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© Publisher:

Transfrigoroute International
Weissenbühlweg 3
CH-3007 Berne
Tel. (+41-31) 370 85 85
Fax (+41-31) 370 85 89
transfrigo@bluewin.ch

Author:

Dr. A. Gac
65, boulevard Exelmans
F-75016 Paris

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Ritzdirect AG
CH - 3018 Berne

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INTRODUCTION

Council Directive 93/43/EEC of 14 June 1993 on **hygiene of foodstuffs**, published in the Official Journal of the European Communities of 19 July 1993, lays down general principles for food safety and for preserving foodstuffs in good hygienic condition throughout the whole marketing chain. This Directive on the one hand asks governments of the European Union to implement legislative, statutory and administrative provisions bringing them into line with the requirements of the Directive, and, on the other hand, invites professional bodies to draw up guides for good hygiene practice.

Although this Directive relates to the preservation of all foodstuffs destined for human consumption in a wholesome condition, it is clear that non-packed or non-packed products (particularly those transported in bulk and in tankers) as well as all perishable, fresh, refrigerated, deep-frozen and frozen foodstuffs are specifically covered.

A **perishable foodstuff** is one whose initial hygienic quality and/or commercial properties are preserved longer if it is kept at a temperature different from and, in order to preserve it in a wholesome condition, lower than the ambient temperature at all times, including during transport. It should be noted that this definition can also be applied to some products of agricultural origin such as cut flowers.

In accordance with the decision taken by the Presidential Executive of Transfrigoroute International at the meeting of 15 June 1999, the Secretariat General carried out a survey of National Groups in order to determine if the Directive had been transposed into national law in the Member States of the European Union and whether any guides to good practice had been drawn up. The replies that the Secretariat received stated that statutory legislation has in fact been enacted. These reaffirm the general principles for the preservation in a hygienic condition of any food substance, whether perishable or non-perishable,

indicate the principles for checks and inspections and lay down sanctions to be applied in case of infringement. The statutory texts also make provision for the drafting by the relevant professional bodies of guides to good practice for preventing hazards to which operators involved in the marketing of foodstuffs could expose consumers, and for ensuring that all premises, cooling cells and vehicles are kept in a hygienic condition.

At present, such guides have only been drawn up in some countries and do not yet exist in countries outside the European Union.

In view of this situation, it appeared opportune to Transfrigoroute International to draw up a guide summing up the principles of and conditions for preservation of food safety, the procedures and the organisation of operations which contribute to maintaining the cleanliness of vehicles used to transport and distribute perishable foodstuffs and products subject to deterioration at ambient temperature.

This guide is intended as an aid for national professional organisations when drawing up guides to good practice for companies as they compile their internal "hygiene" documentation.

OBJECTIVE, SCOPE AND CONTENTS OF GUIDE

The general **objective** of the guide is:

- to heighten awareness of hauliers in relation to risks and hazards of poor hygiene,
- to inform them of the temperatures to be maintained to ensure that perishable goods are transported under appropriate conditions and in conformity with statutory requirements,
- to supply them with recommendations and instructions for maintaining vehicles in a hygienic condition so that products may be delivered to the consignee in a condition as close as possible to the initial one.

The **scope** of this guide is restricted to transport operations. The conditions which need to be satisfied in order to comply with the Directive are as follows:

- 1) vehicle bodies must be constructed in such a way that hygienic conditions are easy to achieve;
- 2) refrigerating units must be powerful enough to cope with varying conditions that may arise during the course of a journey;
- 3) bodies must be carefully cleaned using processes suited to the nature of the cargoes carried;

- 4) the transport temperature laid down in the contractual documents must be such that goods are maintained in a hygienic condition from loading until delivery;
- 5) the temperature of the goods must be checked when the cargo is being taken in charge and delivered;
- 6) loading must be carried out in such a manner that the commercial qualities of the goods are taken into account;
- 7) the condition of the goods and any packaging must be satisfactory;
- 8) the goods must be transported in conditions which allow the hygiene of the cargo to be maintained.

The guide is in **two parts**:

- the first sets out general information on hygiene in the transport of perishable foodstuffs;
- the second consists of checklists and guidelines for drivers.

PART ONE

GENERAL INFORMATION ON HYGIENE

This first section reiterates some fundamental principles regarding chilled or frozen perishable goods for the particular attention of company executives, quality control managers, hygiene managers, those who carry out checks and controls and personnel trainers. It contains general information and guidelines regarding methods and procedures for maintaining goods in a wholesome and hygienic condition during transport.

The **chapters** are *organised* as follows:

- Chapter 1 Food-related hazards and risks
- Chapter 2 The characteristics and capacities of mechanical refrigeration equipment
- Chapter 3 Critical points and self-checks – Conditions of Transport
- Chapter 4 Monitoring and maintaining the hygiene of equipment

FOOD-RELATED HAZARDS AND RISKS

Until relatively recently, health protection was ensured by veterinary inspections of live animals and carcasses at the abattoir and checks for possible microbial contamination of milk during the production process. Due primarily to the diversification in food production and processing sectors and the growth of markets for these products, food safety monitoring procedures have evolved.

Nowadays, we must monitor and remove hazards and risks caused by lack of hygiene during the marketing process, including during transportation. Directive 93/43/EC sets out a procedure for analysing and controlling hazards and critical points to protect the health of consumers. This method, known as HACCP (Hazard Analysis Critical Control Points) was introduced in the chemical industry in America in the 1960s and in the food industry in America in 1972, particularly for food for astronauts.

The main principles of the **HACCP method** are the following:

- 1/ Identification of hazards involved in a particular operation, such as transportation of a consignment of goods.
- 2/ Establishment of the critical points, or risks, for each operation with a view to preventing them and eliminating a hazard.
- 3/ Determination of threshold values for these critical points.
- 4/ Implementation of a monitoring system for critical points.
- 5/ Definition of action to be taken when a critical point arises to rectify the situation and to determine subsequent handling of the products concerned.
- 6/ Periodic verification of the effectiveness of these procedures.
- 7/ Recording of the measures implemented and the results observed.

1.1/ The hazards

There are three types of hazard:

- microbial hazards.
- chemical hazards.
- physical hazards.

1.1.1/ Microbial hazards

Foodstuffs of animal or vegetable origin contain organs or elements whose tissues, when whole, are usually sterile. However, these foodstuffs always carry bacteria and fungi either on their surfaces or in folds and cavities such as the digestive tract or the circulatory system. Other micro-organisms are inevitably introduced when products are handled or processed.

Almost all perishable foodstuffs which have not undergone adequate thermal treatment and been kept sufficiently isolated from the environment are subject to some initial bacterial or fungal contamination. In general, it is desirable that this contamination be kept to a minimum.

We can make a broad distinction between two types of micro-organism:

- non-pathogenic micro-organisms,
- pathogens (salmonella, listeria, etc.).

Non-pathogenic micro-organisms play an essential role in some processing industries, such as the dairy industry and in alcoholic fermentation (wine) and acetic fermentation (vinegar, sauerkraut).

Clearly, only pathogenic germ contamination leads to foodborne diseases of bacterial origin.

Whatever the initial contamination state of a food substance, the microbial hazard stops increasing once the substance has been frozen. Although low temperatures do not have a sterilising effect, as heat does, they place any micro-organisms present in a vegetative state.

Therefore, only fresh perishable products or products conserved by refrigeration, i.e. at a temperature equal to or higher than 0°C, are subject to the risk of an increase in a hazard resulting from the presence and multiplication of pathogens or from synthesis of toxins and mycotoxins by these pathogens.

At a given moment in the marketing of a refrigerated perishable product, its microbial contamination depends on:

- the nature and the stage of development of the food substance,
- initial contamination (number and species of micro-organisms present, toxins),
- what processing it has undergone,
- the effectiveness of any packing or packaging,
- the physical integrity of the packing or packaging,
- the temperature at which the foodstuff has been kept,
- the time spent at these temperatures.

One of the principal ways to slow multiplication of micro-organisms is to keep foodstuffs cold.

The following **are the temperatures** at which multiplication of the principal pathogens, which are mesophilic or psychrotrophic bacteria, stops:

- +10°C for toxicogenesis of staphylococci and *Clostridium botulinum* A and B
- +6.7°C for multiplication of staphylococci
- +6.5°C for multiplication of *Clostridium perfringens*
- +5.2°C for multiplication of salmonellae
- +3.3°C for toxicogenesis of *Clostridium botulinum E*
- +1/+2°C for multiplication of *Listeria monocytogenes*, *Clostridium botulinum*, *Yersinia enterocolitica*
- 12°C for all bacterial multiplication
- 18°C for microbial multiplication (yeasts and mildews)

There are also psychrophilic and psychrotrophic bacteria which contaminate foods of animal origin and which may remain active at lower temperatures, to -2°C.

While micro-organisms in refrigerated foodstuffs, particularly those of animal origin, continue to multiply at temperatures in the region of 0°, this process is sufficiently inhibited to ensure safety of these foodstuffs in the short and medium term.

For example, in an environment at pH 6.0 with a salt (NaCl) content of 1%, the time required for a population of *Listeria monocytogenes* to increase by a factor of 10 is 15.6 days at +1°C, 9.6 days at +3°C, 6 days at +5°C, 3.5 days at +8°C and 2.2 days at +10°C.

Fungi (mildews and moulds) are capable of multiplying within a broad range of temperatures. They can thus grow on fruit and vegetables even at temperatures as low as -1°C, near to the initial freezing temperature, and lead to deterioration, although they do not produce toxins.

Microbial contamination does not depend on temperature alone. The pH, salt content and the presence of oxygen and high humidity in the vicinity of certain food substances can be factors facilitating the development of bacteria and fungi to a greater or lesser extent.

In practice, it is accepted that the risk resulting from pathogens is sufficiently controlled at temperatures below +2 to +3°C.

1.1.2/ Chemical hazards

Chemical hazards, which are a threat to all foodstuffs, refrigerated or frozen, non-packaged or packaged incorrectly, can result from accidental contact with non-food substances, such as lubricating oil spilt on floors, pallets, walls or cooling units, or in storage premises or loading bays.

A chemical hazard can also result from the presence of residues of cleaning products or disinfectants which have

not been completely eliminated, or from the remains from a previous cargo of non-food products (return freight).

1.1.3/ Physical hazards

Physical hazards are caused by solid particles of various types and sizes.

These can be:

- air-borne dust circulated by vehicle fans or introduced via air vents or when the vehicle door is opened,
- dirt from vehicle floors, refrigerating chambers and handling areas,
- various detritus and waste, such as soil, stones, nails, insects, etc.,
- broken or torn debris, such as pieces of wood of varying sizes from boxes and pallets, bits of packing material, pieces of cardboard, broken light bulbs, etc.

1.2/ Risk assessment

The risk, i.e. the seriousness of a hazard associated with the probability of a dangerous action, is estimated by assessing the possible consequences for the health of consumers.

This assessment is carried out in respect of the hazards listed above.

1.2.1/ Microbial risks

The risk of infection is present in all perishable foodstuffs. It is therefore important to be fully aware of the issue.

If hygiene conditions are inadequate at any time before perishable foodstuffs reach the consumer, the microbial risk is increased. The effects will not become apparent until consumption of the foodstuff in question. This justifies the **traceability concept** and joint responsibility of all operators concerned.

Any interruptions in the cold chain, even short ones, particularly during transport or retail sale, are

critical points for consumer health, particularly for vulnerable members of the public with weaker immune systems (those in ill health, pregnant women, the elderly).

For frozen or deep-frozen products, this risk depends on the conditions under which the temperature has been maintained, on the state of the packing and packaging and on the cleanliness of vehicles and storage premises. When the cold chain is maintained normally, this risk is kept under control.

For fresh or refrigerated foodstuffs, the products exposed to the greatest microbial risk are chilled animal products, chilled meat and fish-based preparations and raw vegetables which are factory-prepared (peeled, washed, cut, sliced, chopped or cut into small pieces), intended to be consumed as they are (salads, grated carrots), and for which the storage conditions are similar to those for fresh meat.

All of these products provide a substrate to facilitate development of pathogens when they are kept for too long at temperatures higher than those necessary to prevent these germs from multiplying. These may prove dangerous to consumers if contamination or the presence of toxins does not affect or affects only slightly their organoleptic properties (notably taste and smell).

However, bacteria do not cause deterioration in whole, non-senescent fresh or chilled fruit and vegetables. These products can harbour fungi and moulds if their skin has been damaged and when they reach senescence. However, they do not constitute a hazard because in practice people do not consume rotten or mouldy fruit and vegetables.

When taking in charge a batch of chilled perishable foodstuffs, hauliers do not know how high the risk associated with the product's contamination is, nor do they know its "microbial history".

The risk depends on the nature of the foodstuff, the extent of initial contamination, how it is packed or packaged and on the succession of intervals of time spent at different storage temperatures as laid out in section 1.1.1. Unless a cargo has significantly changed (odour, exudation, stains and discoloration of packing, etc.), the only indications available to hauliers are the temperature of the products at the time of loading, and the dates of production (or manufacture) and use-by dates as printed on the packing.

During transport operations, the increase in risk can be estimated with reference to the rate at which the population of micro-organisms, or preferably the population of certain pathogens, multiplies.

To limit any microbial risk, cargoes should be kept at a suitable temperature and transport times minimised.

The microbial risk may be increased if different types of goods, particularly perishable goods, are *transported together*, at the same time or in the same vehicle or compartment (**cross-contamination**).

This is also the case if a perishable foodstuff has no packing or if its packaging is inadequate or in a poor condition, because additional contamination can result from contact with air of varying degrees of humidity and from contact with other elements in the environment, such as packaging, the floor and walls of the vehicle, etc.

1.2.2/ Chemical risks

Chemical risks are caused by negligence.

They can be caused by:

- incorrect cleaning of vehicles, for example incomplete disinfection (insufficient rinsing),
- or errors of loading, such as the transportation of non-food products (for example, cosmetics or household cleaning products) and perishable foodstuffs, even those which are packaged, in the same vehicle.

Another sort of chemical risk is due to carbon dioxide and/or ethylene being given off in consignments of fresh or chilled fruit and vegetables. This risk may result in some undesirable physiological changes in the produce.

1.2.3/ Physical risks

Physical risks are likely to occur when food products, in particular frozen, deep-frozen or chilled perishable foodstuffs, have not been packed or appropriately packaged. The packaging of products to be transported is therefore a safety factor.

THE CHARACTERISTICS AND CAPACITIES OF MECHANICALLY REFRIGERATED EQUIPMENT

In order to transport perishable foodstuffs in sanitary conditions, hauliers should ensure when purchasing a new mechanically refrigerated vehicle that the vehicle satisfies certain capacity-related and design-related conditions.

2.1/ Refrigerants and foam expanders

Generally, it is a good idea to have all refrigeration units within a transport company using the same refrigerant.

The legislation which resulted from the Montreal Protocol and its amendments led to a ban on the use of halogenated and chlorinated fluids derived from methane or ethane and in particular CFC (R-12 and R-502) and HCFC (R-22) refrigerants and insulating expanding gas (R-11). *You should not buy a unit using CFCs or HCFCs or bodies insulated with R-11 expanded foam.* Halogenated refrigerating agents, either R-134a or mixtures, azeotropic or not, of two or three non-chlorinated fluids (which do not affect stratospheric ozone) are available to replace these proscribed fluids. These include R-404a and R-410a. In recent years, cooling unit manufacturers have perfected and started to manufacture new equipment which uses these replacement fluids. Likewise, new insulants expanded using pentane or cyclopentane, fluids which have no effect on the ozone layer, are available, but these materials are less efficient than those expanded using R-11.

Finally, taking into account the Kyoto Protocol, and the regulations currently in force and in preparation internationally in relation to control of greenhouse gas emissions (cf. Annex 1), and since all halogenated refrigerants contribute to the greenhouse effect to some extent, it would be *preferable to choose refrigerants with a relatively low GWP (global warming potential).*

2.2/ The refrigerated body

As well as comprising insulation with the effectiveness defined by the coefficient of heat transfer, K , which must be lower than or at most equal to the ATP statutory limit ($K < 0.7 \text{ W/m}^2\text{°C}$ for normally insulated equipment and $K < 0.4 \text{ W/m}^2\text{°C}$ for heavily insulated equipment), the body should be constructed in such a manner as to allow proper cleaning and disinfection to take place. Clearly the constraints involved here depend to a greater or lesser extent on transport temperature, the nature of the goods carried and any packaging used. In fact, because manufacturers are unaware of the use to which a vehicle will ultimately be put, and because refrigerated bodies are manufactured in large series runs, refrigerated bodies are designed and manufactured to comply with the most stringent hygiene requirements, which are those related to the transport of fresh or chilled foodstuffs which have neither been packed nor packaged, such as animal carcasses.

The following requirements must be met:

- The **interior surfaces** which could come into contact with goods must be of a type suitable for food contact applications. So, for example, meat hooks should be made of stainless steel rather than electroplated steel. Similarly, the interior of milk tankers should be made of stainless steel.
- The interior surfaces should be chemically neutral with regard to goods and detergents.
- They should not discolour products (aluminium blacken meat).
- They should be smooth and have no bumps which could damage goods as a result of friction or scraping.
- They should not flake.
- They should be watertight in order to facilitate hosing and rinsing.

- They should not contain any sharp angles or any attachments where soiling, which would be difficult or impossible to remove, could accumulate.
- Rails on the floor and walls should be easy to clean.
- **Door** and bulkhead **seals** should be flexible and smooth (no brush-type seals) and easy to clean.
- In order to limit the penetration of radiant heat when a vehicle is stationary and is exposed to the sun, surface materials for the roof and the walls should be white or at least light-coloured. These **colours** are the most effective for reflecting the shorter wavelengths of solar radiation while dark colours, particularly black, and dirt stuck to the walls absorb some of this radiation, converting it into heat so that the temperature of the exterior of the vehicle rises above the ambient air temperature.
- Refrigerated bodies should be equipped with at least one drain so that **washing water** can be released.
- The **defrost water** pan can become contaminated, as can drains leading to the exterior. These should be fitted with a drain hose valve to prevent penetration of exhaust fume odours.

2.3/ The refrigeration unit

The following three points in particular need to be taken into consideration in this regard:

- the kind of refrigerant used (cf. § 2.1),
- refrigerating capacity and safety coefficient,
- the interior ventilation airflow or air circulation.

2.3.1/ Refrigerating capacity and safety coefficient

It is important to distinguish between the safety coefficients prescribed by law and those applied in practice.

From the legislative perspective, the ATP agreement requires that in order for a refrigerated truck to be certified for six years without a tunnel test, the refrigerating capacity of the unit in steady-state operation must at least equal the heat exchange through the walls at an ex-

ternal temperature of 30°C, multiplied by the regulation safety coefficient of 1.75.

For ATP approval to be renewed after six years, the same safety coefficient applies. However, a simplified approval test valid for a three-year period is allowed. This test verifies that the unit is capable of cooling the body from the warm ambient temperature to the temperature limit for its class in less than six hours.

Taking account of the service life of a unit and the ageing of the insulation, it is up to the haulier to acquire a suitably powerful unit to pass the pulldown test for subsequent applications for re-approval (after nine years, twelve years, etc.).

In practice, the safety coefficient is estimated to calculate the maximum capacity of the refrigeration unit. This capacity depends on the heat transfer through the walls when the unit is in operation, i.e. it depends on the external temperature, the speed at which the vehicle is moving, how airtight the walls are and the kind of service being provided.

As the correlation between the operating conditions and the cooling unit capacity is often poorly understood, it is described in detail below.

The speed of the vehicle has a limited effect. If the walls of a vehicle have been carefully sealed, and as the external convection coefficient is very high when the vehicle is on the road, the K coefficient is 4 to 5% higher than the reference value measured in the testing tunnel.

How airtight the body is can be a very important factor for a vehicle where the air inside is renewed.

For bodies whose walls are not fully airtight, the flow of new air, which is negligible in the tunnel test, increases with the speed of the vehicle.

If, when in use, the hourly air renewal rate is R times the volume V (in m³) of the empty body and if the average value of the volume heat of the humid' air is C (in J/m³.°C),

the hourly intake of heat q from air renewal is in degrees Celsius of temperature variance:

$$q = R \times V \times C \quad (\text{in } J/^{\circ}C.h)$$

which corresponds to a capacity p of:

$$p = R \times V \times C / 3600 \quad (\text{in } W/^{\circ}C.h)$$

The reference coefficient K for the body (that is, the value measured at the test station) is increased by ΔK , so that:

$$\Delta K = p / S = R \times V \times C / 3600 \times S$$

The volume heat of the humid air being $C \# 2000 J/m^3^{\circ}C$, and given that the ratio of the volume V to the total surface S of the walls is close to 0.5, the increase ΔK of K is:

$$\Delta K \# R \times 0.5 \times 2000 / 3600. \# R \times 0.28 \quad (\text{in } W/m^2.^{\circ}C)$$

The following conclusions can be drawn from the above: The coefficient K of heavily insulated equipment which when measured in a tunnel is equal to $0.40 W/m^2^{\circ}C$ is increased by 70% if the rate of air circulation is equal to the volume of the empty body per hour.

The lower the coefficient K , the greater this increase. Fortunately modern insulated boxes which are properly maintained are practically airtight.

However, the following should be noted:

- If the door is opened during a journey, even for short periods of time, air entering from the outside significantly increases the heat entering the body. This is the case for delivery to a number of different destinations and particularly to retailers.
- It might be worth doubling up the door on delivery vehicles, especially for frozen or deep-frozen foodstuffs, with a curtain of broad, flexible plastic strips which reach right down to the floor.
- The air temperature in a refrigerated vehicle, particularly a class C vehicle, cannot be guaranteed once the door has been opened for the first time.

Vehicle bodies are frequently subject to stresses of a thermal nature (severe temperature variations) and those of a mechanical nature (vibrations). This results in progressive deterioration in the efficiency of the insulation, or ageing. The **coefficient of ageing** is about 5% per year.

In other words, after N years of service, the coefficient K of a new unit is multiplied by a factor of $1 + N \times 0,05$.

Depending on the kind of services to be provided, the size of the body and the total intended service life of the unit, the safety coefficients applied in practice (refrigeration unit power W_0 in relation to the heat entering through the walls $K \cdot S \cdot \Delta\theta$ are clearly higher than the regulation coefficient of 1.75, and are between 2.5 and 5, or even higher.

Manufacturers of mechanical refrigeration equipment refer to sets of data and special charts to estimate the correct safety coefficient to be applied for the intended service conditions of the vehicle as specified by the vehicle operator.

To conclude, hauliers with an awareness of the importance of

1/ providing enough refrigerating capacity for all foreseeable operating circumstances over a service life of nine or twelve years

2/ carrying out regular preventative maintenance of the body and the refrigeration unit should easily pass the simplified pulldown test for repeat ATP approval.

2.3.2/ Internal ventilation

While goods are being transported, it is important that the air circulating and in contact with the goods is homogeneous in terms of temperature and composition. This means that fans should provide sufficient airflow, that the air must be well distributed on and through the cargo and that there should be no "short circuit" in air circulation.

The airflow of the fans is often defined by the **coefficient of air circulation**, which is the hourly volumetric flow divided by the volume of the empty body.

For practical purposes, it is recommended that the air circulation coefficient be selected at 60 or higher, as is usually the case.

¹ Volumetric heat of humid air is dependent on a number of parameters, notably the water vapour content of the exterior air. Here we use an average value which is sufficient to demonstrate the influence of air circulation on the heat balance of a refrigerated body.

One of the causes of damage to cargoes is an uneven distribution of air, which can arise even when ventilation airflow is sufficient. Badly ventilated sections of the cargo are poorly refrigerated. The temperature of goods affected rises, resulting in rejection by the consignee.

It is therefore advisable, particularly when beginning to use a new unit, to check the **quality of air distribution**.

This can be tested by placing thermometric sensors at different points of a cargo normally consisting of frozen foodstuffs and refrigerated vegetable products. These may be placed on the upper part of the body, at the blower outlet, in the middle and at the back of the load, at the sides, in the stacks in the case of loads of refrigerated foodstuffs and at the refrigeration unit intake vent. The measurements obtained will indicate potential problems and suggest possible corrective measures.

In general, air distribution is improved:

– if the intake vent is piped.

– if, in larger volume vehicles, semi-trailers and multi-temperature trailers in particular, the range of the fans is extended by one or two air ducts pumping refrigerated air onto the cargo in the first and second thirds of the length of the cargo hold.

2.3.3/ Temperature checks

As air temperature must be monitored throughout a trip, the body should contain a thermometric appliance which:

- contains a device in the driver's cab which indicates the interior temperature and sounds an alarm in the event of a malfunction or deviation from the requisite temperature (transit temperature)
- measures and records (compulsory for low temperature transport) the interior air temperature. The appliance must have (in each compartment for multi-temperature vehicles) one sensor at the discharge vent and one at the intake vent. These sensors must be connected to a temperature logging device.

These thermometric units must be calibrated periodically to ensure their accuracy.

CRITICAL POINTS AND SELF-CHECKS – CONDITIONS OF TRANSPORT

In order to ensure that cargoes of perishable foodstuffs are preserved in a hygienic condition, specific operations and checks are carried out when a cargo is loaded, at its point of delivery and during the journey.

Both when the goods are taken in charge and on unloading, observations and measurements are taken in the presence of both parties by the haulier and other responsible individuals, appointed by the consignor or consignee and who have the skills, the qualifications and the authority to make the appropriate decisions. In order to observe **the principle of traceability** and **the principle of temperature maintenance** during transport, the observations, measurement results, readings and evaluations, as well as any anomalies, faults or errors encountered are recorded in written form or otherwise registered as appropriate.

In the event of a dispute, an expert should be called in. All written or recorded information is usually filed and kept for one year. Any experts and the administrative or judicial authorities may be provided with them when requested.

During transport operations, the following recommendations are to be observed:

3.1/ Taking in charge of the cargo

- Leave the refrigeration unit on continuously after leaving the depot to cool the body, for a few hours if possible, before loading.
- Before loading, check that the goods are in good condition. If they are packed, the packing should not be crushed or bent out of shape and should be appropriate for the product concerned. For chilled fruit and vegetables, the packages should have holes large enough to allow air to circulate freely.
- Check the use-by dates on the labels.
- Measure the temperature of the products (cf. § 3.2.2) and ensure that it is the same as that given in the contractual documents. This check should be carried out with particular care in cases where the goods have been stocked in the open air. The procedure for measuring the temperature is described in Annex 2, Appendix 2 to the Agreement on the International Carriage of Perishable Foodstuffs (ATP), reproduced in Annex 2 to the present guide.
- In general, you should check the temperature of a few products from each batch at the beginning, during and on completion of loading.
- Temperature sensors should be placed between two packages. Never pierce the packaging of vacuum-packed goods.
- The temperature inside a package should not be measured by the driver, to avoid any risk of further contamination or dispute. In the event of a major divergence of opinion, this measurement should be carried out by the Quality Control manager in the presence of the driver and the customer.
- In cases where a vehicle or a compartment is loaded with different chilled products, ensure that there are no incompatibilities between these products. There may be incompatibility in terms of temperature, reaction to ethylene or the transfer of odours (cf. Annex 3 to this document). In particular, the physiological activity of certain fruit and vegetables can be increased and their shelf life reduced if ethylene is present, even in small concentrations. Ethylene is an odourless gas given off by certain plants, particularly when they ripen, in quantities which depend on the type and variety concerned. In practice, it is not advisable to carry a mixture of different types and varieties of vegetables which react differently to ethylene. Ethylene filters are available, though their effectiveness is not documented.

- Lastly, odours emitted by certain products could have an effect on other products, particularly those of animal origin, such as butter.
- Foodstuffs which, having been stored at transit premises before being transported, are ripening, or could have ripened, should be carried separately from other products to stop them causing other products to deteriorate.
 - Similarly, in order to avoid cross-contamination, treat separately any batches of goods which are clearly in a poor condition, which could soil other goods, or which are exuding.
 - Any batch with torn or damaged packing should be rejected instead of being loaded.
 - Turn off the refrigeration unit while the door is opened.
 - Load the vehicle as quickly as possible.
 - Whatever the cargo, always keep a space of about 3 cm between the side walls and the packages for better ventilation.
 - Do not block the air intake vent.
 - Never exceed the load height limit.
 - Containers of frozen or deep-frozen foodstuffs, whether on pallets or not, should be stacked close together within the vehicle. However, where batches of fruit and vegetables are concerned, there should be enough space between the packages, the stacks and the walls to allow air to circulate freely among the goods.
 - Once loading is complete, close the door of the vehicle and switch the refrigeration unit to automatic, with the thermostat set to the appropriate temperature. Depending on the ambient temperature and the nature of the cargo, it can take between one and three hours to pull down the air temperature within the body of the vehicle to the setpoint.
 - The setpoint temperature depends on the kind of merchandise carried (cf. § 3.2.2.3).
 - According to the seriousness of any observations made, inform the consignor of any reservations you might have with regard to the condition of a cargo or of one of its constituent batches. This may be the case with products that are not loaded at the requisite temperature or with damaged, torn or soiled packing or packaging.

- If damage or loss is likely during delivery, immediately inform the client and the various operators concerned, in particular the supplier or manufacturer, and request that the owner of the goods take the necessary action.
- In the event of a legal dispute, request the intervention of an expert.

3.2/ Transportation of the goods

3.2.1/ General recommendations

- As the cargo must be kept at the requisite temperature or setpoint, set the refrigeration unit to automatic operation for the whole of the journey.
- Switch off the unit before opening the door (for loading or delivery) or while the vehicle is stationary for short periods of time if any regulation relating to noise or air pollution is in operation locally.
- Periodically check that the air temperature inside the vehicle is correct. This temperature is measured by a thermometer which can be read from outside the vehicle, and wherever possible from inside the driver's cab. For cargoes of frozen or deep-frozen products, the air temperature should be recorded (cf. Annex 4 to this guide).
- If the refrigeration unit malfunctions, the driver should be alerted by an appropriate signal. If an alarm system is not available, the haulier should check periodically that the requisite temperature is indeed being maintained in the body.
- If the cooling unit breaks down, take all action necessary to keep the cargo in a hygienic condition; in particular, shut down the refrigeration unit's fans and, in order to minimise heat entering the body, do not open either the door or the vents.
- The thermal inertia of full loads is high in relation to the hourly heat pick-up through the walls. This means that even in hot weather, a period of some six to seven hours from when the unit shuts down is available to take the action necessary to safeguard the goods, provided the doors are not opened. This period should be as short as possible when chilled foodstuffs preserved at tempera-

tures between 0 and +2 or +3°C are being transported. The risk of pathogens multiplying is highest at these temperatures.

- If the vehicle is loaded or unloaded at a number of different sites, the itinerary should take the shortest time possible. This usually corresponds to the shortest distances between delivery points.
- For each partial delivery, the unit should be switched off while the doors are open. This should be for as short a time as possible.
- Check that the interior temperature actually falls once the door is closed unless the evaporator is being defrosted.
- The same check should be carried out after defrosting.

3.2.2/ Determining transport temperature

The recommended transport temperature or the **temperature required** by the customer is the temperature inside the product. As the cargo is, in principle, at a stable temperature when it is taken in charge by the haulier, it is the haulier's responsibility to maintain the temperature of the products. To do this, the refrigeration unit must be switched on and the thermostat set to the **setpoint temperature**, which is not necessarily the temperature of the products.

We will now therefore look at the recommended values for interior product temperature and thermostat setpoint.

3.2.2.1/ Interior product temperature

3.2.2.1.1/ Interior temperatures for frozen and chilled foodstuffs and ice-cream products

The transport or setpoint temperatures for frozen or deep-frozen foodstuffs and ice creams are those set out in Annex 2 to the ATP and reproduced in Annex 5 to the present guide.

3.2.2.1.2./ Interior temperatures for refrigerated foodstuffs

When transporting chilled foodstuffs, it is advisable to distinguish between those which are inert and those which are living organisms.

In order to limit the multiplication of pathogens on inert refrigerated foodstuffs (particularly meat), the interior temperatures indicated below, i.e. maximum temperatures, must not be exceeded in transit.

– The temperatures recommended for transport of certain inert chilled products, the majority of which are of animal origin, are given in Annex 3 to the ATP, which is reproduced in Annex 6 to the present guide. Required temperatures for any chilled product not mentioned in Annex 3 to the ATP are as follows:

- +2°C for minced meat and for factory-prepared raw vegetables (peeled, washed, cut, sliced, chopped or cut into small pieces) and intended to be consumed as they are (salads, grated carrots)
- +4°C for processed or manufactured meat or fish-based products, such as cooked dishes or catering preparations
- +6°C for fresh dairy products
- +10°C for semi-preserves.

– If the temperature specified by the client for the goods in question is substantially higher than that indicated below, state your reservation when taking the goods in charge.

– Since the storage life for these refrigerated goods is from a few days to two or three weeks (cf. Annex 7), transport times should be kept short (usually less than one or two days). In order to maintain their suitability for sale, there should be no delay in the transportation of the goods.

Unlike when inert chilled products are transported, the inner temperature for whole live fruits and vegetables is the lower limit below which vegetables should not be kept, at least not for long periods of time.

– Whole fruit and vegetables, whether fresh or refrigerated, as well as cut flowers and ornamental plants, are living organisms at harvest and remain so as long as they are not chilled to a temperature lower than that at which they begin to freeze.

– Plants may be more or less sensitive to cold. Below a set

temperature, or a **critical temperature**, usually between 0°C and +16°C, some types or varieties may undergo physiological damage or be otherwise affected by the cold.

- As whole fruit and vegetables damaged by poor preservation conditions are not toxic, the temperature at which they should be marketed is not laid down by law. These temperatures are set by the client and are written on the labels or on the contract documents. In the absence of this information, they can be found in reference works such as "Recommended conditions for the preservation of perishable refrigerated products" published by the International Institute of Refrigeration (IIR) (cf. Annex 8).
- Do not transport fruit or vegetables at a temperature which has not been verified as suitable for the cargo.
- Express your reservations when taking charge of the cargo if the temperature requested by the client for a load of fruit or vegetables is lower than that indicated in the technical documentation.
- If a cargo comprises a mixture of different types of fruit or vegetables, the requisite temperature should be that of the product which is most sensitive to the cold. For example, for a consignment of pears and green bananas, the temperature should be the critical temperature of the bananas, in other words +12°C.
- When naturally cold-resistant fruit and vegetables are transported over long periods of time (several days), periodically renew the atmosphere inside the vehicle, preferably at the coolest times of the day (at night or early in the morning) by briefly opening the door (for about one minute) keeping the refrigeration unit fans on – unless the unit is equipped with a device to supply fresh air. This is because fruit and vegetables breathe. They burn sugars, consume oxygen and give off carbon dioxide and heat. If during transport the oxygen content of the atmosphere falls too low, or the carbon dioxide content rises excessively, respiration can be replaced by fermentation. Fermentation is the incomplete combustion of sugars with associated accumulation of ethanol in the tissues. Fruit and vegetables which have fermented are

no longer saleable.

- Circulation of fresh air is also recommended to discharge ethylene.

The required temperature for **live sea creatures**, that is fish, shellfish and molluscs, is between +4 and +6°C.

3.2.2.3./ Setpoint temperatures

The operation of the refrigeration unit is controlled by a thermostat, with a temperature sensor usually positioned at the refrigeration unit air intake vent.

Therefore, the thermostat temperature, or setpoint (Θ_c), will be the maximum temperature present in the body, provided that the air distribution is correct. Depending on the nature of the merchandise (cf. § 3.2.2.2), the setpoint temperature is set according to the temperature, Θ , requested by the client.

- For *frozen or deep-frozen goods*, the setpoint temperature, Θ_c , is generally less than that requested by the client, Θ , approximately 4 à 5°C. It is equal to or less than -25°C for ice-cream products.
- For refrigerated goods, superficial frost and physiological damage must be avoided. Also, for some loads and depending on the mode in which the refrigeration unit is operating, the discharge air temperature, Θ_s , at the outlet of the refrigeration unit, which is the lowest temperature present in the cargo hold, is the operative temperature. The effects of this temperature are limited when the goods are packaged.
- For animal products, meat and fish whose initial freezing temperature is -1.1°C, the air discharge temperature, Θ_s , may be around -10°C. In practice, there is no need to check this as superficial frost has no effect on the preservation of these products.
- Frost destroys the tissues of fruit and vegetables. The discharge air temperature Θ_s should not be lower than the initial freezing temperature of the foodstuffs, which is between -1.5 and -5°C depending on the type of product and its physiological condition.
- For plant products which are not very sensitive to the

cold the required temperature, Θ , will be between 0 and +1°C. To avoid any risk of frost, some refrigeration systems have a sensor monitoring the air discharge temperature, Θ_s , in order to adjust cooling capacity as appropriate.

- For plant products which are sensitive to cold, the requisite temperature, Θ , should be the critical temperature, that is, that below which the produce may be damaged (for example +12°C for bananas). The setpoint temperature, Θ_c , is usually equal to Θ . This means that for these products, the cargo is transported at temperatures slightly above the required temperature.

3.3/ Delivery of the cargo

- On arrival at destination, the cargo should be unloaded without unnecessary delay and as quickly as possible.
- When delivery is being made to a supermarket, the refrigerated vehicle should be unloaded as a priority. If this is not possible, the refrigeration unit should be left running for as long as possible until unloading begins.
- Switch off the cooling unit and fans before opening the door.
- The receiving agent checks the condition of the load and records the temperature of the goods. The procedure for measuring the temperature of the goods is that described in Annex 2, Appendix 2 to the ATP and reproduced in Annex 2 to the present guide.
- If the goods have seriously deteriorated, the delivery may be refused, particularly if the temperature of the goods when measured is significantly higher than the setpoint temperature.
- If the air temperature was recorded while the goods were being transported, the reading is a good, but on its own insufficient, reason for deciding to refuse the goods, unless the measured temperature of the goods confirms the earlier reading. If the goods are unloaded at several different sites, the air temperature will be higher than the setpoint temperature after the first one or more stops.

- In the event of actual or probable loss or damage, immediately inform the client, and, if necessary, the different operators concerned, particularly the supplier or manufacturer, and request that the owner of the goods take the necessary action. It is in the haulier's interest to inform its insurance company of the situation.
- In the event of a legal or other dispute, immediately request the intervention of an expert.
- When the receiving agent and the driver have completed all the reports jointly, the receiving agent should inform the haulier of any reservations in writing.

3.4/ Return freight

- Products carried in a temperature-controlled vehicle should not present any sanitary hazard for subsequent consignments of perishable foodstuffs or cause contamination or deterioration, in particular to the interior surfaces of the body.
- No odours should emanate from the load. Odours could be absorbed by the interior surfaces and passed on to perishable foodstuffs, especially chilled perishable foodstuffs.

Under no circumstances should dangerous materials be accepted.

- Certain European countries may have in place national health legislation of varying degrees of stringency regulating goods permitted as return freight. Hauliers are required to conform to such legislation.

MONITORING AND MAINTAINING THE HYGIENE OF EQUIPMENT

Hygiene control in transport does not imply that no shortcomings or deficiencies exist but that, if any such arise, it is possible to identify them without delay, pinpoint their origin, define the necessary solutions to implement these remedial measures and check the effectiveness of these solutions.

The function of all these actions taken together is to preventively maintain hygiene standards.

One of the requirements for preservation of wholesomeness of perishable foodstuffs throughout the entire transport process is that the refrigerated bodies and tankers be regularly maintained in such a way that adequate cleanliness can be re-established whenever necessary.

In order to do this, cleaning and disinfection is carried out according to a cleaning plan drawn up and implemented by the company hygiene officer. This work is followed by self-checks, i.e. checks carried out by the company itself, independently of those carried out by the health authorities.

The hygiene officer is responsible for managing cleaning operations to the best of his ability, but, so as not to be required to evaluate his own work, is not responsible for self-checks. Self-checks are carried out by the hygiene inspector.

The positions of hygiene officer and hygiene inspector are usually part-time roles exercised by members of the company's staff.

They are an integral part of the company's quality assurance programme.

Cleanliness of a refrigerated vehicle can also be inspected by the client or its representative.

During transport, the level of cleanliness of a vehicle decreases at a regular rate and on occasions spora-

dically. The hygiene officer must therefore monitor the company's fleet on an ongoing basis so as to create and maintain an environment which does not represent a health risk to goods.

4.1/ Cleaning and disinfection

If foodstuffs are to be kept in a hygienic condition during carriage, vehicles must be sufficiently clean at all times. This means that they should be cleaned before loading of every consignment.

The cleaning and disinfection procedures followed will depend on the type of goods carried on the vehicle's previous run, and should be organised in such a way that optimum effectiveness is achieved. The type of cleaning operation chosen must not jeopardise the safety of foodstuffs carried as a result of detergent residues, insufficient rinsing, etc.

The purpose of cleaning and disinfection is to restore the vehicle and certain accessories (such as pallets) used during transport to a satisfactory hygienic condition.

Every cleaning operation should be logged in a signed and dated document. This document must be stored in the company's hygiene file (cf. § 4.3).

Important: As was noted in the introduction, this document only deals with vehicle hygiene. Refrigerated loading docks are also a part of the transport process, and the hygiene officer at these facilities should apply the recommendations of this chapter as appropriate in their facility.

Cleaning consists of removing any matter which represents a physical or chemical risk, such as dust, waste, detritus, soil, pieces of products or packaging, insects, exudates, dirt, grease, etc.

- Depending on the size of the particles and how strongly they adhere to the walls of the refrigerated body, they should either be removed by dry brushing (with a hand brush or vacuum cleaner), by scraping (with a brush or a scraper) or by washing with cold water using a medium- or high-pressure spray, and then brushing. Potable water should be used for this purpose. After washing, all residual moisture should be removed.
- Particular care should be taken when cleaning corners, rails, and more generally any part of the cargo hold where grime is likely to collect.
- The same applies to the evaporator. Circulating air can deposit dirt on the surfaces of the duct and evaporator blades.
- It is advisable to make available the materials required for collecting, storing and removing waste materials, as well as a washing area with a drain for waste water. This area is indispensable because the vehicle's external surfaces need to be kept clean.
- Cleaning only (no washing) will generally suffice following the carriage of packaged foodstuffs.

Disinfection is carried out after cleaning. The purpose of disinfection is to reduce the microbial contamination of a transport body to such a level that hygiene is ensured. This is done by using the appropriate physical processes or chemical agents.

- Disinfection **generally** involves washing using a detergent or scouring agent. If necessary, the surface to be cleaned is wetted for a time sufficient to allow any substances still adhering to the walls to detach or dissolve. The surfaces are then rinsed with water and dried manually using a squeegee.
- It is a good idea to use a different detergent product each time a vehicle is disinfected, to prevent the proliferation of resistant bacterial strains.
- Attention should be paid to doses and conditions of use (duration of application in particular) for each product as these vary.
- If the walls of a refrigerated body are not in direct contact with the foodstuffs and if there is no danger that

the surfacing materials will be corroded or that the floor will be made slippery, no rinsing need be carried out. The detergent can thus have a lasting effect. However, this applies only if no odour remains, particularly from the detergent.

- However, if it is possible that the foodstuffs can come into contact with the walls, then all surfaces must be rinsed with potable water.
- In practice, disinfection applies to vehicles carrying unwrapped, unpackaged foodstuffs such as meat and fish.

Tankers used to transport liquids, powders or granulates and tanker accessories such as piping, pumps, etc., should be cleaned and disinfected after each run. The procedure followed will be that generally used in the industry and will vary depending on the product in question.

- In particular, dairy tankers used for collecting or transporting milk between factories should be cleaned after each delivery with detergents and hot water as per the procedure for cleaning dairy equipment.
- It should be easy to fully empty tankers of residual products and detergents.
- Automatic cleaning equipment is recommended.

4.2/ Cleaning and disinfection products

Detergents and disinfection products should be chosen by the person in charge of vehicle hygiene, taking into account the following general recommendations:

- The products chosen should not corrode the vehicle walls.
- Preferably they should not foam, or foam very little.
- They should be effective when used cold and act quickly.
- If possible, it should be possible to leave vehicles unrinsed after treatment with detergent.
- Special attention should be paid to the characteristics and properties of the detergent as described in the relevant specifications, in particular as regards their composition and suitability for use in various sectors of the food industry.

- It is preferable to use only products approved by the national authorities responsible.
- The results of any standardised tests carried out on products used in disinfection operations should also be known, and their safety datasheets should be available.

Finally, it is important that stocks of cleaning equipment and supplies are managed carefully.

- Sufficient stocks of cleaning equipment, products and detergents should be available so that no delay in or change to the cleaning plan for the vehicles has to be made.
- Depending on quantities in store, detergents, which are dangerous products, should be stored in a location that complies with the safety requirements outlined in the manufacturer's specifications and any environmental recommendations.
- In addition, staff should use detergents only when wearing protective clothing as recommended by the manufacturer (gloves, goggles, mask, overalls, boots).
- First aid equipment should be to hand (eyewash, shower).

4.3/ Cleaning plan and self-checks

The cleaning plan defines what work needs to be carried out and its frequency.

It depends on the nature of the goods, their packaging and the transport temperature. It is obvious that vehicles loaded with frozen or deep-frozen foodstuffs or goods that are refrigerated, wrapped or packaged in secure containers, such as apples in a box, entail far fewer hygiene risks than cargoes of unpackaged chilled foodstuffs of animal origin, or such products in open containers, such as animal carcasses or fish under ice.

The cleaning plan specifies:

- the points to be checked, by regular inspection of the bodies. For packed foodstuffs, a visual check and cleaning are sufficient. For other perishable products, the visual check is followed by disinfection,

- the frequency of cleaning or disinfection,
- the target value, expressing the ideal cleanliness value,
- the cleanliness differential, i.e., the permissible deviation from this target value within which the state of cleanliness will be considered satisfactory. The notion of a differential implies the existence of "acceptable" and "unacceptable" limit states.

Note that regular cleaning of pallets can help maintain the cleanliness of refrigerated bodies.

Cleanliness **self-checks** or tests, which are the responsibility of the hygiene inspector, should be carried out in accordance with the following recommendations:

- Checks should be carried out after washing and disinfection and during transport.
- As disinfection is no guarantee of cleanliness, microbiological checks should then be carried out in case of doubt.
- Corrective action based on the answers to the five questions Who? What? Where? When? How? is to be taken each time an unsatisfactory result is obtained.
- All corrective action should be checked to ensure its effectiveness.
- If the same problem is observed repeatedly, more careful and frequent checks should be carried out to determine the origin or cause of the problem and to define the remedies to be applied.

In the same way that the principle of traceability requires temperature records and transport documents to be archived, the company should keep all useful information concerning vehicle cleaning and disinfection.

All this information constitutes the company's "hygiene file".

The hygiene file comprises:

- the cleaning plan,
- amendments to this plan (dates and reasons),
- the procedures for and frequency of cleaning and disinfection,
- the results of checks carried out and corrective action taken,

- a record of trips undertaken and cleaning carried out in the body of each vehicle,
- any other information relating to vehicle hygiene.

4.4/ Cleaning and driving staff

Drivers should be well-informed about procedures for taking in charge, loading and handing over goods to the consignee. They should be aware of their responsibilities to the company which they represent and to their customers. They must also:

- be polite and courteous
- have good personal hygiene
- wear clothes which are appropriate to the kind of merchandise being taken in charge. This is particularly important for unprotected products such as animal carcasses.
- remove the clothing used for loading products which have a high risk of infection (meat, for example). These clothes should only be worn for loading and unloading.
- finally, the hauliers must clean the body after each complete unloading of the vehicle.

The vehicles are cleaned and disinfected by **cleaning staff**:

These are

- either specialised company personnel;
 - or an outside cleaning contractor.
- In case of the former, the members of staff must have undergone theoretical and practical training in hygiene maintenance. The programme for this training should form part of the cleaning plan.
 - If an outside company is used, the contract should clearly state the expected results.
 - Finally, cleaning staff should be made aware of the risks involved in cleaning and disinfection work, such as burns, irritation, suffocation, injuries, falls on wet floors, etc.

PART TWO

DRIVER CHECKLISTS

As mentioned in chapter 3, checks and tests should be carried out when goods are loaded, when they are delivered to their destination and during the journey, to ensure that transported perishable foodstuffs remain in good condition and in particular to maintain the required temperature.

The responsibility of the driver is no longer limited to driving the vehicle. He is the representative of his company and has a duty to protect its business interests.

It is the driver's responsibility in particular:

- To carry out inspections and take measurements together with the responsible persons (generally the manager of the loading facility) designated by the consignor or the receiving agent.
- To collect all readings, observations, measurements and, in general, any observations which are, by their nature, recorded in writing on the transport documents (waybill, shipment sheet) or otherwise logged.
- In the event of a dispute, to call in an expert.
- To make the task of the driver somewhat easier, simple, clear checklists are set out below.
- Drivers may then consult the checklist for a particular stage of the transport process and be sure that they have taken all decisions and action appropriate for their

particular circumstances.

- In other words, by following the guidelines set out in these checklists, it is likely that all transport operations will be carried out correctly and without omissions.
- These checklists must, of course, be adapted by transport firms in line with their own activities and legislation in force locally.

The following checklists are set out below:

- Leaving the transport company's premises
- Receiving the cargo
- Transport by road of the cargo
- Cargo delivery
- Vehicle cleaning procedure
- Vehicle cleaning certificate
- Specifying a cleaning product

1. WHEN LEAVING THE TRANSPORT COMPANY'S PREMISES

The driver's clothing must be clean and appropriate to the cargo being transported.

Before arriving at the first consignor, the driver must carry out the following checks:

- Ensure that the vehicle body is clean, inside and out. If not, the body must be duly cleaned inside as a priority.
- Ensure that the vehicle size and cooling performance (ATP class) is appropriate to the goods to be transported.
- Ensure that the vehicle and cooling unit fuel tanks are completely full, and if not, that they are filled.
- Check oil levels.

– Ensure that all statutory documents regarding the driver, the vehicle, the refrigerated body and its equipment are at the driver's disposal, and if not, obtain them.

– Ensure that the temperature measurement and/or recording devices (thermometers) are in good condition and on hand inside the cab.

Turn on the cooling unit several hours before beginning loading to pre-cool the box.

Set off allowing plenty of time to arrive at the first client on time.

2. AT THE CONSIGNOR: TAKING THE CARGO IN CHARGE AND DELIVERY

When taking the cargo in charge, the driver must act correctly:

- Wear clean clothes.
- Respect the client's premises.
- Dump rubbish only in containers provided.
- Wash his hands whenever necessary.
- Only smoke in authorised areas.

The driver must carry out a number of checks before loading.

- These checks and measurements must be carried out in an objective, straightforward and courteous manner.
- Note all results and information relevant to the journey on the transport documents, as specified below.
- In the event of difficulties, reservations or disagreement, the person responsible for the shipment (loading facility manager) should be contacted and all observations noted on the transport documents.

The driver should verify that the shipment corresponds to the waybill or the order slip.

- Verify that the nature of the products, the information on the labels and the number of packages correspond.
- Check the state of the packages and outer packaging.
- If the packaging of any packages is damaged, torn, deformed or dirty, set these packages apart from the consignment and inform the person responsible for the shipment.
- If any products or packagings could dirty other packages or if they are exuding, handle them separately to avoid cross-contamination and inform the person responsible for the shipment.
- If a load has been in the open air, especially for a long time or unsupervised, carefully check its condition and measure the temperature. If this is not satisfactory, remove affected goods.
- Set apart foodstuffs which during a prolonged stay in the

transit premises have or may have undergone natural degradation, to prevent other products being affected.

- Pallets and trolleys must be clean and in good condition. If not, the driver should express his reservations.

The driver must check the temperature of the goods.

- If the required transport temperature is unusual or abnormal, the driver should inform the person responsible for the consignment and inform his employer.
- If the person responsible for the consignment nevertheless insists on compliance with that specific temperature, he should comply with this request, inform his employer and note this in the transport documents.
- Check the temperature of the goods by measuring the temperature of a few packages at the beginning of loading, halfway and at the end of loading.
- Insert the thermometer between two packages.
- Never pierce the packaging of any vacuum packed product.
- Exceptionally, in the event of a major deviation from the required transport temperature, the interior temperature of the product itself may be measured but to avoid any possible dispute about the risk of further contamination, this should be carried out by the Quality Control manager in the presence of the client.

If a cargo consists of different refrigerated foodstuffs, the following tests should be carried out:

- Ensure that this combination of goods is compatible for transport (transfer of odours). If there are any doubts, note the possibility of risk to the person responsible for dispatch and make a note in the transport documents.
- Set the temperature to the requisite temperature for the product which is most sensitive to cold. For example, for a cargo of apples and bananas, set the temperature to that required for the bananas (+12°C) and not that appropriate for the apples (0 or 4°C depending on variety).

Turn off the refrigeration unit on opening the doors.

The vehicle should be loaded with care and with minimum loss of time.

- For deep-frozen and frozen products, leave a space of 3 cm between the side walls and the packages, likewise for cargo on pallets between pallets along the length of the chamber.
- Load packages of frozen or deep-frozen goods, whether they are on pallets or not, compactly but without them touching the walls.
- For refrigerated goods, particularly for fruit and vegetables, leave uninterrupted channels between the walls of the vehicle and the packages or pallets as well as in the pallets and between the packages, for adequate circulation of cold air in contact with the merchandise.
- Do not exceed the maximum cargo height marked by a line on the wall. If there is no limit marked, do not place packages in the air stream from fan vents.
- Do not block the air intake vent to the cooling unit.
- Stow the cargo correctly and securely.

- If necessary (particularly for frozen or deep-frozen goods), set out the temperature sensors according to the instructions supplied by the driver's employer.

When loading is finished and after closing the door:

- Adjust the temperature setting using the thermostat of the vehicle or of each compartment for multi-temperature vehicles in line with the temperature prescribed by law or that requested by the client.
- If the temperature requested by the client differs from that specified in the legislation, note this on the transport documents.
- Turn on the interior air temperature logger.
- Start up the cooling unit and set to automatic operation.
- Note on the transport documents (waybill) all readings and reservations regarding anomalies observed.
- Have the person responsible for dispatch sign the transport documents and, in particular, draw his attention to the observations, readings and reservations noted.
- Only leave the loading area with the consent of the per-

3. THE JOURNEY

During the trip, the driver must abide by certain instructions regarding driving and keeping the cargo in good condition.

As regards driving:

- Respect the authorised driving time limits.
- Take the obligatory rest stops.
- Keep within the speed limit.
- Act courteously towards other road users.

As regards monitoring the cargo:

- Periodically check the cargo temperature.
- When transporting refrigerated fruit and vegetables over long distances, open the back door for about a minute once a day, preferably at the coolest time of day, to prevent the build-up of carbon dioxide.
- Turn off the unit before opening the door (for delivery) or for short vehicle stops if local noise or air pollution legislation requires this.
- Do not turn off the unit during rest stops in parking areas.

In general,

- Draw up an itinerary which takes the minimum driving time.
- If the vehicle must be loaded or unloaded at different sites, the itinerary which requires the least time is usually the one with the shortest distance to cover.

- Minimise the amount of time the doors are left open at each stop.
- Check that the interior temperature actually decreases when the doors are closed, except when defrosting the evaporator - carry out the same check after defrosting.

In the event of a breakdown:

- Take all possible precautions to maintain the hygiene of the cargo.
- Contact the employer's office as soon as possible to determine quickly what safeguards to adopt.
- If the truck engine has broken down, keep the refrigeration unit running.
- If the refrigeration unit has broken down, generally signalled by a malfunction alarm, turn off the cooling unit fans and do not open the door or any hatches to keep the heat out insofar as possible.
- In this case, for refrigerated goods, deliver the foodstuffs as quickly as possible, within 6 hours in warm weather.
- If the cargo cannot be delivered quickly, go to the nearest town where the appropriate steps for preservation of the cargo may be taken.

4. AT THE CONSIGNEE: DELIVERY AND UNLOADING

Delivery should as far as possible be made at the agreed time.

On arrival at destination:

- Do not open the door before unloading.
- For deliveries to supermarkets, the cargo should be unloaded immediately.
- If unloading is delayed, keep the cooling unit running until the cargo can be unloaded.
- If possible, have the receiving agent note that the required temperature has been maintained before opening the door and turning off the cooling unit.

Before unloading, the receiving agent will cross-check the cargo:

- He checks the appearance of the packages.
- He measures the temperature of the goods.
- If the air temperature has been recorded, this is a useful indication but not adequate for a decision to reject the cargo.
- Notably, for deliveries to multiple sites, the interior air temperature may be higher than the required temperature after the first stop.
- If the measured temperature of the goods is significantly higher than the required temperature, the receiving agent may refuse delivery.

Unloading

- On opening the doors, turn off the cooling unit and the fans.
- Unload the vehicle as quickly as possible.

In the event of an actual or potential loss of cargo, the driver must take the following measures:

- As soon as possible, inform the employer's office, which will then establish contact with the client and, if necessary, the various operators concerned, notably the supplier or manufacturer and the insurance company.
- Request that the owner of the goods takes appropriate measures.
- In the event of a dispute, call in an expert immediately.

When the vehicle has been fully unloaded:

- Have the receiving agent sign the transport documents.
- Clean the body.

On returning to base:

- Clean the body.
- Organise and check the documents to be given to the employer.
- Note all the incidents involving the vehicle and the journey itself.

5. CLEANING THE VEHICLE

1/ Control point limits

Floor of the body:	Action:
Stagnant water	Clean
Large amount of residue or run-off from foodstuffs	Clean
Various debris	Clean
Corners	
Insects or pests	Clean
Various debris	Clean
Walls and door(s)	
Thick or sticky marks	Clean
Corrosion	Change the cleaning method

A "**cleaning certificate**" or "**hygiene control slip**" certifying completion of this work must be filled out. The client or consignor must check before loading that the vehicle has been cleaned correctly.

The opposite table shows an example of a hygiene control slip for a refrigerated body or tanker.

2/ Cleaning procedure

The vehicle must be cleaned at the end of each journey.

The cleaning processes are as follows:

- sweeping
- scraping
- brushing
- washing with cold water
- with warm water
- steam-spraying
- rinsing
- draining.

6. VEHICLE CLEANING CERTIFICATE

Vehicle:

Type of vehicle:

- Truck, trailer, semi-trailer, tanker:
- Insulated, refrigerated, mechanically refrigerated
- Class (FNA, FRC, etc.)
- Number of compartments
(multi-temperature, tanker):

Vehicle registration number:

Tractor registration number:

Trip

Name of driver:

Itinerary (from/to):

Date and time of loading:

Date and time of unloading:

Type of foodstuff(s) transported:

Type of return freight:

Observations about the shipment:

Cleaning

Name of cleaning operative:

Date and time of cleaning:

Cleaning procedures:

Detergent used:

Duration of cleaning work (... minutes)

Observations concerning cleaning:

Check points	Check	Dirtiness	Cleaning method
Floor	visual	(*)	(**)
Corners	visual	(*)	(**)
Walls and doors	visual	(*)	(**)
Supports	visual	(*)	(**)
Pipes and ducts, cooling unit	(***)		(**)
Pump	(***)		(**)

(*) Specify type of soiling as indicated in the table above.

(**) Indicate the cleaning method: dry sweeping, washing with clean water, washing with detergent, use of brush, scraper, etc. For washing, sweep the water out and leave the door open until the body is completely dry.

(***) When cleaning a tanker, ensure that the washing and rinsing water is completely drained.

Washing **body exterior** [yes] [no]

Date and signature of cleaning operative:

of consignor:

7. SPECIFYING A CLEANING PRODUCT

Use this table to list the necessary information for determining which cleaning product or disinfectant should be used in which circumstances.

– Product name	_____
– Uses	_____
– Chemical type or composition	_____
– Physical characteristics	_____
– Chemical characteristics	_____
– Action over time	
of heat	
of cold	
of light	
of damp conditions	_____
– Dilution	_____
– Rinsing	_____
– Storage conditions	
Handling conditions	_____
– Risk of	
fire and explosion	
toxicity	_____
Precautions	_____
First aid:	
for skin	
for the eyes	
if ingested	
for the environment	_____
Legal classification	_____

ANNEXES

Annex 1

Summary of principal world-wide and European regulations concerning CFCs, HCFCs and HFCs: timetable

Taken from International Institute of Refrigeration (IIR) bulletin – 1999 – 6

Annex 2

Procedure for the sampling and measurement of temperature for carriage of chilled, frozen and quick-frozen perishable foodstuffs

Taken from the Agreement on the International Carriage of Perishable Foodstuffs (ATP), Annex 2, Appendix 2

Annex 3

Transport compatibility of mixed products

Taken from Manual of refrigerated storage in the warmer developing countries – IIR – Paris – 1999

Annex 4

Checking of ambient temperature for transport of deep-frozen perishable foodstuffs

Taken from ATP, Annex 2, Appendix 1

Annex 5

Selection of equipment and temperature conditions to be observed for the carriage of quick (deep)-frozen and frozen foodstuffs

Taken from ATP, Annex 2

Annex 6

Temperature conditions for the carriage of certain foodstuffs which are neither quick (deep)-frozen nor frozen

Taken from ATP, Annex 3

Annex 7

Storage conditions for chilled animal products

Taken from Manual of refrigerated storage in the warmer developing countries – IIR – Paris – 1999

Annex 8

Storage conditions for chilled vegetable products

Taken from Manual of refrigerated storage in the warmer developing countries – IIR – Paris – 1999

ANNEX 1

Worldwide and European regulations concerning CFCs, HCFCs, HFCs: timetable

Taken from International Institute of Refrigeration (IIR) – bulletin – 1999 – 6

International regulations	CFCs	HCFCs	HFCs
	Montreal Protocol ⁽¹⁾	Montreal Protocol ⁽¹⁾	Kyoto Protocol ⁽²⁾
Developed countries – production ⁽³⁾ – consumption ⁽⁴⁾	banned as of 1.1.1996 banned as of 1.1. 1996	– banned as of 1.1.2030	
developing countries⁽⁵⁾ – production ⁽³⁾ – consumption ⁽⁴⁾	banned as of 1.1.2010 banned as of 1.1.2010	banned as of 1.1.2040	
industrialised countries⁽⁶⁾ – emissions ⁽⁷⁾			mean reduction of 5.2% ⁽⁶⁾
European Regulations	New regulation ⁽⁸⁾	New regulation ⁽⁸⁾	
– production ⁽³⁾ – sale ⁽⁹⁾ – use in maintenance and repair – use in new equipment ⁽¹⁰⁾ – recovery of refrigerants – leak tightness	banned as of 1.1.1996 banned as of 1.1.2000 banned as of 1.1.2001 compulsory for all equipment with the exception of domestic appliances ⁽¹¹⁾ annual if the refrigerant charge is > 3 kg (2 kg) ⁽¹²⁾	banned as of 1.1. 2026 banned as of 1.1.2010 banned as of 1.1.2010 banned as of 1.1.2000 for equipment with a capacity of > = 150 kW compulsory for all equipment with the exception of domestic appliances ⁽¹¹⁾ annual if the refrigerant charge is > 3 kg (2 kg) ⁽¹²⁾	

Footnotes:

- (1) The Montreal Protocol and subsequent Amendments including those concluded in Vienna (1995) and Montreal (1997).
- (2) The Kyoto Protocol: likely to come into effect during 2000.
- (3) Production: quantity of regulated substances produced minus the quantity destroyed using approved means and those used as raw materials in the production of other chemical products. The quantities recycled and re-used are not considered as being used in production.
- (4) Consumption = production + imports - exports.
- (5) Developing countries: countries covered by Article 5 of the Montreal Protocol.
- (6) Mean emission reductions in 38 industrialised countries over the 2008-2012 period with respect to 1990 or 1995 levels. Reduction objectives differ according to Parties. The mean reduction for the European Union has been set at a level of 8%.
- (7) Anthropogenic emissions, expressed in carbon-dioxide equivalents, of 6 gases: CO₂, CH₄ (methane), N₂O (nitrous oxide), HFCs, PFCs (perfluorocarbons), SF₆ (sulphur hexafluoride).
- (8) New European Regulation that will replace the current Regulation 3093/94.
- (9) Marketing: supply of regulated substances or products containing regulated substances to third parties.
- (10) Ban on use for production of all refrigeration or air-conditioning plant as of 1.1.2004 (or earlier for certain other types of equipment).
- (11) Compulsory recovery of refrigerants in all refrigeration and air-conditioning plant, with the exception of domestic refrigerators and freezers.
- (12) The amount 2 kg is indicated in the common position, but may be raised to 3 kg.

ANNEX 2

Procedure for the sampling and measurement of temperature for carriage of chilled, frozen and quick-frozen perishable foodstuffs

Taken from ATP, Annex 2, Appendix 2

A. GENERAL CONSIDERATIONS

1. Inspection and measurement of temperatures stipulated in Annexes 2 and 3 should be carried out so that the foodstuffs are not exposed to conditions detrimental to the safety or quality of the foodstuffs. Measuring of food temperatures should be carried out in a refrigerated environment, and with the minimum delays and minimum disruption of transport operations.
2. Inspection and measurement procedures, as referred to in paragraph 1, shall preferably be carried out at the point of loading or unloading. These procedures should not normally be carried out during transport, unless serious doubt exists about the conformity of the temperatures of the foodstuffs stipulated in Annexes 2 and 3.
3. Where possible, the inspection should take account of information provided by temperature monitoring devices during the journey before selecting those loads of perishable foodstuffs for sampling and measurement procedures. Progression to temperature measurement of the food should only be undertaken where there is reasonable doubt of the temperature control during carriage.
4. Where loads have been selected, a non-destructive measurement (between-case or between-pack) should at first be used. Only where the results of the non-destructive measurement do not conform to the tempe-

ratures laid down in Annexes 2 or 3 (taking allowable tolerances into account), are destructive measurements to be carried out. Where consignments or cases have been opened for inspection, but no further action has been taken, they should be resealed giving the time, date, place of inspection, and the official stamp of the inspection authority.

B. SAMPLING

5. The types of package selected for temperature measurement shall be such that their temperature is representative of the warmest point of the consignment.
6. Where it is necessary to select samples during transport whilst the consignment is loaded, two samples should be taken from the top and bottom of the consignment adjacent to the opening edge of each door or pair of doors.
7. Where samples are taken during unloading of the consignment, four samples should be chosen from any of the following locations:
 - top and bottom of the consignment adjacent to the opening edge of the doors;
 - top rear corners of the consignment (i.e. furthest away from the refrigeration unit);
 - centre of the consignment;
 - centre of the front surface of the consignment (i.e. closest to the refrigeration unit);
 - top or bottom corners of the front surface of the consignment (i.e. closest to the return air intake of the refrigeration unit).

8. In the case of chilled foods in Annex 3, samples should also be taken from the coldest location to ensure that freezing has not occurred during transportation.

C. TEMPERATURE MEASUREMENT OF PERISHABLE FOODSTUFFS

9. The temperature measuring probe should be precooled to as close to the product temperature as possible before measurement.

I. Chilled foods

10. *Non-destructive measurement.* Measurement between -case or between-pack should be made with a probe with a flat head, which gives a good surface contact, low thermal mass, and high thermal conductivity. When placing the probe between the cases or food packs, there should be sufficient pressure to give a good thermal contact, and sufficient length of probe inserted to minimise conductivity errors.

11. *Destructive measurement.* A probe with a rigid, robust stem and sharpened point should be used, made from a material which is easy to clean and disinfect. The probe should be inserted into the centre of the food pack, and the temperature noted when a steady reading is reached.

II. Frozen and quick-frozen foods

12. *Non-destructive measurement.* Same as paragraph 10.

13. *Destructive measurement.* Temperature probes are not designed to penetrate frozen foods. Therefore it is necessary to make a hole in the product so as to insert the probe. The hole is made by a precooled product penetration instrument, which is a sharp pointed metallic instrument such as an ice punch, hand drill or an auger.

The diameter of the hole should provide a close fit to that of the probe. The depth to which the probe is inserted will depend on the type of product:

i) Where product dimensions allow, insert the probe to a depth of 2.5 cm below the surface of the product;

ii) Where (i) is not possible because of the size of the product, the probe should be inserted to a minimum depth below the surface of 3 to 4 times the diameter of the probe;

iii) It is not possible or practical to make a hole in certain foods because of their size or composition e.g. diced vegetables. In these cases, the internal temperature of the food package should be determined by insertion of a suitable sharp-stemmed probe to the centre of the pack to measure the temperature in contact with the food.

After inserting the probe, the temperature should be read when it has reached a steady value.

D. GENERAL SPECIFICATIONS FOR THE MEASURING SYSTEM

14. The measuring system (probe and read-out) used in determining temperature shall meet the following specifications:

i) The response time should achieve 90% of the difference between the initial and final reading within three minutes;

ii) */ the system must have an accuracy of + 0.5°C within the measurement range -20°C to + 30° C;

iii) */ the measuring accuracy must not change by more than 0.3°C during operation in the ambient temperature range -20°C to +30°C;

- iv) the display resolution of the instrument should be 0.1°C;
 - v) */ the accuracy of the system should be checked at regular intervals;
 - vi) the system should have a current certificate of calibration from an approved institution;
 - vii) the electrical components of the system should be protected against undesirable effects due to condensation of moisture;
 - viii) the system should be robust and shock proof.
- i) *operational* – in the case of frozen and quick-frozen foods, a brief rise of up to 3°C on the temperature permitted in Annex 2 is allowed for the surface temperature of the food.
 - ii) *methodology* – non-destructive measurement can give up to a maximum of 2°C difference in the reading compared to the true product temperature measurement, especially with the thickness of cardboard in case packaging. This tolerance does not apply to the destructive measurement of temperature.

E. ALLOWABLE TOLERANCES IN THE MEASUREMENT OF TEMPERATURE

15. Certain tolerances should be allowed in the interpretation of temperature measurements:

*/ The procedure will be defined.

ANNEX 3

STORAGE COMPATIBILITIES OF REFRIGERATED PRODUCTS

Taken from the Manual of refrigerated storage in the warmer developing countries - IIR - Paris - 1999

	Bananas	Butter	Beef	Cabbage	Cheese	Lobsters	Bacon	Mutton	Eggs	Oranges	Peaches	Apples	Potatoes	Pork	Plums	Grapes
Bananas	-	0	0	N	0	0	0	0	0	N	N	N	N	0	N	0
Butter	0	-	0	N	SR	R	SR	0	0	R	SR	N	N	0	0	0
Beef	0	0	-	N	SR	SR	SR	0	0	N	0	R	SR	0	0	0
Cabbage	N	N	N	-	N	N	N	N	N	N	SR	SR	SR	N	SR	LR
Cheese	0	SR	SR	N	-	N	0	SR	N	N	SR	N	SR	SR	SR	LR
Lobsters	0	R	SR	N	N	-	SR	SR	SR	N	SR	N	N	SR	SR	0
Bacon	0	SR	SR	N	0	SR	-	0	0	N	0	N	0	0	0	0
Mutton	0	0	0	N	SR	SR	0	-	0	N	0	N	SR	0	0	0
Eggs	0	0	0	N	N	SR	0	0	-	N	SR	N	N	0	SR	0
Oranges	N	N	N	N	N	N	N	N	N	-	0	0	0	N	0	0
Peaches	N	SR	0	SR	SR	SR	0	0	LR	0	-	0	0	0	0	0
Apples	N	N	R	SR	N	N	N	N	N	0	0	-	SR	N	0	0
Potatoes	N	N	SR	SR	SR	N	0	SR	N	0	0	SR	-	SR	0	0
Pork	0	0	0	N	SR	SR	0	0	0	N	0	N	SR	-	0	0
Plums	N	0	0	SR	SR	SR	0	0	SR	0	0	0	0	0	-	0
Grapes	0	0	0	SR	SR	0	0	0	0	0	0	0	0	0	0	-

0: Can be stored together with no risk of mutual contamination

SR: Slight risk of mutual contamination

R: Risk of mutual contamination

N: Cannot be stored together; mutual contamination very likely

ANNEX 4

Monitoring of air temperatures for transport of quick-frozen perishable foodstuffs

Taken from ATP, Annex 2, Appendix 1

The transport equipment must be fitted with a suitable recording instrument to monitor, at frequent and regular intervals, the air temperatures to which quick-frozen foodstuffs intended for human consumption are subjected.

The measuring instruments must be approved by the competent authorities of the country in which the transport vehicle is registered.

Temperature recordings obtained in this manner must be dated and stored by the operator for at least one year or longer, according to the nature of the food.

However, for transport equipment in service at the date of the entry into force of this Appendix, ¹⁾ the above provisions will be progressively applicable within three years after that date.

¹⁾The date of entry into force of this Appendix is 13 February 1996.

ANNEX 5

Selection of equipment and temperature conditions to be observed for the carriage of quick (deep)-frozen and frozen foodstuffs

Taken from ATP, Annex 2

1. For carriage of the following quick (deep)-frozen and frozen foodstuffs, the transport equipment has to be selected and used in such a way that during carriage the highest temperature of the foodstuffs at any point of the load does not exceed the indicated temperature.

By that means the equipment used for the transport of quick-frozen foodstuffs other than railway equipment shall be fitted with the device referred to in Appendix 1 to this Annex. If, however, one should proceed to the verification of the temperature of the foodstuff, this shall be done according to the procedure laid down in Appendix 2 to this Annex (cf. page 35).

2. Accordingly, the temperature of the foodstuffs at any point in the load must be at or below the indicated value on loading, during carriage and on unloading.

3. Where it is necessary to open the equipment, e.g. to carry out inspections, it is essential to ensure that the foodstuffs are not exposed to procedures or conditions contrary to the objectives of this annex and those of the International Convention on the Harmonisation of Frontier Controls of Goods.

4. During certain operations, such as defrosting the evaporator of mechanical refrigeration equipment, a brief rise of the temperature of the surface of the foodstuffs of not more than 3°C in a part of the load, e.g. near the evaporator, above the appropriate temperature may be permitted.

– Ice cream	- 20°C
– Frozen or quick (deep)-frozen fish, fish products, molluscs and crustaceans and all other quick (deep)-frozen foodstuffs	- 18°C
– All frozen foodstuffs (except butter)	- 12°C
– Butter	- 10°C

Deep-frozen and frozen foodstuffs mentioned below to be immediately further processed at destination: ⁽¹⁾:

Butter

Concentrated fruit juice

⁽¹⁾ The deep-frozen and frozen foodstuffs listed, when intended for immediate further processing at destination, may be permitted gradually to rise in temperature during carriage so as to arrive at their destination at temperatures no higher than those specified by the sender and indicated in the transport contract. This temperature should not be higher than the maximum temperature authorised for the same foodstuff when refrigerated as mentioned in Annex 3 (cf. page 41). The transport document shall state the name of the foodstuff, whether it is deep-frozen or frozen, and that it is immediately to be further processed at destination. This carriage shall be undertaken with ATP-approved equipment without use of a thermal appliance to increase the temperature of the foodstuffs.

ANNEX 6

Temperature conditions for the carriage of certain foodstuffs which are neither quick (deep)-frozen nor frozen

During carriage, the temperatures of the foodstuffs in question shall not be higher than those indicated below:

Red offal	+3°C ⁽³⁾
Butter	+6°C
Game	+4°C
Milk (raw or pasteurised) in tanks, for immediate consumption	+4°C ⁽³⁾
Industrial milk	+6°C ⁽³⁾
Dairy products (yoghurt, kefir, cream, and fresh cheese)	+4°C ^{(3) (4)}
Fish, molluscs and crustaceans /	must always be carried in melting ice
Meat products ⁽²⁾	+6°C
Meat (other than red offal)	+7°C
Poultry and rabbits	+4°C

{If, however, one should proceed to the verification of the temperature of the foodstuff, this shall be done according to the procedure laid down in Appendix 2 of Annex 2 (cf. page 35)}.

⁽¹⁾ Other than smoked, salted, dried or live fish, live molluscs and live crustaceans.

⁽²⁾ Except for products stabilised by salting, smoking, drying or sterilisation.

⁽³⁾ In principle, the duration of carriage should not exceed 48 hours.

⁽⁴⁾ "Fresh cheese" means a non-ripened (non-matured) cheese which is ready for consumption shortly after manufacturing and which has a limited conservation period.

ANNEX 7

Storage conditions for chilled animal products

Taken from Manual of refrigerated storage in the warmer developing countries - IIR - Paris - 1999

Animal products	Temp. °C	R.H. %	P.S.L. d or w
Variety meat	-1,5 to 0	85-95	7 d
Lamb	-1,5 to 0	85-95	3 to 4 w
Bacon	4	85-95	3 to 5 w
Butter	0 to 4		2 to 4 w
Beef	-1,5 to 0	85-95	3 to 5 w
Cephalopods	0		7 to 8 d
Cream	-2 to 0		2 w
Crustaceans	0		4 to 6 d
Cheese	5		1 to 2 w
Raw milk	0 to 4		2 d
Pasteurized milk	4 to 6		7 d
Eggs	-1 to 0	90	24 to 28 w
Pork	-1,5 to 0	85-95	3 w
Lard	-1 to 0		16 to 32 w
Veal	-1,5 to 0	85-95	3 w
Chopped meat	2	85-95	1 d
Poultry	0	85-95	1 to 2 w
Yogurt	4		2 to 3 w

R.H.: Relative humidity

P.S.L.: Practical storage life

d: Day

w: Week

ANNEX 8

PRESERVATION CONDITIONS FOR CHILLED VEGETABLE PRODUCTS

Taken from Manual of refrigerated storage in the warmer developing countries – IIR- Paris – 1999

0 to 4°C	°C	R.H. %	P.S.L.
Fruits			
Apricots	0	90	2-4 w
Cherries	0	90-95	1-2 w
Lemons (coloured)	0 to 4,5	85-90	2-6 m
Dates (fresh)	0	85	1-2 m
Strawberries	0	90-95	1-5 d
Raspberries	0	90-95	1-4 d
Kiwis	-0,5	90-95	8-14 w
Coconuts	0	80-90	1-2 m
Oranges (a.o.v.)	0 to 4	85-90	3-4 m
Peaches	0	90	2-4 w
Pears (a.o.v.)	0	90-95	2-5 m
Apples (a.o.v.)	0 to 4	90-95	2-6 m
Plums	0	90-95	2-4 w
Grapes	-1 to 0	90-95	1-4 m
VEGETABLES			
Garlic	0	65-70	6-7 m
Artichokes	0	95	3-4 w
Asparagus	0 to 2	95	2-3 w
Carrots	0	95	5-6 m
(without leaves)			
Celery	0	95	4-12 w
Mushrooms	0	90-95	5-7 d
Cabbage (a.o.v.)	0	95	1-3 m
Brussels sprouts	0	95	2-3 w
Cauliflower	0	90-95	3-5 w
Spinach	0	95	1-2 w
Lettuce	0	95	1-2 w
Sweet corn	0	95	1 w
Turnips	0	95	4-5 m
Onions (dry)	0	65-70	6-8 m
Leek	0	95	1-3 m
Peas (in the pod)	0	95	1-3 w
Potatoes (bulbs)	2 to 3	90-95	5-8 m
Radishes	0	90-95	1-2 w
Rhubarb	0	90-95	2-4 w
4-8°			
FRUITS			
Mandarins	4 to 6	85-90	4-6 w

Mangoosteens	4 to 5,5	85-90	6-7 w
Watermelons	5 bis 10	85-90	2-3 w

VEGETABLES

Green beans	7 bis 8	92-95	1-2 w
Potatoes (ware)	4 bis 6	90-95	4-8 m
Potatoes (industrial)	7 bis 10	90-95	2-5 m

> 8°C	°C	R.H. %	P.S.L.
FRUITS			
Pineapples (green)	10 to 13	85-90	2-4 w
Pineapples (ripe)	7 to 8	90	2-4 w
Avocados	7 to 12	85-90	1-2 w
Bananas (green)	12 to 13	85-90	10-20 d
Bananas (coloured)	13 to 16	85-90	5-10 d
Green lemon (a.o.v.)	10 to 14	85-90	1-4 m
Guava	8 to 10	90	2-3 w
Limes	8,5 to 10	85-90	3-6 w
Mangoes (a.o.v.)	7 to 12	90	3-7 w
Melons (a.o.v.)	7 to 10	85-90	1-12 w
Grapefruits	10	85-90	2-3 m
Papaws	7 to 10		1-3 w
VEGETABLES			
Eggplants	7 to 10	90-95	10 d
Cucumbers (a.o.v.)	9 to 10	95	1-2 w
Pickles	13	90-95	5-8 d
Ginger	13	65	6 m
Okra	7,5 to 10	90-95	1-2 w
Yams	16	85-90	3-5 m
Sweet potatoes	13 to 16	85-90	4-7 m
Sweet peppers	7 to 10	90-95	1-3 w
Pumpkin	10 to 13	50-75	2-5 m
Tomatoes (green)	12-13	85-90	1-2 w
Tomatoes (ripe)	8 to 10	85-90	1 w

R.H. Relative humidity
 P.S.L. Practical storage life
 d.c. Depending on class
 a.o.v. According to origin and variety
 d Day
 w Week
 m Month

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