

Please note that this information is for guidance and not regulatory. Specific circumstances may dictate deviations.

Regulatory information is available on PPECB's website (www.ppecb.com) *Documents – HP28 – Procedures for Pome Fruit*

Basic Cooling Principles for Pome Fruit

1. Recognise differences between pome fruit cultivars.
2. Some apple cultivars (Low Temperature Sensitive – **High Risk A**) develop internal disorders if stored below zero degrees (0.0°C) for long periods (21 days).
3. Some are both Low Temperature and CO₂ Sensitive (**High Risk B**). The latter should **not** be packed in unperforated plastic bags.
4. CO₂ generation is low at 0.0°C or lower but increases significantly at higher temperatures (1 .0 to 5.0°C)
5. Early-season fruit with low sugar content is prone to freezing.
6. Rapid cooling of some cultivars (e.g. Granny Smith) may lead to core flush.
7. Plastics bags are used to retain green colour.
8. Certain markets, such as Far East and Africa, demand plastic bags.
9. Fruit in plastic bags cool slower than those without plastic bags
10. Fruit in unperforated plastic bags must be loaded out within specified tolerances to avoid possible warming inside containers.
11. For fruit packed in plastics bags, the container vents can be closed to save energy.
12. When loading pallets with different packaging into a container, those with less effective ventilation (e.g. plastic bags) should be loaded first, as cooling at the door-end of the container is less efficient than near the refrigeration unit.
13. It is recommended to close the container vents when fruit is shipped below 0.0°C.
14. Fruit treated with 1-MCP may be stored at +1.0°C or higher compared to non-treated fruit.
15. Maintain relative humidity between 90 and 95%.

STANDARD PROTOCOLS:

Cooling Guidelines for Apples

<i>Risk Level</i>	<i>Cultivar</i>	<i>Type</i>	<i>Comments</i>	<i>Plastic Bags</i>	<i>Load out Temp</i>	<i>Set Point</i>	<i>Code</i>	<i>Vents</i>
High Risk A (HR) (Low Temperature Sensitive) (Below 0.0°C)	Panorama Golden D (HR)	Early season	First week of the season ≤ week 12	Yes	0.0°C to +3.0°C	0.0°C	D0	Closed if in sealed bags
	Golden Delicious (HR)	Early season	First week of the season ≤ week 12	Yes	0.0°C to +3.0°C	0.0°C	D0	Closed if in sealed bags
	Granny Smith (HR)	Louterwater GS, Early Granny S	Brix <11°Brix	Optional	0.0°C to +3.0°C	≥0.0°C	D0	Closed if in sealed bags
High Risk B (HR) (Low Temperature and CO₂ Sensitive) (Below 0.0°C)	Fuji (HR)	IB prone areas	<i>(Internal Browning)</i> Do not cool below 0°C	If bags, it must be perforated	0.0°C to +3.0°C	≥0.0°C	D0 or D0.5	Open
	Joya	As per protocol						
	Envy	As per protocol						
	Cripps Red	Late picked						
	Cripps Pink							
	Pink Lady							
Moderate Risk (MR)	Fuji (B)		As per season's requirements	Optional	-0.5°C to +3.0°C	-0.5°C	D-0.5	Closed if in sealed bags
	Gala	Mutants		Optional	-0.5°C to +3.0°C	-0.5°C	D-0.5	Closed if in sealed bags
	Starking Topred							
	Braeburn							
	Panorama Golden D (MR)	Optimum maturity	Only first week's fruit	No	-0.5°C to +3.0°C	-0.5°C	D-0.5	Open
	Golden Delicious (MR)	Optimum Maturity	Only first week's fruit	No	-0.5°C to +3.0°C	-0.5°C	D-0.5	Open
	Granny Smith (MR)	Optimum maturity	Only first week's fruit	No	-0.5°C to +3.0°C	-0.5°C	D-0.5	Open
Low Risk	All treated with 1-MCP		Handle at >0°C to save energy	Optional	-0.5°C to +3.0°C	-0.5°C	D-0.5	Closed if sealed bags

Note: 1. **Risk Level** refers to disorders and damage caused by too low temperatures. This includes freezing, cold damage, internal browning and scald-related damage.
 2. The information above is to be used as **guidelines**. Specific circumstances, markets and maturity may require deviations in the interest of quality.
 3. Note that **early variants of main cultivars** such as Panorama Golden Delicious and Louterwater Granny Smith, as well as Golden Delicious/ Granny Smith that are not fully matured (e.g. **first week of picking**), are considered as high risk and protocols must be adhered to. Low sugar levels often lead to cold damage.

Cooling Guidelines for Pears

Risk Level	Cultivar	Type	Comments	Plastic Bags	Load out Temp	Set Point	Code	Vents
High Risk (HR)	Early Bon Chretien	Summer Pears	These pears are high respiration fruit and the cold chain must be maintained all cost	Most experience is with 37.5 µm bag	-0.5°C to +1.5°C	<p>Some rules: If full container with bags – can go down to minus 1.5°C.</p> <p>If sugar >13° Brix: minus 1.0°C</p> <p>Without bags: -0.5°C</p>	DP1	Closed if bags are unperforated
	Bon Chretien							Closed if DAT is below 0°C
	Bon Rouge & Victoria Blush							
	Rosemarie & Sempre							
	Flamingo & Sempre							
	Beurre Hardy							
	Doyenne du Comice							
	Cheeky & Cape Rose							
	Celina & Qutee							
	Packhams Triumph (HR)	DCA Stored	Dynamic Controlled Atmosphere (sometimes they act as WBC)	Yes		-1.0°C		
Moderate Risk (MR)	Early Season Packhams Triumph (MR)		Possible CO2 damage at 2°C and higher. Low sugar levels are freezing prone		0.0°C to +2.0°C	0.0°C	D0	Closed if in sealed bags
Low Risk (LR)	Packham's Triumph(LR)	Winter Pears			-0.5°C to +2.0°C	-0.5°C	D-0.5	Closed if in sealed bags
	Abate Fetel							
	FEMA Forelle & Vermont Beauty							
	Beurre Bosc Golden Russet Bosc							
	Forelle & Vermont Beauty		Special protocols are to be followed.		0.0°C to +2.0C	0.0°C	D0	Closed if in sealed bags. (Choice of plastic bag is important. Lower microns (e.g. 20) reduce CO2 risk)