

FACT SHEET

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Government of South Australia
Primary Industries and Resources SA

Transporting fresh produce in refrigerated trucks

The quality of packed fresh fruits and vegetables is only maintained by storage and transport at the correct temperature. At very high temperatures off flavours can develop, while at low temperatures chilling induced injuries and freezing can occur. Each product has an optimum temperature which is best for handling and storage. Produce with different optimum handling conditions should not be transported together on the same load without expert advice.

Ethylene and ripening

Some fruits and vegetables must also be protected from the ripening gas, ethylene.

Ethylene gas has an aging affect on most produce although its expression may be different. Examples of ethylene induced aging are premature ripening of bananas, yellowing of broccoli and bitterness in lettuce. Fresh produce are categorised as ethylene producers, sensitive to, or tolerant of ethylene gas. There are risks associated with the transport of ethylene sensitive produce on the same load as ethylene producing produce, particularly with heavy producers and highly sensitive produce transported together at high temperatures. If in doubt about a certain mixed produce load, seek professional advice. See Figure 1. for recommended storage temperatures and ethylene sensitivity.

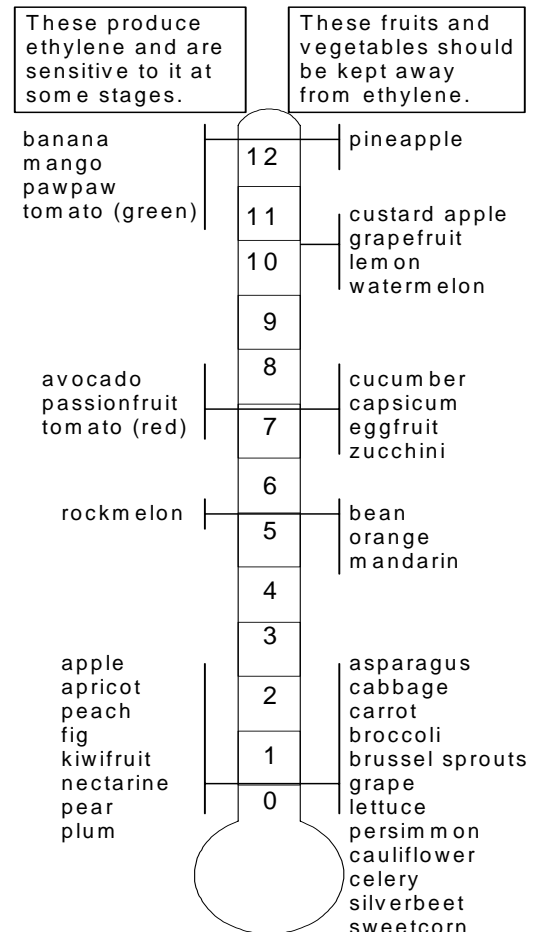


Figure 1. Recommended storage temperatures (degrees Celsius).

Sources of heat and heat flow

In warm weather the inside of an insulated truck will heat up unless the heat is removed by a refrigeration unit.

The warming of fruit inside such a truck is a combination of the heat produced by the produce and the heat coming in from outside the truck. When loaded with pre-cooled produce, the majority of the heat input to the load is from outside the truck (see Figure 2).

In very cold weather some produce would be damaged by the cold if the system did not automatically reverse cycle to maintain the correct temperature



Truck refrigeration systems are designed to maintain the temperature inside the truck irrespective of the external weather conditions. It is essential that only produce fully pre-cooled to the transport temperature is loaded as truck refrigeration units have little more cooling capacity than that required to remove the heat coming into the refrigerated space from outside, especially in hot weather conditions.

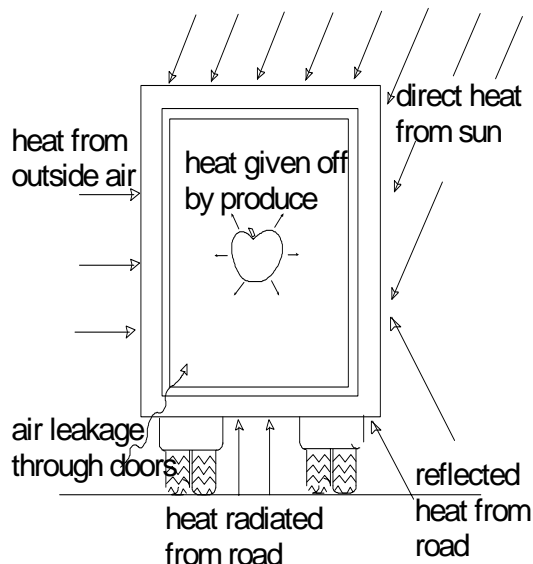


Figure 2. Sources of heat.

The refrigeration unit

The forced air refrigeration equipment fitted to most trucks has three main components: a fan, a refrigeration unit and a temperature control system (thermostat).

Regularly service and check the refrigeration system and thermostat. The time required to cool an empty truck can be an indication of whether the system is operating efficiently or not. The thermostat must be checked against a thermometer (reference pre-checked against ice slurry). The refrigeration unit will operate efficiently in a loaded truck only if the cold air can circulate freely, collecting heat from the produce and from *all* of the ceiling, walls and floor of the truck before returning to the refrigeration unit.

Air circulation

Air will always flow along the easiest path (the path of least resistance). The air could be blocked or short-circuit directly back to the refrigeration unit without cooling the inside surface of the truck or the produce if the truck is poorly designed and/or the produce is not stowed correctly. Continuous flow paths around and under the stow are necessary to maintain temperatures at the preset level throughout the load (see Figure 3). An air delivery duct or chute below the ceiling will distribute the conditioned air to the sides and rear of the truck. The chute must not be obstructed by loading too high or the airflow will be reduced. Bracing produce away from the walls and rear will maintain the air paths during transport. The fork entry spaces of pallets provide the return air path beneath the load, when produce is loaded from the rear of the truck. T- Bar flooring alone is generally insufficient in an Australian summer to maintain near zero carriage temperatures. The return air path to the refrigeration unit is best provided by a solid, full tray width bulkhead which is open only for the first 200 mm above the floor.

The removal of heat given off by produce is not a problem if correct pre-cooling has been achieved. The small gaps between cartons allow sufficient air flow for the removal of the quantity of heat given off by fully precooled produce.

Checklist

The following checklist can be used each time produce is loaded for transport. An honest "Yes" to each question will ensure the best results when the produce reaches its destination.

Before loading

- Has the refrigeration system been checked recently? (The system can be checked by measuring and comparing the “pull-down” time. That is the time to cool the truck when empty).
- Have the temperature instruments (thermostat, temperature gauge, temperature logger, and chart recorder) been checked recently using an accurate “referenced thermometer” (checked against rainwater ice slurry).
- Are the door seals and the air delivery chute in good condition?
- Are the floor and walls undamaged?
- Is the return air duct in good condition?
- Has the van been pre-cooled to the transit temperature or just above?
- Has the produce been pre-cooled?

While loading

- Unless you are loading from a refrigerated “dock”; have you turned the truck refrigeration unit OFF to prevent evaporator ice-up?
- Will there be adequate “return” air flow under the load or pallets to the front bulkhead?
- Are there continuous flow paths for the air to circulate down the sides of the load and at the rear of the truck load of produce?
- Have you taken pulp temperatures of different batches of fruit, recorded them on the consignment note and had the grower representative sign it?

After loading

- Is the load braced in such a way to keep the air paths from becoming obstructed during transport? (Pillows, pressure inflated with air, work well between the walls and the pallets of produce).
- Will there be adequate air flow under, over and around the load or pallets?
- Have you initiated a manual defrost cycle?
- Is the thermostat set at the correct temperature?
- Is the refrigeration system operating and is there sufficient fuel for its continued operation?

Additional information

In addition to the author (08) 8595 9130, information is available from Mike Rettke PIRSA / SARDI phone (08) 83039411 or <http://www.sardi.sa.gov.au/hort/coolchai/indx.htm> and the Australian United Fresh Transport Advisory Council secretariat on phone (07) 4635 6845 or Fax (07) 4635 9422 or <http://www.auftac.com.au>

Comprehensive information is available as a Code of Practice on the Road Transportation of Fresh Produce. This may be purchased from the Secretary AUFTAC, PO Box 7667, TOOWOOMBA Mail Centre 4352 Queensland or e-mail office@auftac.com.au.

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