shall contain: • minimum milk fat 1.2% - Canada 1, >1.2% - Canada 2 • maximum moisture 4.5% - Canada 1, 5.0% - Canada 2 • Titrable Acidity (min) 0.30% - Canada 1, 0.30% - Canada 2 **Permitted Ingredients and Additives** **Labelling** • name of the product - Blended Skim Milk and Whey Powder or • Blended Whey and Skim Milk Powder • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg • 2.5 kg • and any size in multiples of 1 kilogram**.**

8.4.12	Compositional Standards for Edible Casein/Caseinates
Common Name - Edible Casein/ Caseinates	**Composition** shall contain: • minimum milk fat 1.5% - Canada 1, >1.5% - Canada 2 • maximum moisture 10.0% - Canada 1, >10.0% - Canada 2 • Titrable Acidity (min) 0.20% - Canada 1, >0.20% - Canada 2 **Permitted Ingredients and Additives** **Labelling** • name of the product - Edible Casein, Edible Caseinates • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • 100 g • 250 g • 500 g • 1 kg • 1.5 kg • 2.5 kg • and any size in multiples of 1 kilogram**.**

8.4.13	Compositional Standards for Evaporated Milk
Common Name - Evaporated Milk	**Composition** • shall be milk from which not less than 50% of the water has been evaporated • shall contain not less than: o 25.0 % milk solids, and o 7.5 % milk fat • shall, if containing 7.5% milk fat or more, notwithstanding sections D.01.011 contain added vitamin C in such an amount that a reasonable daily intake of milk contains not less than 60 milligrams and not more than 75 milligrams of Vitamin

	• shall if containing less than 7.5% milkfat, notwithstanding sections D.01.010 contain added Vitamin A in such an amount that a reasonable daily intake of the milk contains not less than 1200 International Units and not more than 2500 International Units of Vitamin A • shall contain Vitamin D in such an amount that a recommended daily intake of the evaporated milk contains not less than 300 International Units and not more than 400 International Units of Vitamin D. **Permitted Ingredients and Additives** • may contain: • disodium phosphate or sodium citrate, or both • an emulsifying agent. **Labelling** • name of the product - Evaporated Milk • the date of manufacture. **Suggested Sizes** • 160 mL • 385 mL • 1 litre

8.4.14	Compositional Standards for Sweetened Condensed Milk

Common Name - Sweetened Condensed Milk	**Composition**
	
	• shall be milk from which water has been removed
	• shall contain not less than:
	  o 28% milk solids, and
	  o 8 % milk fat
	
	Permitted Ingredients and Additives
	
	may contain:
	
	• permitted sweetening agents
	• vitamin D in such an amount that a recommended daily intake of the evaporated milk contains not less than 300 International Units and not more than 400 International Units of Vitamin D.

	Labelling • name of the product - Sweetened Condensed Milk • the volume of the product in millilitres or litres • the date of manufacture. **Suggested Sizes** • 250 mL • 300 mL

8.5.1	Compositional Standards for Yogourt
Common Name - Yogourt	**Composition** • · shall be the product obtained by lactic acid fermentation through the protosymbiotic mixture action of Streptococcus thermophilus and Lactobacillus delbruekii subsp. bulgaricus from dairy products to which may have been added optional Permitted Ingredients listed below. • · the micro-organisms shall be viable, active and abundant in the finished product at the time of sale for consumption except in the case of heated treated or frozen yogourt • · acidity not lower than 0.70% per weight expressed as lactic acid from the activity of the micro-organisms. Minimum counts of characteristic micro-organisms (determined according to IDF Standard 117A:1988) 10^7 cfu/g at the time of sale. • · at least 9.5% milk solids non fat or at least 8.2% milk solids non fat in the case of yogourt with added fruit • · at least 6.5% milk solids non fat in the case of yogourt drinks • · at least 2.8% milk proteins in the final product or 2.2% milk proteins in the case of yogourt drinks. **Permitted Ingredients and Additives** may contain: • milk products and milk solids • other non harmful bacteria such as *Lactobacillus acidophilus* or *Bifodbacterium bifidum, Bifidobacterium longum, Bifidobacterium infantis* and *Bifidobacterium breve* bacteria • fruits, juice or fruit extracts, jams, cereal or any other flavour.

	or jam, a preservative in a quantity not exceeding 50 parts per million. • sweeteners • stabilizing agents, gellifying agents, thickeners or emulsifiers in a quantity not exceeding 2.0% • citric acid • food colour. **Labelling** • name of the product - **Yogourt. Yogourt Drink (Drinkable Yogourt), Frozen Yogourt** and **Sterilized Yogourt** may be used if the yogourt used has first met the definition for yogourt and the other criteria in this code have been followed for composition and labelling. The spelling for yogourt is recommended for both official languages. Other spellings such as yaourt, yogurt, yoghourt, yoghurt, and yahourth are included in these standards. • yogourt which after fermentation, has been pasteurized or sterilized, shall bear in indelible print, large and uniform, having at least half the size of the largest print on the container, the expression "pasteurized after fermentation" or as the case may be "sterilized after fermentation" placed immediately after the name of the product • when natural is used along with yogourt, no artificial flavourings, preservatives or synthetic colours shall be present either in the natural yogourt or ingredients of fruit or flavouring of the (naming the flavour) yogourt • the weight and/or volume of the product in litres or millilitres. **Suggested Sizes** **Non Frozen Yogourt**: • 75 g, 100 g, 125 g, 175 g, 250 g, 500 g, 750 g and any size in multiples of 500 g **Frozen Yogourt**: • 200 mL and less in any size of metric whole numbers • 250 mL, 500 mL, 1 L, 2L, 4L and any size of metric unit in bulk containers **Yogourt Drinks**: • 200 mL, 250 mL, 500 mL and any multiple of 500 mL.

8.5.2	Compositional Standards for Buttermilk
Common Name - **Buttermilk**	**Composition** • shall be the product obtained by the fermentation of milk and the addition of bacterial culture • shall contain not less than 3.25% milk fat • shall contain not less than 8.25% milk solids non fat • shall contain 0.7% lactic acid. **Permitted Ingredients and Additives** may contain: • salt • stabilizing agents. **Labelling** • name of the product - Buttermilk • the volume of the product in litres or millilitres. **Suggested Sizes** • 200 mL • 250 mL • 375 mL • 500 mL • 1 L • 2 L • 4 L and any size in multiples of 1 litre.

8.5.3	Compositional Standards for Sour Cream and/or Cultured Cream
Common Name - **Sour Cream and/or Cultured Cream**	**Composition** • sour cream shall be a cream fermented by the addition of bacterial cultures and must contain a minimum of 14% milk fat and 0.2% lactic acid • cultured cream shall be cream, fermented by the addition of a bacterial culture, which shall contain not less than 10% of fat and 0.2% of lactic acid. **Permitted Ingredients and Additives**

	may contain: • milk products and milk solids • buttermilk • starch in a quantity not exceeding 1% • salt • rennet • sodium citrate in a quantity not exceeding 0.1% • enzymes as permitted in the Food and Drug Act and Regulations. **Labelling** • name of the product - Sour Cream and/or Cultured Cream • the volume of the product in litres or millilitres. **Suggested Sizes** • 125 mL • 250 mL • 500 mL • 1 litre and any size in multiples of 1 litre.

8.5.4	Compositional Standards for Cottage Cheese
Common Name - Cottage Cheese	**Composition** • shall be the product, in the form of discreet curd particles, prepared from pasteurized or an acceptable alternate process which has been approved by the regulatory agency of skim, evaporated or powdered milk which meets the fat free requirement, and harmless acid-producing bacterial culture • shall contain no more than 80% moisture • shall in the case of creamed cottage cheese have not less than 4% fat. **Permitted Ingredients and Additives** may contain: • milk products • rennet • enzymes as permitted by Food and Drugs/GMP • Chymosin A & B per Good Manufacturing practices • salt, calcium chloride

	• lactose • pH adjusting agent • relish, fruits, vegetables • not more than 0.5% stabilizing agents. **Labelling** • · name of the product - Cottage Cheese or Creamed Cottage Cheese • · the mass of the product in grams or kilograms. **Suggested Sizes** • 125 g • 175 g • 250 g • 375 g • 500 g • 750 g, and multiples of 500 grams**.**

8.5.5	Compositional Standards for Cultured Milk
Common Name - Cultured Milk	**Composition** • shall be milk, fermented by the addition of a bacterial culture, which shall contain not less than 8.25% non fat solids and 0.7% of lactic acid. **Permitted Ingredients and Additives** **Labelling** • name of the product - Cultured Milk • the volume of the product in millilitres or litres. **Suggested Sizes** • 15 mL • 125 mL • 200 mL • 250 mL • 500 mL • 1, 2, 4, 10, 20 litres**.**

8.6.1	Compositional Standards for Butter
Common Name - Butter	**Composition** • shall be made from a minimum of 80% milk fat by mass (weight) • in the case of flavoured butters, may contain less than 80% if the percentage of milk is reduced by the amount of the product added, but in no case shall the resultant milk fat content be less than 75%. **Permitted Ingredients and Additives** may contain: • milk solids • permitted bacterial culture • salt • air or inert gas • permitted food colour • up to 1% added edible casein and caseinates in the case of lower fat versions of butter. **Labelling** • name of the product - Butter • butter shall be designated Cultured Butter if a bacterial culture is added • butter shall be designated (naming the flavour) Butter if flavour, seasoning fruit, vegetable or relish has been added • shall be designated Whipped Butter if air or inert gas has been added. **Suggested Sizes** • 20 g or less (any metric size in whole numbers) • 125 g • 250 g • 454 g • 500 g • 1 kg and any multiple of 1 kg.

8.6.2	Compositional Standards for Whey Butter
Common Name - Whey Butter	**Composition** • shall be made from a minimum of 80% milk fat by weight recovered from whey. **Permitted Ingredients and Additives** may contain: • milk solids • permitted bacterial culture • salt • air or inert gas • permitted food colour • up to 1% added edible casein or edible caseinates in the case of reduced fat versions. **Labelling** • name of the product - Whey Butter • whey butter shall be designated cultured if a bacterial culture and flavour, seasoning, fruit, vegetable or relish if they have been added • shall be designated "whipped" if air or inert gas has been added • the mass of the product in grams or kilograms. **Suggested Sizes** • 20 g or less (any metric size in whole numbers) • 125 g, 250 g, 454 g ,500 g, • 1 kg and any multiple of 1 kg**.**

8.6.3	Compositional Standards for Butteroil (Clarified) Butter, Anhydrous Butter Oil, Ghee
Common Name - Butteroil (Clarified Butter), Anhydrous Butter Oil, Ghee	**Composition** • shall be the product prepared from butter or cream and resulting from the removal of most of the water and solids non-fat content • shall in the case of butter oil and ghee, contain not less than 99.3 % milk fat and not more than 0.5% water • shall in the case of anhydrous butter oil, contain not less than 99.8% milk fat and not more than 0.1% water. **Permitted Ingredients and Additives** **Labelling** • name of the product - Butter Oil, Anhydrous Butter Oil, Ghee • the mass of the product in grams or kilograms. **Suggested Sizes** • 20 g or less (any metric size in whole numbers) • 125 g • 250 g • 454 g • 500 g • 1 kg and any multiple of 1 kg.

8.7.1	Compositional Standards for Cheese
Common Name - Cheese	**Composition** • may only be used in combination with other words to describe a product or its common name when it contains cheese for which the standard for cheese has been met. This applies to both standardized and unstandardized products • shall be the fresh or matured solid or semi-solid dairy product obtained: 1. by coagulating milk or milk products or any combination of these materials, through the action of

	partially draining the whey resulting from such coagulation; or 2. by processing techniques involving coagulation of milk and/or materials obtained from milk which give an end-product which has the same essential physical, chemical and organoleptic characteristics as the product defined under (1). • shall in the case of a cheese variety named in Table 2 (Part I and Part II) to this section, contain no more than the maximum percentage of moisture in Column II thereof for that cheese • shall in the case of a cheese variety named in Table 2 (Part I) to this section, contain not less than the minimum percentage of milk fat shown in Column III for that variety • shall in the case of a variety named in Table 2 (Part II) to this section, shall contain no more than the maximum percentage of milk fat shown in Column III for that variety. **Permitted Ingredients and Additives** may contain: • salt • bacterial cultures to aid in the further ripening • permitted firming agents • permitted preservatives • permitted food colour. **Labelling** • name of the product - (Naming the Variety) Cheese and Cheese • the weight (mass) of the product in grams or kilograms; • prepackaged varietal cheese other than cottage cheese and those shown in the Table 2 shall use terminology to describe the cheese firmness and ripening characteristics, as shown in Table 1, on the principle Display Panel of the package. **Suggested Sizes** • any metric size**.**

TABLE 1

Descriptor	Requirement
Firmness	
Soft White Cheese	having a moisture on fat-free basis content of 80% or more
Soft Cheese	having a moisture on fat-free basis content of 67% and less than 80%
Semi-Soft Cheese	having a moisture on fat-free basis content of 62% and not more than 67%
Firm Cheese	having a moisture on fat-free basis content of 50% or more and not more than 62%
Hard Cheese	having a moisture on fat-free basis of less than 50%
Ripening	
Ripened	where the cheese ripening process develops within the whole body of the cheese
Surface Ripened	where the ripening process starts from surface and moves into the body of the cheese
Blue Veined	where veins of mould occur within the body of the cheese
Unripened or fresh	where the cheese has not undergone any ripening

TABLE 2 PART I

Item	Variety of Cheese	Column II Maximum % of moisture	Column III Minimum % of milk fat
1	Asiago	40.0	30.0
2	Baby Edam	47.0	21.0
3	Baby Gouda	45.0	26.0
4	Blue	47.0	27.0
5	Butter (Butterkase)	46.0	27.0
6	Bra	36.0	26.0
7	Brick	42.0	29.0
8	Brie	54.0	23.0
9	Caciocavallo	45.0	24.0
10	Camembert (Carre de l'est)	56.0	22.0
11	*Cheddar*	*39.0*	*31.0*
12	Colby	42.0	29.0
13	Danbo	46.0	25.0
14	Edam	46.0	22.0
15	Elbo	46.0	25.0
16	Emmentaler (Emmental, Swiss)	40.0	27.0
17	Esrom	50.0	23.0
18	Farmer's	44.0	27.0
19	Feta	55.0	22.0
20	Fontina	46.0	27.0

21	Fynbo	46.0	25.0
22	Gouda	43.0	28.0
23	Gournay	55.0	33.0
24	Gruyere	38.0	28.0
25	Havarti	50.0	23.0
26	Jack	50.0	25.0
27	Kassert	44.0	27.0
28	Limburger	50.0	25.0
29	Maribo	43.0	26.0
30	Montasio	40.0	28.0
31	Monterey (Monterey Jack)	44.0	28.0
32	Mozzarella (Scamorza)	52.0	20.0
33	Skim Mozzarella	52.0	15.0
33	Muenster (Munster)	50.0	25.0
34	Neufchatel	60.0	20.0
35	Parmesan	32.0	22.0
36	Pizza	48.0	20.0
37	Provolone	45.0	24.0
38	Romano (Sardo)	34.0	25.0
39	St. Jorge	40.0	27.0
40	Saint- Paulin	50.0	25.0
41	Samsoe	44.0	26.0
42	Tilsiter (Tilsit)	45.0	25.0
43	Tybo	46.0	25.0

TABLE 2 PART II

Item	Variety of Cheese	Column II Maximum % of moisture	Column III Maximum % of milk fat
1	Harzkase (Harzer Kase, Mainzer Kase)	55.0	3.0
2	Skim Milk	55.0	7.0

8.7.2	Compositional Standards for Whey Cheese
Common Name - Whey Cheese	**Composition** • shall be the products obtained by the concentration of whey and the molding of the concentrated whey, with or without the addition of milk, milk products and milk fat • the dry matter of the whey cheese includes the water of crystallization of lactose. **Permitted Ingredients and Additives** may contain: • micro-organisms to aid further ripening. **Labelling** • name of the product - Whey Cheese • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • any metric size.

8.7.3	Compositional Standards for Cream Cheese
Common Name - Cream Cheese	**Composition** • shall be the product made from cream with the use of coagulating agents to form curd and forming curd into a homogenous mass after the removal of whey • shall contain not more than 55% moisture • shall contain not less than 30% milk fat • shall in the case of cream cheese with (naming the added ingredients) contain not more than 60% moisture and not less than 26% milk fat • shall in the case of creamed cheese spread contain not more than 60% moisture and not less than 24% M.F. and be at least 51% cream cheese. **Permitted Ingredients and Additives** • may in the case of cream cheese spread contain: • added milk and milk products • salt • vinegar • sweetening agents • flavours. **Labelling** • name of the product - Cream Cheese • the weight (mass) of the product in grams or kilograms. **Suggested Sizes** • 60 g or less, 125 g, 250 g, 500 g, 750 g, • 1 kg, 1.5 kg and any metric size over 1.5 kg • two or more single portions, other than slices, may be packed together in any metric container if the number and size of the single portions are declared on the container.

8.7.4	Compositional Standards for Processed Cheese
Common Name - Processed Cheese	**Composition** • shall be the product made by comminuting and mixing the named variety or varieties of cheese into a homogenous mass with the aid of heat • shall contain not less than 51% cheese • shall contain not more than 60% moisture • in the case of Processed (naming the Variety) Cheese, the cheese shall meet the compositional standards of the sourced variety 1. shall be a cheese with a moisture content that does not exceed by more than 5% and a milk fat content that is not less than 3% of : ▪ the moisture and fat of stated variety cheese or the average moisture and fat of two or more varieties of cheese 2. shall in the case of processed skim milk cheese, contain not more than: ▪ 55% moisture ▪ 7% milk fat. **Permitted Ingredients and Additives** may contain: • water added to adjust the moisture content. **Labelling** • name of the product - Processed Cheese • the mass of the product in grams or kilograms. • optional terms may be used to modify the common name "processed cheese" with such terms as sauce, loaf, slice, food and spread. **Suggested Sizes** • 60 g or less whole numbers of metric • 125 g, 250 g • 500 g, 750 g • multiples of 500 g.

8.7.5	Compositional Standards for Cold Pack Cheese
Common Name - Cold Pack Cheese	**Composition** • shall be the product by comminuting and mixing the names variety or varieties of cheese into a homogenous mass without the aid of heat • shall contain not less than 51% cheese • shall contain not more than 46% moisture • shall in the case of cold pack (naming the variety) cheese, meet the compositional standards of the sourced variety **Permitted Ingredients and Additives** may contain: • water added to adjust the moisture content. **Labelling** • name of the product **- Cold Pack Cheese and Cold Pack (naming the variety) Cheese** • the mass of the product in grams or kilograms; • optional terms may be used to modify the common name "cold pack cheese" with such terms as sauce, loaf, slice, food and spread. **Suggested Sizes** • any size of metric unit**.**

8.7.6	Compositional Standards for Grated (Naming the Variety) Cheese
Common Name - Grated (Naming the Variety) Cheese	**Composition** • shall be cheese that is dehydrated and ground from a named variety cheese(s) including hard interior ripened cheese meeting the requirements for the "Named Variety Cheese" outlined in the regulations and/or the National Dairy Code • the lactose level must be <1% using the Enzymatic Method. **Permitted Ingredients and Additives** • permitted anti-caking agents may be added up to the specified levels as indicated in the Food and Drug Regulations B.08.032 (c)

	(x). **Labelling** • name of the product - Grated (naming the variety) Cheese • the mass of the product in grams or kilograms. **Suggested Sizes** • 60 g or less • 125 g • 250 g • 500 g • 750 g • 1 kg • 1.5 kg • and any size of metric over 1.5 g**.**

8.7.7	Compositional Standards for Grated Cheese Product
Common Name - Grated Cheese Product	**Composition** • shall be cheese that is dehydrated and grated from a number of cheese variety/varieties including hard interior ripened cheese preparations and contain at least 50% cheese **Permitted Ingredients and Additives** • permitted anti-caking agents may be added up to the specified levels as indicated in the Food and Drug Regulations, B.08.033 (a) (x). **Labelling** • name of the product - Grated Cheese Product • the mass of the product in grams or kilograms. **Suggested Sizes** • 60 g or less • 125 g • 250 g • 500 g • 750 g • 1 kg • 1.5 kg • and any size of metric over 1.5 g.