Container Loading


Types of Products

Fresh and Frozen

- Fresh:
- Fruits and Vegetables
- Bulbs
- Flowers

- Frozen:
- Juices
- Ice cream
- Meats

Fresh Products

- Are alive
- Breathe: They consume O2 and produce CO2.
- Perspiration: they lose moisture. Weight
- They mature, they grow old.
- They generate and consume ethylene.

Fresh Products

What do we do to extend life?

- **Cooling**
  - Specific temperature for each product
  - Avoid quality casualties (weight, appearance, flavor, etc.)
  - Ventilate unwanted gases
- **Atmosphere Control**
  - Change Air composition
  - Retard maturation = > extends post-harvest life
  - Avoid fungi and diseases

Perishable (Chill)

• Set Point	Above -10ºC
• Control Sensor	Supply (STS)
• Evaporator Fans	High Speed
• Condenser Fan	OK
• Compressor	OK
• Heaters	OK
• SMV	“X” % Open

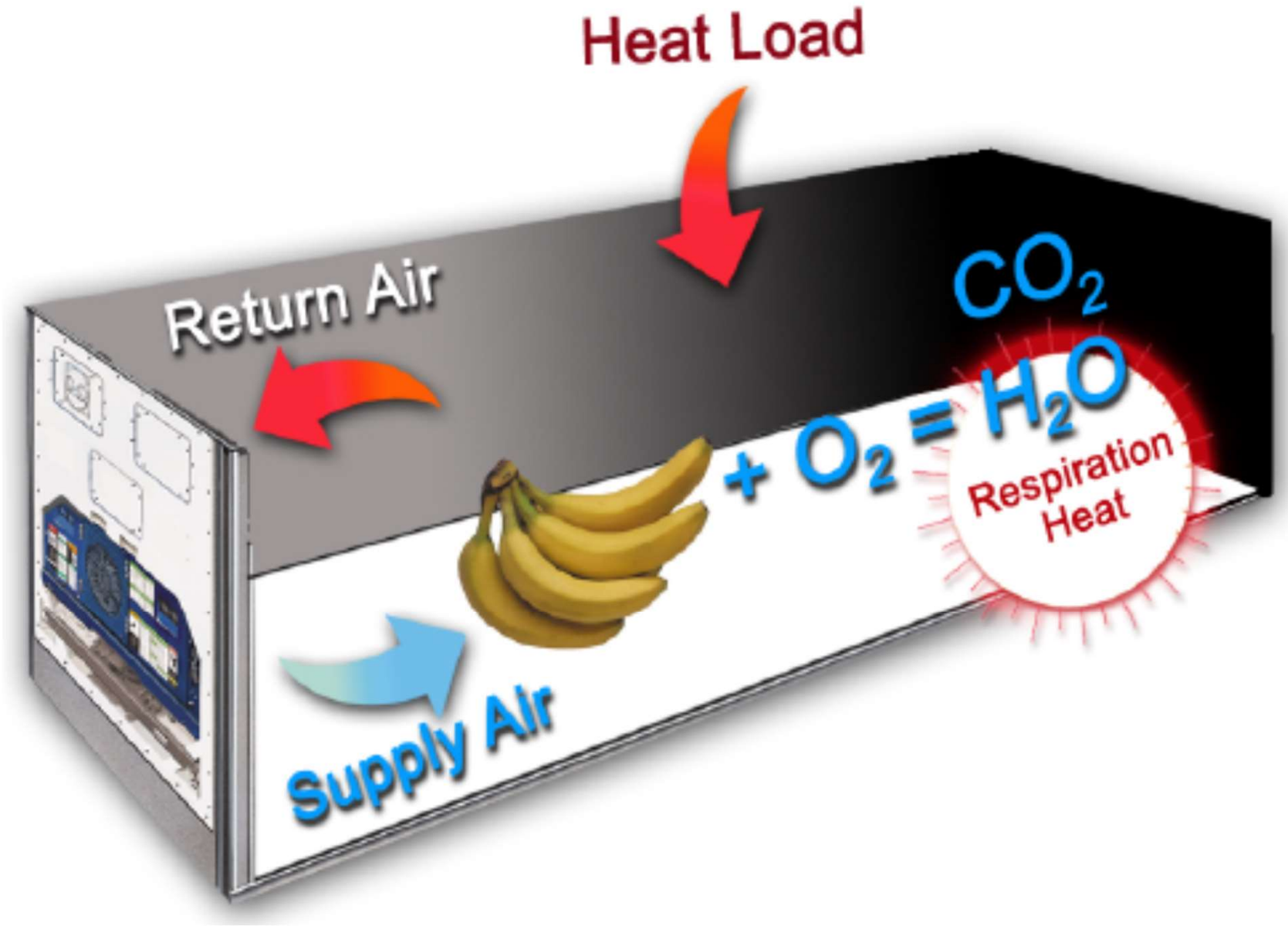
Frozen Products

- They're not alive.
- They don't react to the environment.
- They must remain under setpoint.
- They don't need ventilation.

Frozen

- Set Point — -10ºC or Below
- Control Sensor — Return (RTS)
- Evaporator Fans — Low Speed
- Condenser Fan — OK
- Compressor — OK
- Heaters — Locked Out
- SMV — “X” % Open

Container Loading & operation


Heat Load
Return Air
CO_2
$+ O_2 = H_2O$
Respiration Heat
Supply Air

Transport Refrigeration

- To maintain the Temperature of the Product
- It is not designed to reduce or increase the temperature of the product
- It relies on good air circulation within and around the load

Fresh Air Systems

Available Systems

- Manual
  - Superior fresh air (standard; can be placed on any access panel)
  - Lower fresh air (located to the left of the condenser)
- Automatic
  - EAutoFresh (The vent opens when selected levels of CO2 or O2 are reached) using a CO2 sensor.
  - The controller calculates the oxygen level by the proportional part of 21% of the normal atmosphere minus the CO2 level. The sum of both will always be 21%.

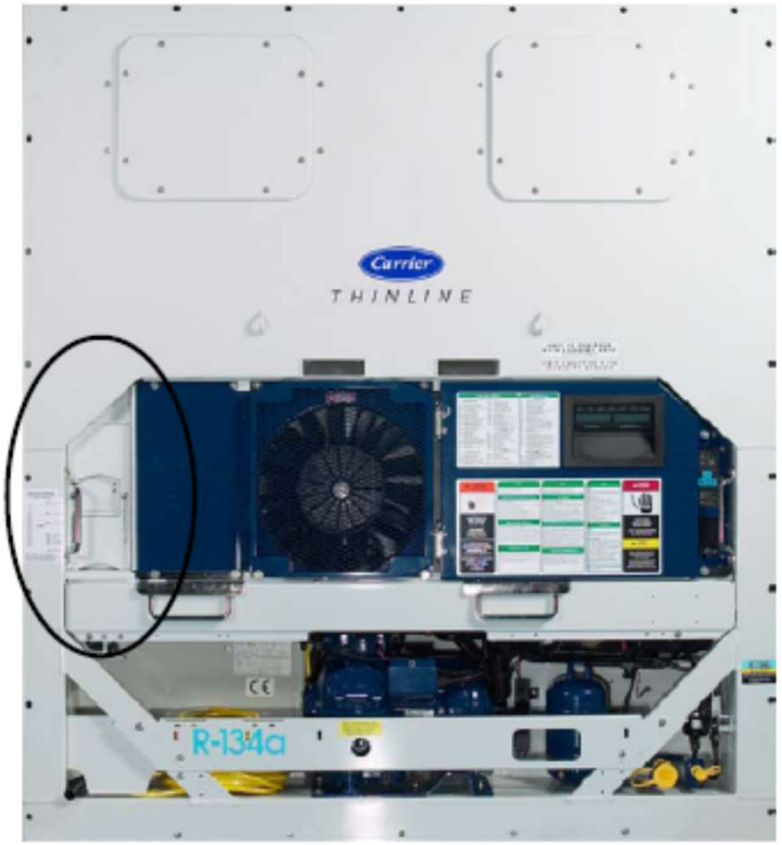
Example: 10% CO2, 11% O2. 10+11=21

Fresh Air Systems

- Manual Fresh Air

Superior

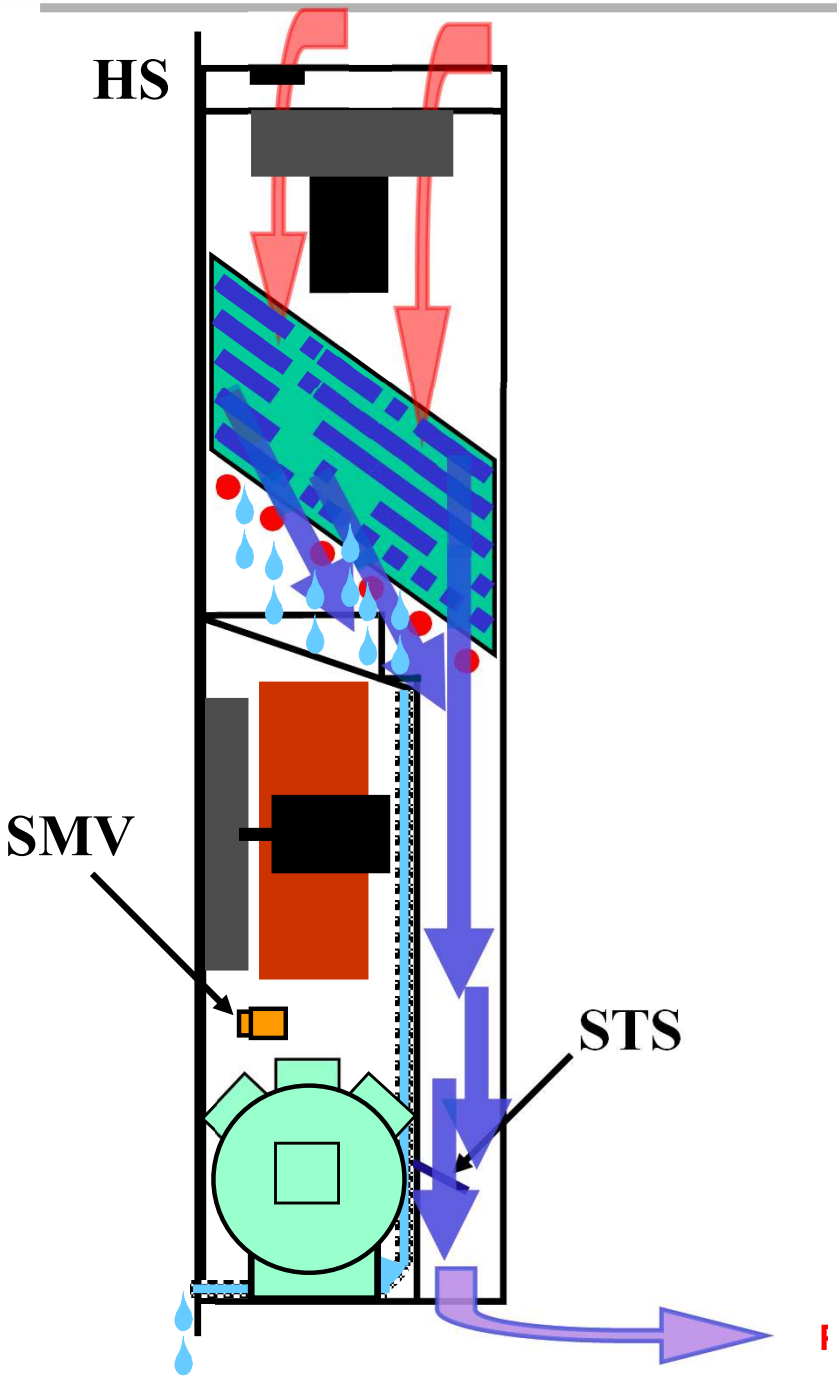
Inferior



Dehumidification

- Available optionally
- Requires a humidity sensor
- It allows users to lower the relative humidity down to 50% in specific cases.
- Works in conjunction with refrigeration
- Simple Interface through controller codes

Dehumidification



Perishable (chill) mode, not in pull down, within .25 °C of setpoint, and Humidity level is above RH setpoint.

When STS is within .25° of setpoint and Humidity level is above RH setpoint the heaters will turn on.

When the heaters turn on, the temperature at STS will increase.

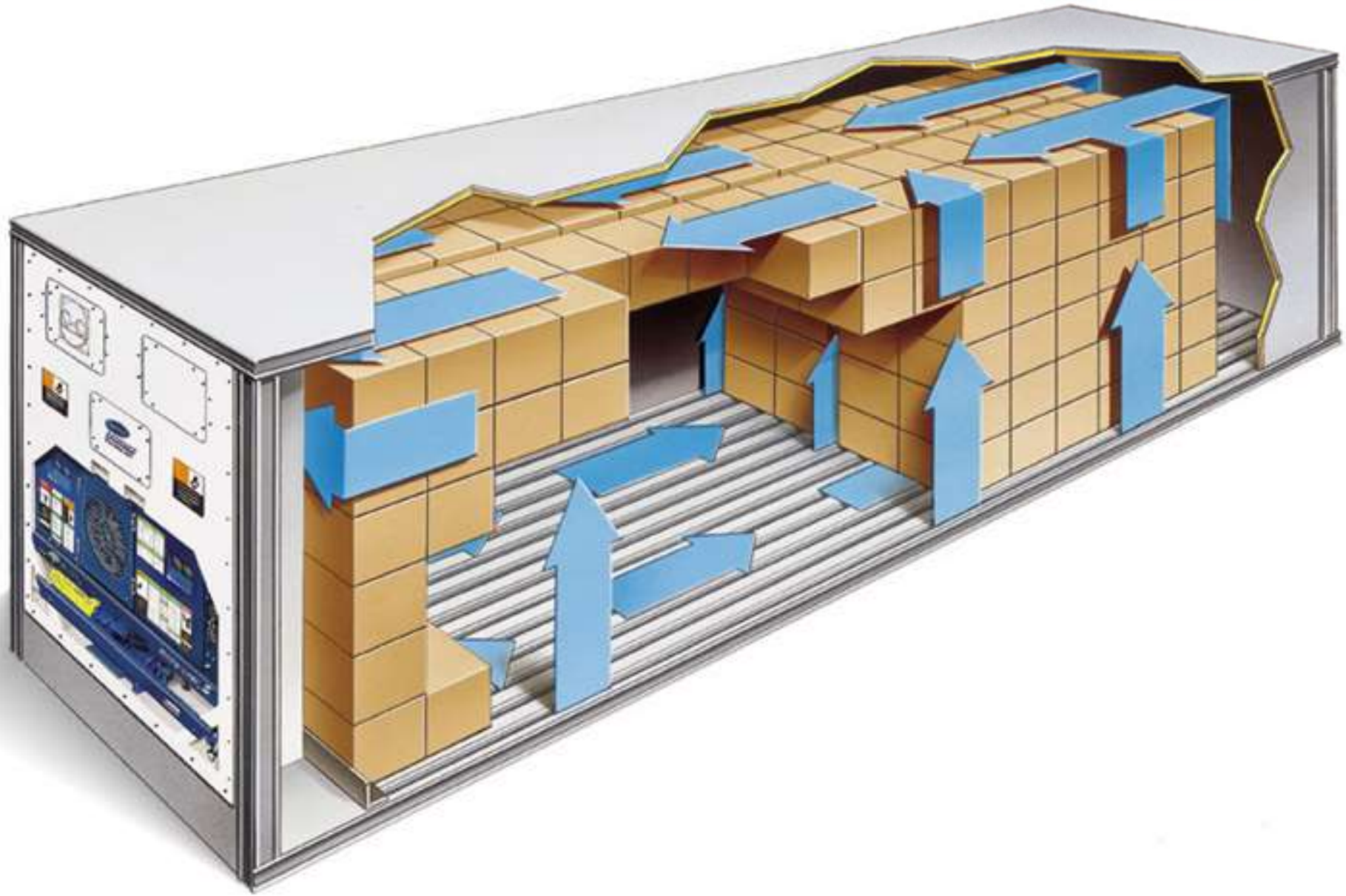
When the temperature at STS increases, SMV will open to allow more refrigerant into the Evaporator to force the temperature back down to setpoint.

The result is that any humidity in the air will condense on the evaporator and drip down into the drain pan and out the drain hose in the front of the unit.

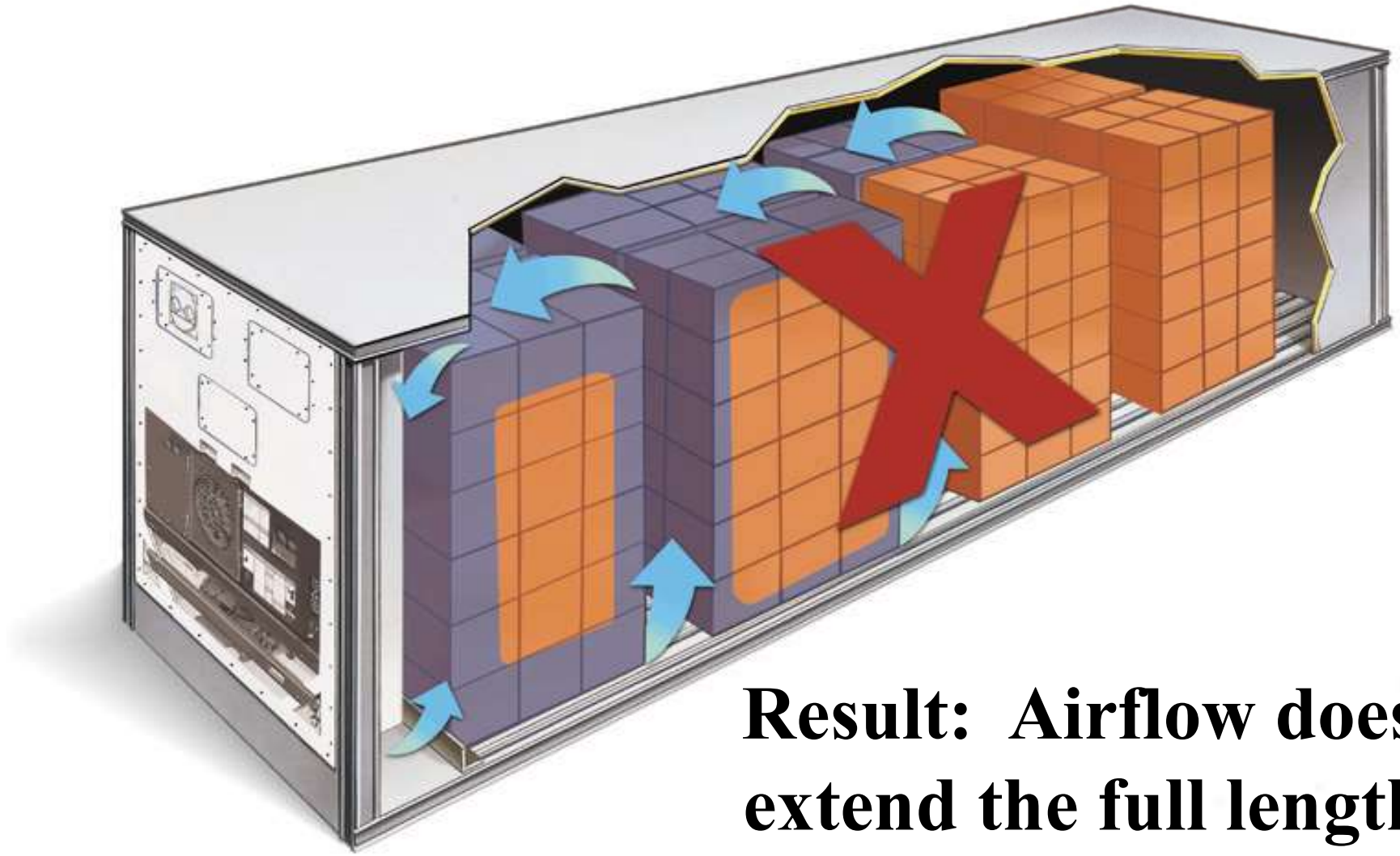
NOTE: If the above conditions are true for at least one hour the Evap. Fans will switch to “low speed”.

Proper Cargo Loading & Airflow

Carrier

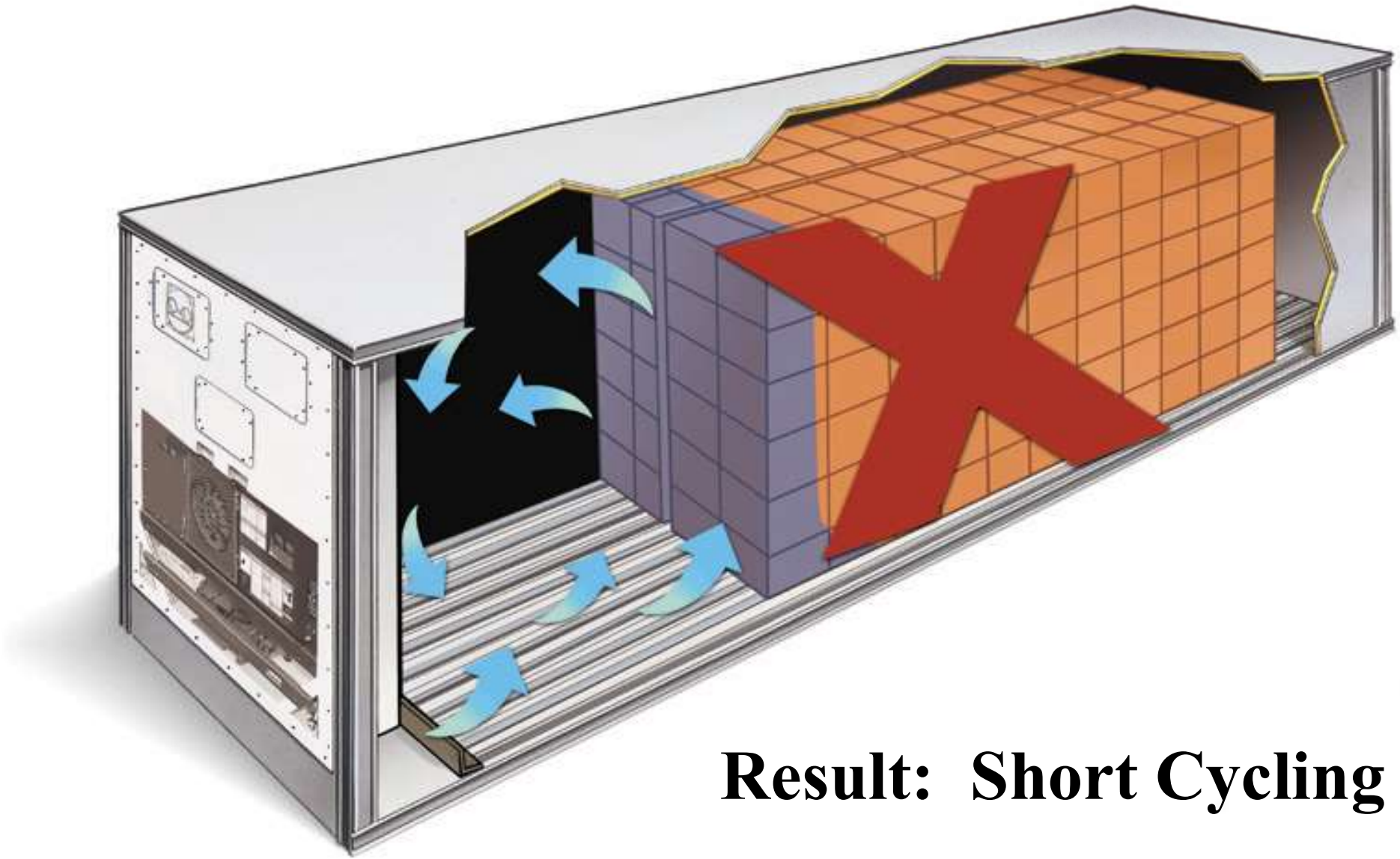


Excessive space in the load



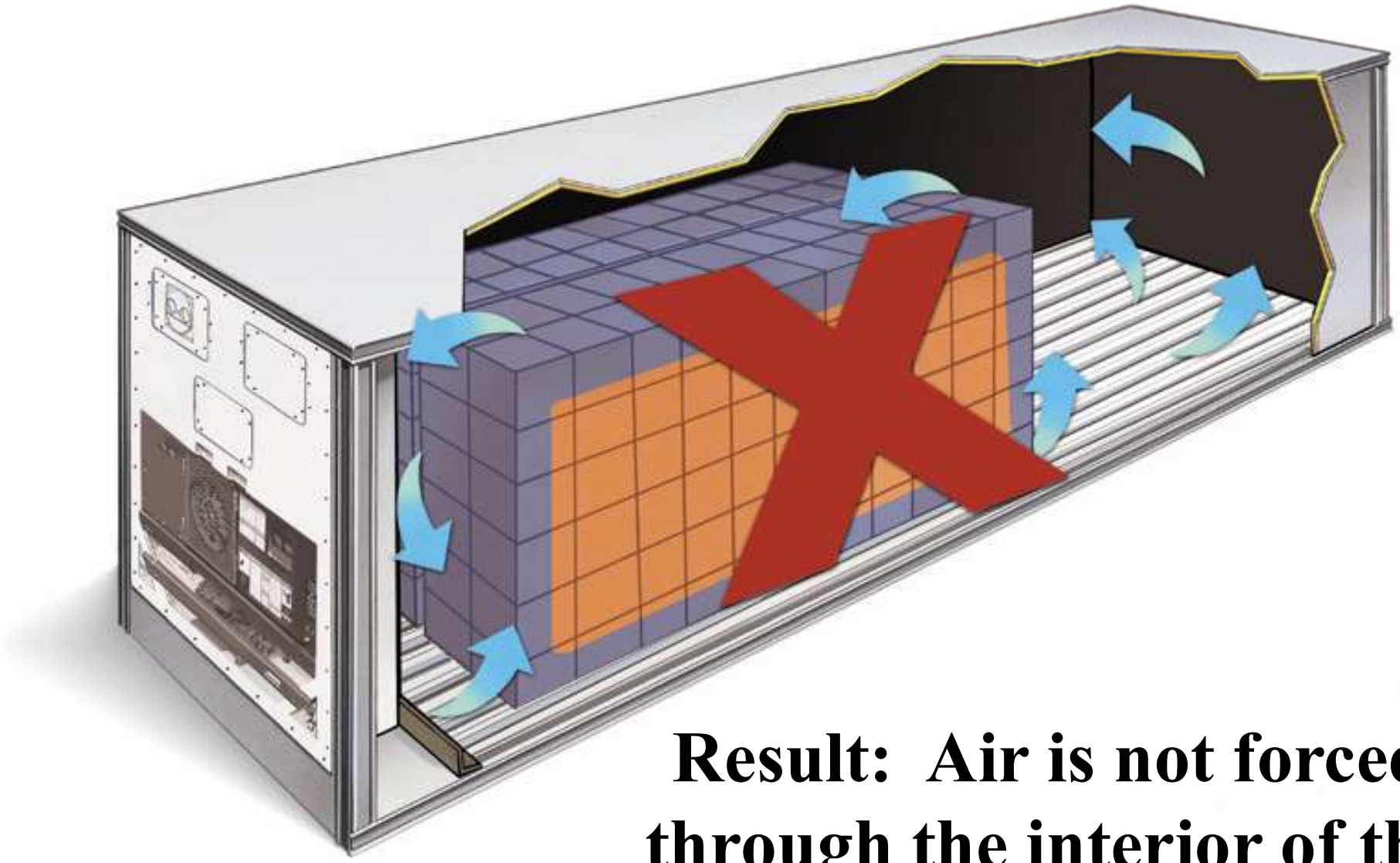
Result: Airflow doesn't extend the full length of the container.

Load in the rear of the container



Result: Short Cycling

Load in the front of container

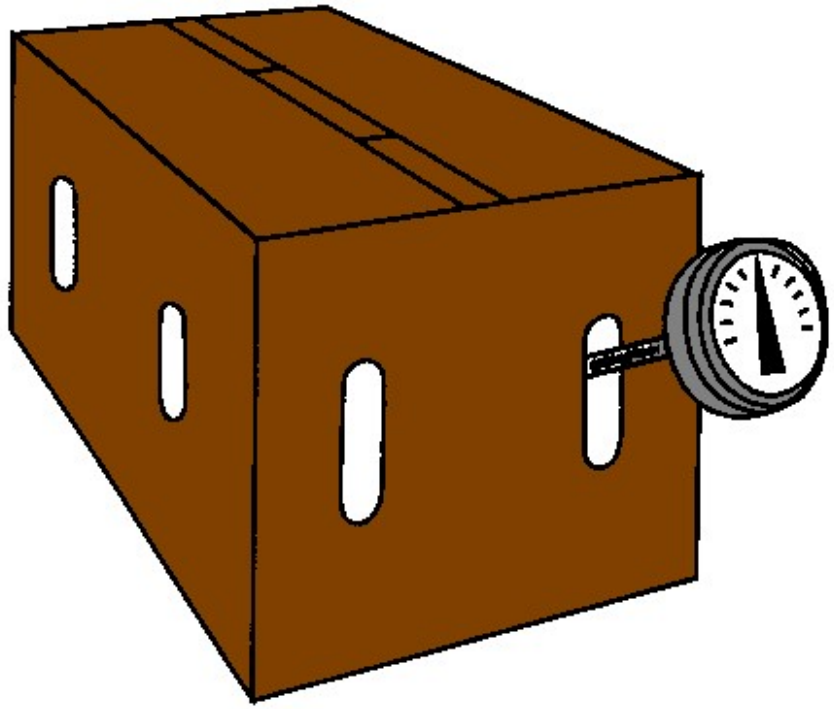


Result: Air is not forced through the interior of the load.

Product Temperature

Product should always be cooled to the required temperature before being loaded.

Transport refrigeration equipment is designed to maintain temperature only.

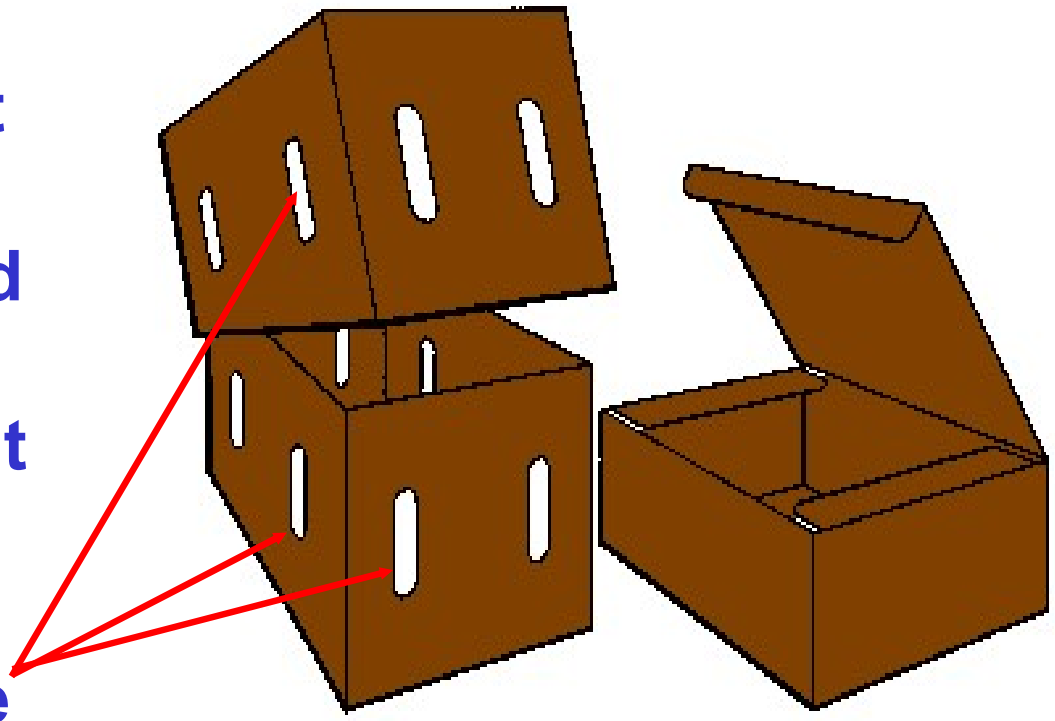


Product should be loaded from a refrigerated loading bay.

Different Containers

Plastic wrap will act as a vapor barrier. Sometimes it is used to trap in moisture, other times to keep it out.

It will always reduce the air circulation in and around the product.



Fresh Products

Frozen Products

Loading Procedures

- Inspect the unit to be loaded
- Pre-cool the box preferably until setpoint
- Switch off the unit
- Load product at the correct temperature and in the correct manner
- Close doors
- Start up unit
- Ensure correct setpoint

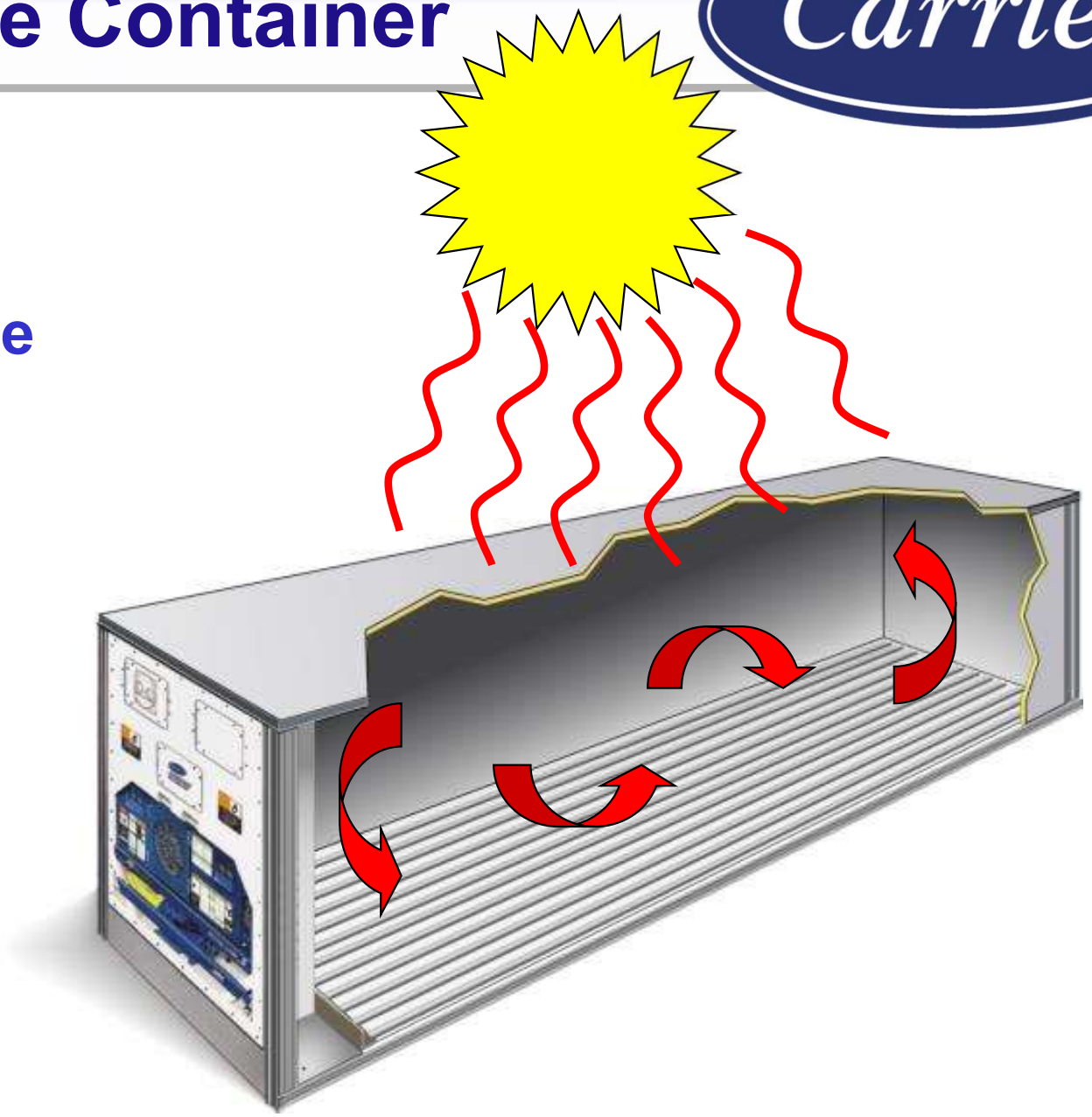
Inspect Equipment

Ensure

- Container is clean
- Container & seals are in good condition
- Reefer is well maintained and pre-tripped by trained technicians

Pre-Cooling the Container

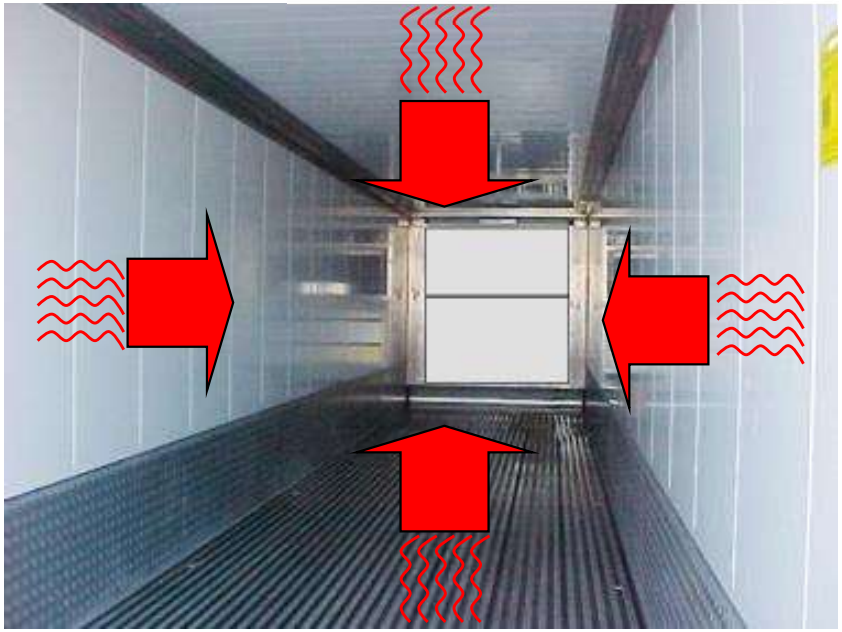
Removes the heat that has entered the body from the sun.

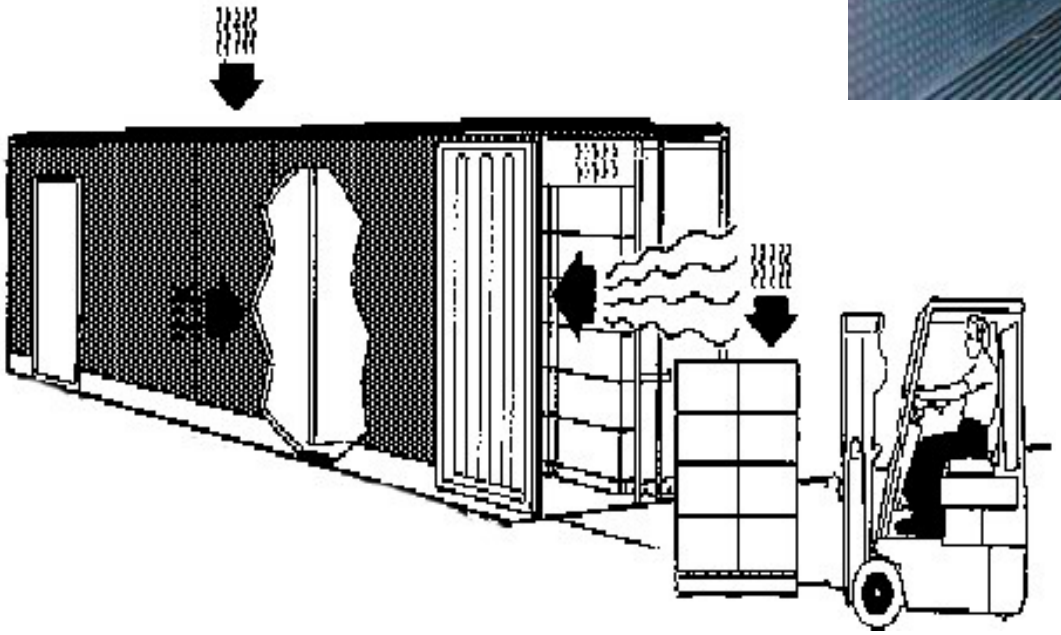


Pointless if proper loading bay not provided or unit left off power after packing.

Heat Sources

1. Through the body
2. Through the rear door
3. Warm Products
4. Door Seal





Loading Procedures

- **Poor air distribution is one of the primary causes of product deterioration even when unit capacity is more than adequate.**

- **Obstruction anywhere around the load can result in hot spots.**

Do not stack boxes above the load line

Loading Procedures

RED LINE

Container side wall

Vertical air channels

Summary Loading Practices

- Supply a well maintained clean reefer
- If possible pre-cool the container
- Only load cargo at the desired carrying temperature
- Ensure load is stacked to provide proper airflow
- Run the unit from the time it's packed un-till the time it is unpacked