Cold Storage

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Mechanical Refrigeration

Evaporator → Expansion valve
vapor

Compression → Condenser
liquid

Cold Room

Cold Storage

- Temperature variation < 2°F (1°C).

Maintaining Temperature

- Refrigeration capacity.

Reciprocating Compressor
Maintaining Temperature

- Refrigeration capacity.
- Evaporator coils.

Finned-Tube Evaporators

Insulation

Maintaining Temperature

- Refrigeration capacity
- Evaporator coils
- Insulation

Calibrate control system
Maintaining Temperature

- Refrigeration capacity.
- Evaporator coils.
- Insulation.
- Controls/thermostat.
- Air mixing volume (usually above fruit).

Cold Storage

- Temperature variation < 2° F.
- Relative Humidity > 90% - 95%.

Maintaining High Humidity

- Large evaporator surface.
- High evaporator temperature.

Higher capital cost but
1. lower energy use.
2. more uniform temperature.
3. higher humidity.

Maintaining High Humidity

- Large evaporator surface.
- High evaporator temperature.
- Reduce refrigeration load.
- Humidifier.
Humidifiers

Adds water to packing materials

Maintain High Humidity

High humidity requires uniform air temperature.

Reduce Moisture Loss

• Minimize paper & wood packaging.

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• Harvest during the cool hours of the day & protect fruit from heating.

Cold Storage

• Temperature variation < 2° F.
• Relative Humidity > 90% - 95%.
• Adequate airflow & good uniformity.
Airflow Capacity

- 100 cfm per ton of product for initial cooling (0.05 m³/mt).
- 20 - 40 cfm per ton for long term storage (0.01 – 0.02 m³/mt).

Use only as much air as is needed to maintain uniform temperature.

Airflow Uniformity

Solid ceiling plenum or duct

Airflow Uniformity

Solid ceiling plenum

Airflow Uniformity

Slotted ceiling plenum

Vertical Slots in Plenum Wall

Horizontal Slots in Plenum Wall

4” - 6” between pallet lanes

Tight stack bins
Airflow Uniformity
Serpentine - Letter box

Air speed reduced by 43%

Alternate Refrigeration Sources

Cool Bot

Evaporative Cooling

Air temperature = wet bulb temp + 1 to 3°C
Construction
Tilt-up Concrete & Masonry

Concrete Dome

Controlled Atmosphere