

# **STANDARDS ON MAPLE EQUIPMENT INTENDED FOR THE PRODUCTION OF MAPLE SYRUP**

***COLLECTION AND STORAGE OF MAPLE SAP  
CONCENTRATION BY REVERSE OSMOSIS  
EVAPORATION  
CONDITIONING AND STORAGE OF SYRUP***

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## **INTRODUCTION**

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This document, devoted to maple equipment, was prepared by the Manufacturers of Maple Sugaring Equipment (LMEA) with the participation of suppliers, Canadian and American experts and representatives of the public agencies (Quebec and Canada). It should to be a tool of reference for the eager manufacturer to design the equipment intended for the production of maple syrup.

These standards indicate the minimal requirements in the choice of materials and design of the equipment or equipment parts directly or indirectly in contact with maple sap and maple syrup in order to preserve the quality, innocuity and integrity of the product.

None of the recommendations or guidelines of this standard can alone guarantee the production of a healthy and high quality maple product. However, their implementation will be used to reduce the possibility of contamination and to support the quality of the maple syrup. The standards apply to the current knowledge of the equipment, based on the experience of the industry. It will be revised as new data comes from the manufacturers, from the maple research centers, the industry and from government experts become accessible.

## **SECTION 1      GENERAL INFORMATION**

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### **1.1    RANGE**

The standard relates to the equipment or equipment parts which are directly in contact with maple sap and the maple syrup and which is used for:

- collection and storage of maple sap;
- partial concentration of maple sap by reverse osmosis ;
- evaporation of maple sap;
- the mixture, conditioning, the packaging and storage of maple syrup.

### **1.2    OBJECTIVES**

To establish the guiding principles in the design, assembly, choice of materials, utilisation, the safety of the equipment or equipment parts, to ensure integrity of the maple sap and of the maple syrup; to reduce the dangers of physical, chemical and biological contamination; to maintain the food safety and innocuity of these products.

### **1.3    EQUIPMENT COVERED BY THE STANDARD**

#### **1.3.1    Collection and storage of maple sap**

- Spout
- Bucket for the gathering
- Tubing / collector / accessories
- Vacuum transfer tank / distribution system
- Inlet Manifold
- Extractor / releaser
- Filter
- Maple sap pump
- Tanker / tank for sap transportation / storage
- Level control
- Piping, connections and valves

### **1.3.2 Concentration by reverse osmosis**

- Pump (feed, pressure, circulation)
- Reverse osmosis membrane
- Membrane pressure vessel
- Membrane storage vessel
- Filter
- Heating element
- Concentrate tank
- Wash tank
- Wash Pump
- Pump for the circulation of filtrate
- Filtrate pre-heating equipment
- Pipe, connections, valves, seals

### **1.3.3 Evaporation**

- Pre-heater
- Hood
- Steam stack, pipes and accessories
- Evaporator, flue pan, syrup pan, finishing pan
- Connections, seals, valves
- Level control
- Complementary evaporation system by forced air circulation

### **1.3.4 Conditioning and storage of maple syrup**

- Gravity filter
- Filter press
- Filter element
- Filter aids
- Syrup pump
- Filter tank / water jacketed bottling tank
- Large container
- System for filling large containers
- Piping, connections, seals, valves
- Level control
- Any equipment or part of the equipment located downstream from the output of syrup of the evaporation system

## **SECTION 2    DEFINITIONS / VOCABULARY / DESCRIPTIONS**

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### **2.1    GENERAL INFORMATION**

**Processing aid:** Substance, generally inert, approved by regulating agencies and used to improve the performance in the process of food transformation without leaving any residues or by-products levels in the food marketed to consumers or that is eliminated during processing.

**Contaminant:** Chemical, drug, food additive, heavy metal, industrial pollutant, ingredient, drug, microbes, pesticides, poisons, toxins or all other substances whose use is prohibited according to applicable government acts and their regulations as regards to the environment, of food and drug, of pesticides or of which the level exceeds the tolerances prescribed under the appropriate acts and regulations.

**Level Control:** Device making it possible to control the level of liquid in a tank or equipment, can be by probe or float.

**Flowmeter:** Measuring apparatus of the flow.

**Disinfection:** Destruction, by chemical or physical processes, of the germs present on surfaces of the equipment (cleansing).

**Filter element:** Filter paper or of synthetic fibre obtained by pressing or metal netting of very small opening whose porosity is smaller than the diameter of the particles to eliminate.

**Filter:** Device allowing the removal of solid particles in maple sap at the various stages of the process and for maple syrup before the packaging.

**Seal:** Trimming ensuring the sealing of an assembly ( gasket, O-ring).

**Food grade quality material:** Material approved by an reputable organization for use in direct contact with food.

**Potable water quality material:** Material certified by a recognized organization (ex: BNQ, CSA, NSF) for use in direct contact with drinkable water. Generally, the standards in force relate to the toxicity of these materials and the potential transfer of chemical contaminants towards drinkable water under the standard conditions of installation and use in circulation, transport and storage of drinkable water. The standards relating to drinkable water are of provincial jurisdiction in Canada.

**Connection:** Element being used for joining or connecting various juxtaposed parts of equipment.

**Pipe:** Closed channel, led to circular or round section, out of rigid material, flexible or pliable, intended for the passage of a liquid or gas.

**Valve:** Apparatus being used to regulate the fluid flow in a conduit.

**Food contact Zone :** Surface in direct contact with the food in the normal course of the operations.

**Splash zone:** Surface of equipment which can be in occasional contact with food and from where the food is able to return back the zone of contact (ex: lid of tank).

**Non-food contact food:** Any surface that could be in accidental contact with food without the food being returned to the food contact surfaces. It would read much better if Non-food zones are zones for which the food is not intended to contact with.

## **2.2 EQUIPMENT FOR COLLECTION AND STORAGE OF MAPLE SAP**

**Spout:** Device inserted in tap hole allowing to channel the maple sap towards the exterior of the tree.

**Bucket:** Container installed on the spout allowing to collect the maple sap.

**Tanker / tank :** Container being used for transporting and/or storing maple sap.

**Mainline:** Principal pipe to which are connected the small tubes from the maple trees.

**Input collector :** Device allowing the connection of several lines (manifold).

**Extractor / releaser:** Apparatus which is used to bring back to the atmospheric pressure maple sap under vacuum in maple piping (including system with reversed slope).

**Sap pump :** Apparatus allowing to transfer maple sap from one piece of equipment to another.

**Vacuum transfer tank / distribution system :** Tank allowing to separate and direct, in different pipes, the air and maple sap coming from sub-groups of collectors.

**Tubing :** Network of pipes being used to directly collect maple sap at the taps and to dispatch it towards the pumping station.

## **2.3 EQUIPMENT FOR PARTIAL CONCENTRATION BY REVERSE OSMOSIS**

**Pressure vessel of membrane:** Element of the machine in which is placed the membrane during the concentration.

**Membrane storage vessel:** Container in which is stored the membrane for a prolonged storage.

**Concentration by reverse osmosis:** Process of concentration per selective membrane separation allowing to withdraw part of the water contained in maple sap and thus to increase the percentage of solids before evaporation.

**Concentrate:** Liquid retained by the reverse osmosis membrane.

**Filtrate:** Liquid passing through the reverse osmosis membrane (also called permeate).

**Reverse osmosis membrane:** Material through which is thorough maple sap and whose porosity allows the passage of the water molecules and retains sugars and the majority of the elements dissolved in water.

**R/O Machine :** Apparatus of concentration of the sap by reverse osmosis.

**Feed Pump / pressure / circulation:** Apparatus ensuring the flow of maple sap in each part of the machine at required pressure and flow.

**Filtrate Pump :** Apparatus ensuring the circulation of the filtrate.

**Pre-heater of filtrate:** Equipment made with a network of tubes in which circulates the filtrate obtained by concentration with reverse osmosis to allow the heating of the filtrate for subsequent use in the operations of cleaning the r/o machine.

**Concentrate Tank :** Container allowing accumulation of concentrated maple sap.

**Filtrate Tank :** Container allowing the accumulation of filtrate.

**Wash Tank :** Container being used to prepare the solution of washing and rinsing for the system of partial concentration by reverse osmosis; it can be provided with a heating element.

## **2.4 EVAPORATION EQUIPMENT**

**Evaporation Accessories:** group of instruments and utensils used in the process of evaporation and which is in direct contact with syrup.

**Steam Stack :** Assembly of chimney pipes, roof flashing, cover connecting the hood to the point of evacuation of the steam to the exterior.

**Evaporator:** Apparatus being used for evaporating water contained in the maple sap and concentrating it into maple syrup.

**Hood:** Device installed on or above the evaporator which allows the collection of the steam condensation water and to evacuate it.

**Flue pan:** Section of the evaporator where is done the first stage of evaporation of maple sap.

**Syrup / front / finishing pan:** Part of the evaporator where final process of evaporation occurs, resulting in final concentration which can be integrated into the evaporator or can be a separate equipment.

**Pre-heater:** Equipment made with a network of tubes in which circulates maple sap allowing the heating of the sap before its input into the evaporator (heat exchanger).

**Condensation Tray :** Device allowing the recovery of the condensed vapor and its rejection to the exterior of the evaporator.

## **2.5 EQUIPMENT FOR THE CONDITIONING AND STORAGE OF SYRUP**

**Bain marie :** Container with two concentric compartments allowing the heating of food without direct contact with the heat source.

**Gravity filter:** System of filtration in which the syrup runs out by gravity.

**Filter press :** System of filtration in which the syrup is thorough under pressure through filter element(s).

**Barrel :** Container, generally cylindrical of average or great capacity (higher than 20 liters), being used for handling the transport or storage of maple syrup.

**Syrup pump :** Apparatus allowing to push syrup through the filter press.

**Niter / sugar sand :** Suspended particles composed primarily of caramelized sugar, salt precipitate of calcium and magnesium of the acid malic, insoluble hot, not very soluble cold.

**Filter tank:** Container in which boiling syrup coming from the evaporator is placed for a temporary storage.

**System of filling:** Device allowing the filling of the large containers.

**Diatomaceous earth / filter aid :** processing aid used in the system of filtration by the filter press.

## **SECTION 3 MATERIALS**

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### **3.1 GENERAL INFORMATION**

It is the manufacturer's responsibility to get approval from recognized organizations of the country concerned, for the materials used in manufacture and assembly of the equipment, parts and accessories. In addition to the public agencies, the National Sanitation Foundation (NSF) in the United States emitted series of standards referring to drinkable water, the food equipment, environment which are often quoted like requirements in the American regulation.

For Canada, it is necessary to make a request for acceptance to the Canadian food Inspection Agency (CFIA) so that the equipment, parts and accessories are listed with the "Reference Listing of Accepted Construction Materials, Packaged Materials and Non-Food Chemical Products" This list with the application procedure can be found at the following Web Address: <http://www.inspection.gc.ca/english/ppc/reference/cone.shtml>. An alternative consists in obtaining a letter of no objection from Health Canada (HC). The components of the plastic materials such as resins, pigments, additives cannot be approved individually by the CFIA; but only in combination to form the finished product. The adhesives, sealers, the coatings of construction or protection used in the manufacture of the equipment and interior surfaces of the food containers must also be accepted and be listed. CFIA is generally listing material in contact with foods but not the design of complex equipment (e.g. pumps) appendice 1 indicates the pieces that need to be CFIA listed and the ones that need to be 3Z or NSF accepted only.

For the United States, it is necessary to refer to the Code of Federal Regulations (CFR) of Food and Drug Administration (FDA). The requirements of the American regulation must be used like general guide in the United States.

#### **3.1.1 Zones in contact with food and splash zones**

The requirements concerning materials in direct contact with food are the following :

- Smooth surface;
- corrosion resistant;
- inert, not absorbing with the products of maple;
- non-toxic;
- compatible with the products and procedures of cleaning and disinfecting repeated, like with the pest-destroying products, according to recommendations' of the manufacturer;
- Should not generate mineral deposits
- Should not diffuse, nor transfer to maple sap and to maple syrup any toxic substances, heavy metals, odor, color, taste, or any other contaminating agents.

The choice of materials should also take into account the risks of galvanic corrosion when two different metals that come into contact in a solution may become an electrolyte for electrotysis..

The plastic materials, the resins, the pigments and other additives must be made up exclusively of pure raw materials, free from recycled materials.

The seals ie (O-rings, gaskets) must be made out of rubber or other plastic materials and conform to the preceding guidelines.

### **3.1.1.1 Material permitted**

It is necessary to refer to the tables in Annex 1 to identify materials allowed in the manufacture of the various equipment, parts and accessories for the zones in contact with food and splash zones.

### **3.1.2 Non-food contact zones**

The characteristics of the materials which are not in contact with food has to be:

- smooth surface, non-porous;
- corrosion resistant or made corrosion resistant by using materials that do not crack, flake, peel or pit:
- if surface is painted, painting must adhere and must be resistant to cleaning products and cleaning procedures and including pressure cleaning .
- compatible with the cleaning products and cleaning procedures and repeated use of desinfectants and pesticides agents, according to the recommendations of the manufacturer.

### **3.1.2.1 Material permitted**

It is necessary to refer to the tables within Annex 1 to identify materials allowed in the manufacture of the various equipment, parts and accessories for the zones without contact with food.

## **3.2 DESCRIPTION OF MATERIALS**

**Galvanized steel :** Steel made resistant to rust by the application of a layer of zinc .

**Stainless steel:** Alloy containing iron, chromium, nickel resistant to the various agents of corrosion at ambient or moderate temperatures; the alloys of series 300 are usually used in food industry because of their greater corrosion resistance

**Vitrified steel:** Steel doubled with a layer of glass, where glass is the material in contact with the food, generally used in the design of tanks.

**Additives:** Group of products being able to be added to the resin to give specific properties to plastic materials (antimicrobial agent, demister, antioxidant, anti-locking, anti-static, plasticizer, stabilizing UV, etc).

**Adhesive:** Product used to join the plastic material parts during the assemblies.

**Aluminium:** White metal, shining, light, ductile, malleable, little deterioration to air. Certain alloys or type of aluminium can be used in food industry.

**Alloy tin-silver:** Alloy shining, very malleable, used as a coating protection and for the soldering.

**Copper:** Metal of red-brown color, malleable and ductile.

**Fiberglas :** Filament obtained by stretching melted glass, used in the manufacture of reinforced plastics.

**Brass:** Copper alloy of ductile and malleable zinc, also called yellow copper or " brass "; must be free of lead for use in contact with maple sap and the maple syrup.

**Flexible membrane:** Film made up of a flexible inert material being used to double the interior of a tank.

**Pigment / dye:** Product added to the resin to give it a color; must be free from heavy metals and be approved for the direct contact with food.

**Plastic / plastic:** Synthetic products made up primarily of macromolecules which can be shape by heat and pressure and may include one or combination of the following resins for manufacturing items for use in the food industry.

- Plexiglas: Hard, transparent, deformable hot plastic material (polymethylmethacrylate).
- Polycarbonate: Plastic material transparent and very resistant to the shocks, resulting from the regular repetition of the carbonate organic function.
- Polyethylene: Plastic material resulting from the polymerization of ethylene.
- Polypropylene: Plastic material resulting from the polymerization of propylene.
- PVC : Polymer of vinyl chloride (vinyl polychloride).
- Nitrile: Generic name of derived from the hydrocyanic acid.
- Teflon : Polytetrafluoroethylene (Teflon is a trade mark name).

**Virgin resin :** Natural or synthetic macromolecular compound used in the manufacture of plastics, free from recycled materials.

## **SECTION 4 DESIGN / CONSTRUCTION / ASSEMBLY**

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### **4.1 GENERAL INFORMATION**

The design, and construction of the collection tubing equipment intended for the gathering, storage, preparation and the processing of maple sap into syrup for packaging and storage of the maple syrup must be constructed so as to prevent the contamination by contaminants as defined in section 2. e.g. lubricants, cleaning compounds etc.

The equipment must be designed so that materials and surfaces in contact with food can be cleaned and disinfected adequately. The liquids, such as cleaning compounds and rinse water must be drain to the exterior of the equipment to preclude accumulation in the equipment according to procedures prescribed by the manufacturer.

Any lighting system must be with protection in order to protect the maple sap and maple syrup from any contamination by glass fragments in the event of breaking of the light fixture.

#### **4.1.1 Food contact surfaces and zone:**

All surfaces in contact with maple sap and the syrup as well as their connections must be smooth and continuous. They should not have roughness, and free of fractures which may shelter organic and inorganic matter or other contaminants cleaning and disinfecting procedures.

The surfaces must be designed so as to reduce projections, ledges, pronounced angles, ends, and recesses which would allow accumulation of residues. The joining of surfaces are preferably by welding or a continuous joining. The welding must be permanent, smooth, be polished, free of roughness and even, resistant to constraints. Only the welding with stainless steel by fusion or alloy of tin-silver are acceptable. The solder must be lead-free.

Adjoining surfaces should be joined with a complete weld. Spot welding is not acceptable. Cells and hollow voids within the interior of a structure present with the interior of a surface must be sealed perfectly by a continuous weld to avoid the accumulation of maple product other contaminants (ex: border folded up and rolled, invisible sealing).

The ball & socket joint, rivets and nails must be eliminated from all the zones in direct contact with food. If bolts and nuts are used, they are to be sealed by welding or removable to allow the cleaning with accepted materials for the intended purpose.

The components, parts or pieces of the equipment must be able to be disassembled to allow the cleaning and disinfecting of food contact surfaces. Cleaning in place (CIP) for assembled tubing by circulating cleaning solution through the closed system when the equipment or equipment parts cannot be disassembled (pipe, valves, pipe, etc). The CIP system must allow the circulation of cleaning & rinsing solution to be able to contact all internal surfaces. This system must be capable of draining completely according to procedures prescribed by the manufacturer.

#### **4.1.2 Non-food contact Zones**

Surfaces which are not in direct contact with food like reinforcements and supports structures must be accessible for washing, to prevent accumulation of residues and, other contaminants, and to prevent the propagation of the insects and rodents.

### **4.2 COMMON EQUIPMENT AT VARIOUS STAGES OF THE PROCESS**

#### **4.2.1 Piping, connections, valves**

The pipes, fittings, valves must be resistant to the processing conditions for manufacturing maple products and cleaning procedures according to the stage of the process where they are employed. They are subject to the same rules as any surface in direct contact with food. The pipe fittings must be corrosion resistant, easy to clean, and without dead ends. They can be removable (external clamp or coupler), be screwed, glued or be amalgamated. The assembly should not allow the entry of contaminants at the time of processing operations.

The potable water quality seals (rubber or plastic) must be compatible with the manufacturing process and the cleaning conditions.

The metal parts covered with plastic or rubber are not accepted for the uses where covered surface is in contact with the maple product because of the risk of cracking or chipping and subsequently exposing the metal.

#### **4.2.2 Pump**

The design of the pump must prevent the cross-contamination of lubricants with the pumped food. Stainless steel of series 400 can be used for the manufacture of the shaft. The pumps must resist to the cleaning products and repeated cleaning procedures.

#### **4.2.3 Tank**

Once installed, the bottom of the tank should have a slope directing the liquid towards the exit point or drain outlet. The design of the tank can induce this slope when the tank is on level via a tilted bottom. Uneven installation of a tank could also induce a slope. It is the manufacturer's responsibility to indicate the installation mode in the note joined to the tank at the time of purchase or delivery.

The port-holes and doors installed on the side of a tank must be provided with a removable gasket. Any accessory installed in the tank should not prevent the cleaning and/or complete cleansing.

#### **4.2.4 Level control**

The control level systems must meet the same requirements of the equipment in which they are installed according to the type of maple product (maple sap vs. syrup), conditions of use, the cleaning and cleansing procedures.

#### **4.2.5 Filter Elements**

The filtering elements made from paper or of synthetic fibre are considered as processing aids according to the CFIA and must be accepted and be included in the " Reference Listing of accepted Construction Materials, Packaging, Materials, and Non-Food Chemical Products " or to have obtained a letter of non-objection from Health Canada. The CFIA list with application procedure can be found at the following Web address; <http://www.inspection.gc.ca/english/ppc/reference/cone.shtml>.

### **4.3 EQUIPMENT SPECIFIC TO THE COLLECTION AND STORAGE OF MAPLE SAP**

Notwithstanding to the characteristics previously stated, the particular requirements apply to the following equipment used for the collection and storage of maple sap.

#### **4.3.1 Tubing and accessories for mainline**

The tubing, accessories, connections and valves in direct contact with maple sap must be compatible with the manufacturing process and cleaning requirements. The interior of the pipe must be smooth, without obstructions, vitrified aspect, not striated. Failing to be of food grade quality, the material could be of potable water quality.

The connections must be corrosion resistant, easy to clean, without dead ends. They can be removable (external clamp or coupler), be screwed, glued or be amalgamated. The assembly should not allow the entry of contaminants.

#### **4.3.2 Tank for the transport and storage of maple sap**

The tanks used for the transport of maple sap and storage of maple sap at the exterior of the building must be equipped with a lid designed to protect maple sap from any external contamination.

#### **4.3.3 Vacuum transfer tank and distribution system**

The general principles which applied to the tanks are valid for these types of the equipment parts. Failing to be of food grade quality, the material could be of potable water quality.

#### **4.3.4 Extractor / releaser**

The general principles which applied to the tanks are valid for these types of equipment. Failing to be of food quality, the material could be of potable water quality.

### **4.4 SPECIFIC EQUIPMENT TO THE PARTIAL CONCENTRATION BY REVERSE OSMOSIS**

Notwithstanding to the characteristics previously stated, the particular requirements apply to the following equipment used in the partial concentration by reverse osmosis.

#### **4.4.1 Reverse osmosis membrane**

The reverse osmosis membrane should have the following rejection characteristics: > 95% of MgSO<sub>4</sub> or > 70% of NaCl according to standard tests' from the membrane manufacturers.

The reverse osmosis membrane is in direct contact with maple sap and must meet the established criteria for the equipment. It must resistant to the cleaning procedures (temperature, product) and to the prescribed disinfecting procedures from the manufacturer.

The instruction notice accompanying the reverse osmosis membrane must specify the new starting conditions as well as the storage conditions and start-up procedures after a prolonged storage.

#### **4.4.2 Membrane pressure vessel, membrane storage vessel**

The membrane pressure vessel and the membrane storage vessel must meet the established criteria for surfaces directly in contact with food. Failing to be of food grade quality, the material could be of potable water quality. They must be resistant to the cleaning procedures (temperature, product) and to prescribed disinfecting procedures from the manufacturer.

#### **4.4.3 Washing tank and Filtrate tank**

These tanks are intended to receive the filtrate which will be used subsequently in the operations. They must be equipped with a lid and designed to protect the filtrate from any external contamination.

#### **4.4.4 Filtrate pre-heater**

When this system is installed directly on the evaporator, the requirements for the evaporator pre-heater also apply to the filtrate pre-heater.

## **4.5 EQUIPMENT SPECIFIC TO THE EVAPORATION OF MAPLE SAP**

Notwithstanding to the characteristics previously stated, the particular requirements apply to the following equipment.

### **4.5.1 Hood**

It must be provided with a device that will eliminate the condensation water from the steam coming from the side walls, to prevent it from returning in the pans or in the syrup.

### **4.5.2 Steam Stack**

The steam stack or the hood must be designed to collect any condensation water from the steam to prevent it from falling back into the evaporator

### **4.5.3 Pre-heater**

It must be equipped with a collecting tray or other device to eliminate the condensation water from forming on the pre-heater pipes, to prevent this water from falling back into the evaporator.

### **4.5.4 Evaporator / flue pan / syrup pan / finisher**

The interconnections must meet the same criteria as the evaporator. The Construction must avoid any direct contact between the syrup and preclude any cross-contamination with lubricants, fuel and/or combustion gases.

### **4.5.5 Complementary evaporation system by forced air circulation**

Any system based on incorporating air injection in syrup or the circulation of forced air in close direct contact with syrup must be designed in order to prevent the incorporation of contaminants in syrup. The system must be equipped with a filtration mechanism to eliminate potential contaminants from the air as required by the regulation.

*N.B. : In 2001, the Canadian regulation requires that the air entry feed pipes be equipped with well adjusted netting or filters to prevent introduction of contaminated air. However, no specific requirement on the nature of the filter, nor on the rate of purification of the air is listed in the regulation. The manufacturer must show the performance of the system employed.*

## **4.6 SPECIFIC EQUIPMENT TO THE CONDITIONING AND STORAGE OF MAPLE SYRUP**

Notwithstanding to the characteristics previously stated, the particular requirements apply to the following equipment used in the conditioning and storage of the maple syrup.

### **4.6.1 Large containers**

The large containers can be for single filling or multiple filling. The interior of the large containers for single filling is covered with a coating approved for direct contact with food. This coating is applied to a metal not approved for direct contact. On the other hand, the large containers for multiple filling are made of a material approved for the direct contact with syrup for prolonged storage period.

The internal coating of the large containers for single filling can breakdown and may flake or peel when subjected to shock during washing at high temperature. It loses its protective effect then and the syrup comes into direct contact with non approved metal. The containers must thus be identified by the manufacturer as being for single filling or multiple filling.

Various contaminants coming from the manufacturing process of the large containers can be found inside the new containers. The containers must be identified " Ready for use " if they were cleaned to eliminate the residues. If they are not cleaned, they must be marked "Wash before the first filling ". A washing procedure must accompany the containers having to be washed before the first use.

The use of a plastic bag material in the barrels is equivalent to a single filling. It is necessary to use a new bag with each filling. It is not necessary to wash the bag before use. The bag must be accepted by CFIA and be included in the " Reference Listing of accepted Construction Materials, Packaging Materials and the non-food accepted chemicals " or to have obtained a letter of non-objection from Health Canada. The CFIA list with application procedure can be found at the following Web Address: <http://www.inspection.gc.ca/english/ppc/reference/cone.shtml>.

The containers must be provided with a tight closing system. The manufacturer must provide the recommendations necessary to maintain a tight seal, especially for the containers with multiple filling.

From their shape, the folded up seams of assembly making it possible to join two metal parts, allow accumulation of residues. They are not recommended for the containers with multiple filling, but only for the containers of single use.

### **4.6.2 Syrup tank**

Tanks, others than the large containers, used for storage of the maple syrup must be provided with a lid and conceived to protect the syrup from any external contamination.

#### **4.6.3 Filter Press**

Aluminum components are acceptable being given the short time of contact with hot syrup during the filtration.

#### **4.6.4 Filter tank**

The requirements of syrup containers apply to the filter tank.

#### **4.6.5 Water Jacketed Bottling Tank**

The requirements of syrup containers apply to the water jacketed bottling tank.

#### **4.6.6 Processing aids**

The processing aids such as the diatomaceous earth (filter aid) must be accepted by CFIA and be included in the " Reference Listing of accepted Construction Materials, Packaging Materials and Non-food Chemical Products " or to have obtained a letter of non-objection from Health Canada. The CFIA list with application procedure can be found at the following Web address::  
<http://www.inspection.gc.ca/english/ppc/reference/cone.shtml>.

## **SECTION 5      INSTRUCTION MANUAL OF THE EQUIPMENT**

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### **5.1      INSTRUCTION MANUAL**

With the purchase or the delivery, an instruction sheet or manual must be provided with the equipment, the parts and the accessories. This note indicates, at least :

- installation mode;
- mode of use;
- storage mode for a prolonged period;
- mode of reconditioning after a prolonged storage;
- the recommendations on the routine and preventive maintenance, if applicable;
- recommended lubricants, cleaning and disinfection products;
- recommended methods of cleaning, disinfection and rinsing;
- security instructions relating to the use of the equipment.

All the non-food chemicals (pesticides, lubricants, cleaning products, disinfectant, filter aid) recommended by the manufacturer must be approved by the recognized organizations of the country concerned. In Canada, it is necessary to refer to the " Reference Listing of Accepted Construction Materials, Packaging Materials and Non-Food Chemical Products" of the Canadian Agency of Inspection of food (CFIA) or to obtain a letter of approval from Health Canada (HC). The CFIA list with application procedure can be found at the following Web address: <http://www.inspection.gc.ca/english/ppc/reference/cone.shtml>.

#### **Note to be added (use of hydrogene peroxyde)**

For the United States, it is necessary to refer to the Code of Federal Regulations (CFR) of Food and Drug Administration (FDA).

### **5.2      PROCEDURES OF WASHING AND CLEANSING**

The washing and cleaning procedure must be adapted for the equipment. It is necessary to identify the composition of the parts and equipment and to make sure that the procedures and cleaning products are suitable. The aluminum and copper cannot support the same conditions as the stainless steel.

## **SECTION 6    REFERENCES**

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NSF, Food Equipment (Standards)

CTCPA, La conception hygiénique des équipements de l'industrie alimentaire

Ohio State University, North American maple syrup producers manual

BNQ, Matériaux en contact avec les aliments (Standards)

Ontario Maple Syrup Producers Association, Ontario Maple Seal of Quality Manual

ACIA, Manuel d'inspection des usines laitières

ACIA, Modèle générique HACCP, sirop d'érable

ACIA, Manuel d'inspection des produits – Produits de l'érable

ACIA, Code national de l'érable, ébauche de document de travail, juin 1997

ACIA, Manuel des méthodes de l'hygiène des viandes

Reilly, c. Metal Contamination of food

Office de la Langue Française, Vocabulaire de l'acériculture

Imholte, T.J. Engineering for food safety and sanitation

FDA, Code of Federal Regulations

# APPENDICES 1

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## **Material permitted in the manufacture of equipment**

- *Collection and storage of maple sap*
- *Concentration by reverse osmosis*
- *Evaporation*
- *Conditioning and storage of syrup*

MATERIAL PERMITTED IN THE MANUFACTURE OF MAPLE EQUIPMENT

**COLLECTION AND STORAGE OF MAPLE SAP**

*SURFACES IN DIRECT CONTACT WITH FOOD*  
(including splash zone)

EQUIPMENT \ MATERIAL	STAINLESS STEEL	APPROVED PLASTIC (1)	BRASS	COPPER	PAINTED STEEL	GALVANIZED STEEL	ALUMINUM	OTHER	OTHER	OTHER
Spout	OK	OK	NO	OK	NO	NO	OK			
Bucket for gathering	OK	OK	NO	NO	NO	NO	OK			
Tubing, for collection and accessories	OK	OK	NO	NO	NO	NO	NO			
Valve	OK	OK	OK	NO	NO	NO	NO	Rubber	Nitrile	
Filter support	OK	OK	NO	NO	NO	NO	OK			
Filter element	OK	OK	NO	NO	NO	NO	NA			
Pump for maple sap	OK	OK	NO	NO	NO	NO	NO			
Lid for releaser/extractor	OK	OK (3)	NO	NO	NO	NO	NO	Vitrified steel		
Deflector for releaser/extractor	OK	OK (3)	NO	NO	NO	NO	NO			
Trap for releaser/extractor	OK	OK (3)	NO	NO	NO	NO	NO	Nitrile		
Case for releaser	OK	OK (3)	NO	NO	NO	NO	NO	Vitrified steel		
Entry collector	OK	OK (3)	NO	NO	NO	NO	NO			
Tank for transfer of vacuum	OK	OK (3)	NO	NO	NO	NO	NO			
Tank	OK	OK	NO	NO	NO	NO	NO	Vitrified steel	Membrane(3)	Fiberglas
Connections and joints	OK	OK (3)	OK	NO	NO	NO	NO			
Level control	OK	OK	OK	NO	NO	NO	NO	Ceramic		
Piping	OK	OK	NO	NO	NO	NO	NO			

**OTHER SURFACES WITHOUT CONTACT TO FOOD**

EQUIPMENT \ MATERIAL	STAINLESS STEEL	APPROVED PLASTIC (1)	BRASS	COPPER	PAINTED STEEL	GALVANIZED STEEL	ALUMINUM	WOOD	OTHER	OTHER
Surface without direct contact to food	OK	OK	OK	OK	OK	OK	OK	NO		

**NA = NOT ACCEPTABLE**

**1: approval by organization recognized according to in place regulation**

*OK = ACCEPTABLE*

*2: food material of quality or drinking water quality*

*NO = NOT ACCEPTABLE*

*3: plastic flexible material membrane approved*

MATERIAL PERMITTED IN THE MANUFACTURE OF MAPLE EQUIPMENT

**CONCENTRATION BY REVERSE OSMOSIS**

*SURFACES IN DIRECT CONTACT WITH FOOD*  
(including splash zone)

<b>EQUIPMENT</b> \ <b>MATERIAL</b>	STAINLESS STEEL	APPROVED PLASTIC (1)	BRASS	COPPER	PAINTED STEEL	GALVANIZED STEEL	ALUMINUM	OTHER	OTHER	OTHER
Pump for maple sap	OK	OK	NO	NO	NO	NO	NO			
Pump	OK	OK	NO	NO	NO	NO	NO			
Pressure pump	OK	OK	NO	NO	NO	NO	NO			
Circulation pump	OK	OK	NO	NO	NO	NO	NO			
Circulation wash pump	OK	OK	NO	NO	NO	NO	OK			
Water support	OK	OK	NO	NO	NO	NO	NO			
Water element	OK	OK	NO	NO	NO	NO	NO	Synthetic fiber	Paper	
Concentrate tank	OK	OK	NO	NO	NO	NO	NO	Vitrified steel	Fiberglas	
Reverse osmosis membrane	NA	OK	NO	NO	NO	NO	NO	Ceramic		
Membrane vessel	OK	OK (2)	NO	NO	NO	NO	NO			
Storage vessel	OK	OK (2)	NO	NO	NO	NO	NO			
Wash tank	OK	OK	NO	NO	NO	NO	NA			
Sealing element	NA	NA	NA	NA	NA	NO	NO	Alloy (3)		
Valve	OK	OK	OK	NO	NO	NO	NO			
Connections and joints (filtrate)	OK	OK	NO	NO	NO	NO	NO			
Connections and joints (concentrate)	OK	OK	NO	NO	NO	NO	NO			
Concentrate tank	OK	OK	NO	NO	NO	NO	NO	Vitrified steel	Fiberglas	
Concentrate pump	OK	OK	NO	NO	NO	NO	NO			
Re-heater for filtrate (coil)										
Table of recovery	OK	OK	NO	NO	NO	NO	OK			
Coil	OK	OK	NO	OK	NO	NO	NO			

**OTHER SURFACES WITHOUT CONTACT TO FOOD**

<b>EQUIPMENT</b> \ <b>MATERIAL</b>	STAINLESS STEEL	APPROVED PLASTIC (1)	BRASS	COPPER	PAINTED STEEL	GALVANIZED STEEL	ALUMINUM	WOOD	OTHER	OTHER
Surface without direct contact to food	OK	OK	OK	OK	OK	OK	OK	NO		

NA = NOT ACCEPTABLE

OK = ACCEPTABLE

NO = NOT ACCEPTABLE

1: approval by organization recognized according to in place regulation

2: food material of quality or drinking water quality

3: alloy approved for heater in contact with drinking water





# APPENDICES 2

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## **Certification and regulation organizations**

- *Agence Canadienne d'inspection des Aliments (ACIA)*
- *Health Canada*
- *Food and Drug Administration (FDA)*
- *National Sanitation Foundation (NSF)*

Agence Canadienne d'Inspection des Aliments  
(ACIA)  
Évaluation des matériaux de construction  
M. J.J. Donald  
Agent de programme  
ACIA  
IRV – Division des sciences  
3851, Chemin Fallowfield  
Nepean (Ontario)  
K2H 8P9  
Tél. : (613)-228-6698  
Fax : (613)-228-8875  
Web : <http://www.cfia-acia.agr.ca>

Santé Canada  
Division de l'évaluation du danger  
des produits chimiques pour la santé  
1<sup>er</sup> Étage Est  
Centre de recherche Sir Frederick G Banting Pre  
Tunney  
Ottawa (Ontario)  
K1A 0L2  
Tel. : (613) 957-1696  
Fax : (613) 990-1543

NSF  
3475 Plymouth Road.  
P.O. Box 130140  
Ann Arbor, Michigan  
48113-0140  
USA  
Tél. : (734) 769-8010  
Fax : (734) 769-0109  
Web : <http://www.nsf.org>

FDA  
Northeast Region  
850 3<sup>rd</sup> Ave.  
Brooklyn, NY  
112323  
USA  
Tél. : (718) 340-7000  
Web : <http://www.fda.gov>

BNQ  
333, rue Franquet  
Sainte-Foy (Québec)  
G1P 4C7  
Tél. : (418) 652-2238 / 1-888-267-1476  
Fax : (418) 652-2221  
Web : [www.criq.qc.ca/bnq/](http://www.criq.qc.ca/bnq/)