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**1. REFERENCE:**

- 1.1 **This procedure refers to the cold treatment of apples, pears, plums, table grapes, persimmons, oranges, lemons, grapefruit and mandarins** as prescribed by Jordan Plant Quarantine Authorities. This procedure will be applied by PPECB as authorized by the South African Department of Agriculture Land Reform and Rural Development (DALRRD) and Jordan. Also refer to PPECB Work Instructions AWI04 (Container) for loading procedures.
- 1.2 The Perishable Products Export Control Board (PPECB) is a statutory body in terms of the provisions of Act No. 9 of 1983 of the Republic of South Africa and is authorized to apply the following cold treatment procedures:
  - 1.2.1 **Accurate calibration** of cold store and ship temperature controls and recording systems, inspection of vessels and container refrigeration equipment and registration of vessels and containers.
  - 1.2.2 **Correct stacking** and air circulation control during pre-cooling and cold store management as well as frequent temperature monitoring.
  - 1.2.3 **Correct handling** and loading procedures to ensure minimum temperature gain during shipment and the voyage.
  - 1.2.4 **Temperature specification**, measurement and control as agreed on and specified by authorities of both the importing and exporting countries.
  - 1.2.5 **Specially authorized and trained PPECB technical personnel** will supervise the cold treatment procedure for accuracy and completeness.  
A separate clause in the Carrying Instructions will be given for cold treatment shipments The **following codes** are in place to assist vessel planners and PPECB in identifying these types of shipments. (Refer to Yellow Cold Treatment Card and PPECB website [www.ppecb.com](http://www.ppecb.com))


SD: Steri Deciduous  SC: Steri Citrus	}	These codes must be used for in-transit shipments, commencement of cold treatment in the container and en-route to final country of destination.
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**1.3 PPECB Requirements**

Jordan’s import permit may request that lemons and grapefruit be exposed to cold treatment in land based cold store process in Jordan.

PPECB is also responsible under Act No. 9 of 1983, to ensure that the most optimum handling, storage and transport temperatures are applied to ensure product quality maintenance. The carrying temperature for citrus and deciduous fruit is a specification of the importing country to prevent the importation of quarantine pests. It is therefore a requirement of the importing country and not of the PPECB. To achieve this, it is necessary to:

- **Containers** – It is a recommendation to set the thermostat control to deliver air for deciduous at minus 0.5°C (SD2), table grapes at minus 1.0°C (SD4) and citrus at 0.5°C (SC5) or sometimes even colder depending on commodity, packaging and return air temperature (RAT) readings.
- **Fresh Air Ventilation** settings for plums and citrus and certain apple and pear cultivars are preset prior loading to introduce approximately 15 cubic meters fresh air per hour into the container and **closed for all other deciduous fruit**. The settings can change or differ as per separate agreement between the Exporter and Shipping Line.

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- **Carton and pallet markings** – Each carton and pallet must have specific markings in accordance with the protocol.

The minimum cold treatment temperature for fresh fruit destined for Jordan is the treatment as specified as follows:

Product	Treatment Temperature °C	Exposure Period
<b>Oranges, lemons, soft citrus (mandarins)</b>	2.0°C	14 days
<b>Plums, table grapes, persimmons</b>	1.5°C	14 days
<b>Pears, apples</b>	1.5°C	40 days

The Jordan officials will scrutinize the recorded temperature data and apply the following formula on the pulp temperatures as recorded by the relevant instruments.

## 2. PRECOOLING OF THE FRUIT:


- 2.1 **Cold stores will be inspected annually** to be certified by PPECB. PPECB requires that a remote fruit pulp temperature monitoring system be installed to monitor pulp temperatures. Suggested sensor specification probe sheath length 50mm and thickness ±2,3mm surgical steel. All the temperature sensors shall be calibrated in a bath of melting ice at 0.0°C prior to pre-cooling and connected to a temperature recorder in order to provide a permanent record of the pre-cooling operation. The cold store must also comply with the prescribed South African regulations and must have a valid PPECB certificate, which is issued in terms of Act No. 9 of 1983 and promulgated regulations no. R917 of 4 May 1984.
- 2.2 Palletized fruit that passed both quality and phytosanitary inspections and intended for cold treatment, will be loaded into the cold store according to standard procedures for forced air pre-cooling (also known as pressure cooling or FAC). **Please note** that the PPECB does not recommend double row stacking on either or both sides of the FAC tunnel because double rows often result in hot spots and therefore require careful and much longer cooling. PPECB requires that temperature sensors be installed into the fruit while building the FAC stack and that the temperatures are continuously recorded to give a true reflection of the warmest and coldest product temperature of the total load. Air temperature sensors should also be installed to verify correct temperature and air circulation control. Temperature readings should be recorded at least once every hour at regular intervals during loading of the chambers and during pre-cooling. These temperature recordings will be filed for later scrutiny if necessary.
- 2.3 Fruit that passed phytosanitary inspection must be stored at least one meter away from any other fruit not destined or not passed for Jordan.
- 2.4 Fruit to be shipped must be pre-cooled to the target temperature of 0.0°C or below. Recommended cold store delivery air must not be colder than minus 1.5°C and the pulp temperature must not be colder than minus 1.5°C.

### **Maximum pulp temperatures in the centre of pallets at time of measuring in the pre-cooling cold room:**

Containers: **minus 0.0°C**

- 2.5 PPECB Technicians will under no circumstances whatsoever, authorize commencement of loading if the above minimum pre-cooling requirements are not met.

## 3. INTEGRAL CONTAINERS TO BE USED FOR COLD TREATMENT:

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### 3.1 PPECB registration


3.1.1 PPECB will make use of the USDA list of registered containers, refer to USDA website – [HTTP://TREATMENTS.CPHST.ORG/cont](http://TREATMENTS.CPHST.ORG/cont). **Only containers and temperature recording devices certified by the USDA may be used.**

Containers will then be selected from this list by the shipping agent for each particular shipment to Jordan. The above is based on criteria and specifications submitted by the ship's agents to the PPECB, relating to refrigeration capacity, temperature range for which the container is designed, temperature monitoring and recording equipment. Containers shall have adequate refrigeration, insulation and accurate thermostatic control to re-cool and uniformly maintain all fruit (pulp) temperature between minus  $0.5 \pm 0.5^{\circ}\text{C}$ . Containers must be properly designed to ensure good air circulating to all parts of the cargo spaces.

3.1.2 The PPECB will ensure that containers for in-transit cold treatment to Jordan comply with the following requirements: (Portable recorders or Fixed on board data loggers)

- Accurate and steady delivery air temperature (DAT) across the entire width of the air delivery plenum to control the delivery air temperature within  $0.5^{\circ}\text{C}$  of the thermostat set point.
- Sufficient refrigeration and thermal capacity to maintain the fruit at a temperature of  $0.0^{\circ}\text{C}$  and colder for at least 14 consecutive days.
- A defrost cycle and temperature maintenance procedure to ensure that the fruit pulp temperature will be maintained in the range of minus  $0.5 \pm 0.5^{\circ}\text{C}$ .
- Automatic temperature recorders, portable recorder or fixed onboard data logger, to continuously monitor and record fruit pulp temperatures in at least two (2) locations in the container and to monitor air temperatures in at least two (2) locations.
- The cargo pulp sensors must be marked at the sensor end of the cable for ease of identification and to ensure that each sensor is placed in the correct / dedicated position.
- It is recommended that the pulp sensors must have an outer sheath of 6,4 mm (0.25 inch) diameter or less. The sensing element must be located within the first 2,5 cm (inch) of the sensor.
- Automatic monitoring from these locations must record temperatures on a recorder or data logger to produce a printout in a clearly legible form.
- Temperatures must be recorded at least **once every hour** in units of  $0.1^{\circ}\text{C}$  and with an accuracy of  $\pm 0.3^{\circ}\text{C}$  in the range minus  $3^{\circ}\text{C}$  to plus  $3^{\circ}\text{C}$ .
- The instrument shall maintain the specified accuracy for a minimum of one month after calibration.
- In all other respects, the container must comply with standard international requirements for the carriage of perishable products and carry a valid certificate from an international certification society.

**USDA approved containers** for in-transit cold treatment shall be fitted with at least two air temperature sensors (delivery and return air) and two fruit pulp temperature sensors, connected either to an onboard or independent temperature data logger. These pulp sensors will be inserted into the fruit in the Jordan designated positions.

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### 3.2 Selection and registration of containers

In addition to holding a valid USDA registration certificate for in-transit cold treatment the PPECB will confirm that the containers to be used for each shipment:

- Are equipped with USDA approved temperature monitoring equipment to measure temperatures in the center of fruit (2 sensors) and air (2 sensors) in positions specified by Jordan.
- The temperature monitoring equipment is capable of continuously recording pulp temperatures at least once every hour in units of 0.1°C, with an accuracy of ±0.3°C in the range of minus 3°C to plus 3°C.
- Containers that do not have an automatic built in PTI system must be pre tripped at 0.0°C (chill mode) and maintain a stable temperature of 0.0°C or colder for at least 6 hours prior to the pre-trip inspection by PPECB. A detailed recorded temperature log must be made available to the PPECB for scrutiny before the container can be approved. Temperature data must be recorded at least once every hour or as a continuous graph.
- It is advisable to pre-cool containers for at least 12 hours prior to being picked up for commencement of loading.

## 4. CANCELLATION OF PPECB REGISTRATION:

### 4.1 Cancellation

Containers withdrawn from service or that are no longer used for in-transit cold treatment to the USA, will be removed from the respective lists and will only be reconsidered if re-inspected and approved by the USDA.


### 4.2 Non-compliance

USDA Certification and PPECB approval for in-transit cold treatment will be cancelled with immediate effect if any one of the specifications laid down in this document is no longer being met or if the container(s) could not successfully maintained in-transit cold treatment during any previous cold treatment programs.

## 5. CONTAINER CALIBRATION:

### 5.1 Procedures

- 5.1.1 Calibration of the temperature monitoring and recording devices must be done by authorized PPECB personnel according to the agreed PPECB requirements.
- 5.1.2 Only USDA approved temperature data loggers or permanently on board units may be used.
- 5.1.3 Authorized PPECB personnel shall perform the calibration procedures applicable to the specific data logger.
- 5.1.4 Authorized PPECB personnel shall check the Portable loggers for being the correct type and that they are functional. Portable loggers will not be checked for calibration, but must be accompanied by a factory guarantee indicating completion of calibration after manufacture. This written guarantee will serve as a validation and must be handed to the PPECB assessor at the load point.
- 5.1.5 The container depot personnel shall electronically “DEPLOY” the onboard data logger by calibrating the different sensors in melting ice and checking correct sensor identification. Authorized PPECB personnel will audit the

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process and note the outcome.

- 5.1.6 Authorized PPECB personnel will ensure that the sensor cables are satisfactory in length, probes at the door end must be at least 15m in length.
- 5.1.7 All temperature sensors must be immersed in an insulated container filled with crushed melting ice at 0.0°C. The ice bath temperature must be checked regularly with a calibrated reference thermometer.
- 5.1.8 Two consecutive readings must be recorded for each sensor at the lowest temperature obtainable. There shall be at least a 60 second interval between the two readings for any one sensor; however, the interval should not exceed 5 minutes. The variance between the two consecutive readings must not exceed 0.1°C.
- 5.1.9 If the consecutive sets of readings are not both within the applicable tolerance of 0.1°C end the calibration procedure and reject the container for in-transit cold sterilization shipments.
- 5.1.10 all calibrated readings must be verified on a laptop or similar device, calibration reading must be printed out and noted on the Q14 form.
- 5.1.11 All temperature measuring and recording devices must be calibrated by the PPECB prior to every in-transit cold treatment shipment; alternatively where applicable a calibration certificate must be supplied for every portable temperature data logger.
- 5.1.12 Faulty sensors or temperature data loggers, i.e. if the instrument does not comply with the specifications in this document, shall be rejected by the PPECB.

## 6. LOCATION OF TEMPERATURE SENSORS:


### 6.1 Air Sensors

For control and recording of the delivery air temperature and to ensure that fruit pulp temperatures remain in the range of 0.0°C and colder, the following shall apply:

- 6.1.1 Containers must be equipped with one air temperature sensor positioned in the delivery (supply) air to the cargo and one sensor positioned in the return air.
- 6.1.2 The air temperature supplied to the fruit must be controlled in the delivery air stream prior to coming into contact with the fruit.

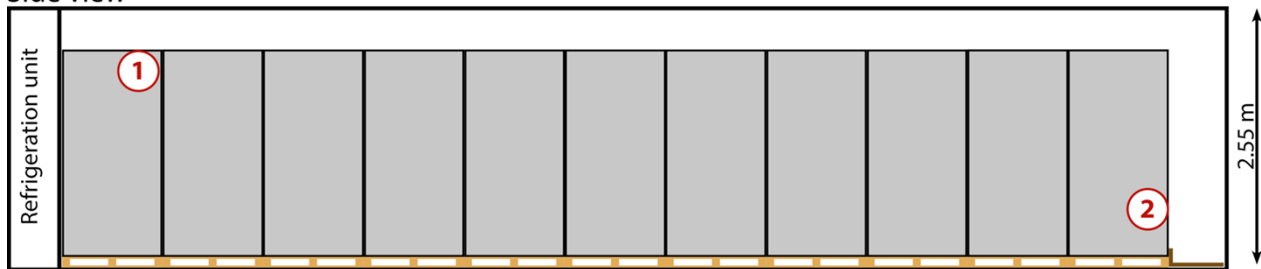
### 6.2 Fruit Sensors

- 6.2.1 Containers are required to have a minimum of two (2) fruit pulp sensors inserted into the fruit in prescribed positions. Detailed positions are as per **par 6.2.5** below.
- 6.2.2 **No.1 sensor** or portable logger be placed in the carton in the first pallet loaded LHS into the container, top layer and centerline of pallet
- 6.2.3 **No.2 sensor** or portable logger must be placed in the carton in the last pallet loaded LHS into the container, 2<sup>nd</sup> carton layer from the bottom and centerline of pallet
- 6.2.4 The sensor cables must be positioned in such a way that it cannot be damaged during loading and or the voyage.

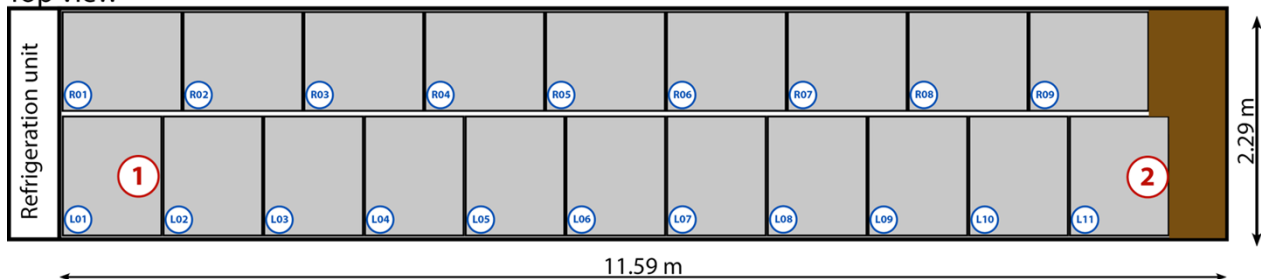
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6.2.5 **Sensor positions specified by Jordan:**

Side view



Top view



6.2.5 **Supervise Loading and Placement of Temperature Sensors**

The tip of the sensor must not extend beyond the fruit. In the case of grapes, berries, must be carefully inserted onto the spear until fully covered, then placed amongst the bunches of grapes.

If the recorder is to be carried inside the container, the means must be provided to obtain the recorded temperature data without having to open the container doors.


7. **STANDARDS FOR TEMPERATURE RECORDING SYSTEMS:**

7.1 **General**

Recording instruments whether separate (loose) or an integral part of a container that is to be used for conducting in-transit cold treatment **must be approved by the USDA**. Full specifications of the temperature sensors and recording system must however be submitted to the PPECB. The PPECB reserves the right to test the container and the recording instrument performance with or without a load.

The standards are intended to meet USDA and the PPECB requirements for a temperature recording installation used in containers engaging in the in-transit cold treatment program for fruit. The recording system shall have an overall accuracy of  $\pm 0.3^{\circ}\text{C}$  in the range of minus  $3^{\circ}\text{C}$  to plus  $3^{\circ}\text{C}$ , with a resolution of  $0.1^{\circ}\text{C}$ .


The design, construction and materials used shall be such that the performance of the installation is unaffected by marine conditions. The calibration accuracy of  $\pm 0.3^{\circ}\text{C}$  shall be maintained for at least one month after calibration.

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## 7.2 Requirements

- 7.2.1 The instrument shall be capable of recording temperature data **at least once every hour** during the voyage, and storing such data for at least 30 days.
- 7.2.2 Recording instruments that form an integral part of the container must have a visual display so that all temperature readings can be viewed manually during calibration, during storage (port terminals etc.) and during the cold treatment period (voyage).
- 7.2.3 The downloaded printout shall identify the container number and data logger serial number and each sensor, indicating date and time of printing.
- 7.2.4 At least two (2) fruit sensors (data logger) and two (2) air sensors (container logger) are required for each container.
- 7.2.5 Recorded data must be of sufficient capacity to display the complete cold treatment record for the entire voyage.
- 7.2.6 Data loggers must have sufficient memory to store all temperature data from time of loading until discharge of the cargo.
- 7.2.7 Independent (separate or loose) PPECB approved electronic portable loggers must be delivered to PPECB at the approved load facility and must be accompanied by a written manufactures calibration certificate or guarantee, validation certificate.
- 7.2.8 Integral (permanently fixed) USDA approved data loggers shall be calibrated by the PPECB after completion of the cleanliness and pre-trip inspection (PTI) procedure at the container depot.
- 7.2.9 All temperature sensors shall be immersed in an insulated container filled with crushed melting ice at 0.0°C.
- 7.2.10 A printed record or log confirming calibration accuracy shall be obtained by the PPECB and included in the documentation to Jordan.
- 7.2.11 Sensor identification shall be confirmed by the PPECB.
- 7.2.12 The cargo sensors must be marked on both sides of the cable for ease of identification and to ensure that each sensor is placed in the correct dedicated position.
- 7.2.13 Faulty sensors or temperature data loggers, i.e. if the instrument does not comply with the specifications in this document, shall be rejected by the PPECB.
- 7.2.14 Temperature readings, downloaded printouts and calibration records must be indicated in °C.
- 7.2.15 The data logger must be capable of showing the results of more than one calibration on the downloaded printout.
- 7.2.16 The data logger must have a unique serial number that is also included on the download printout. In the case where the serial number can not be verified the Shipping Line must seal the controller unit with its own Shipping Line seal and supply PPECB with such information on a company letterhead.

## 8. LOADING CONTAINERS:

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## 8.1 Authorization

The PPECB will authorize commencement of loading if:

- 8.1.1 Fruit to be shipped has been continuously pre cooled in an approved PPECB certified inland or quayside cold stores to the target temperature of 0.0°C or colder. Refer to the cold treatment yellow card.
- 8.1.2 Temperature sensors and recording devices are operating satisfactorily within the specified tolerances.
- 8.1.3 Hourly, tabular temperature printouts to be supplied within an hour before commencement of loading for approval.
- 8.1.3 Only one type of product may be loaded into a container i.e. no mixing of different products **unless approved by the importing country.**
- 8.1.4 It is advisable to pre-cool containers and held at the carrying temperature until commencement of loading.

## 8.2 Supervision

Authorized PPECB technical personnel will perform the following functions during loading:

- 8.2.1 Frequently measure and record fruit temperatures with a calibrated thermometer to ensure that the following stipulated fruit temperatures are not exceeded.

- **Maximum fruit temperature tolerances:**

- During loading      0.5°C


Due to the fact that the cold store environment may affect the accuracy of thermocouple and electronic thermometer connections, **pulp temperatures in the cold store shall only be measured with PT100** or similar type of thermistor temperature sensors.

- 8.2.2 Where temperature discrepancies are found the deciding factor will be to break down the pallets to take pulp temperatures in the center of the pallet.
- 8.2.3 Ensure that containers are loaded directly from cold stores without delay. It is unacceptable to accumulate pallets outside the cold store prior to loading into the containers. Scanning of the bar codes on each pallet must be done prior to loading out of the cold store. Effective loading platforms and equipment must be provided. Container loading including installation of the pulp temperature sensors must be completed within 40 minutes for 12m/40ft containers and 30 minutes for 6m/20ft containers.
- 8.2.4 Insert temperature monitoring sensor no. 1 and 2 of independent or fixed recording devices, into fruit in the Jordan prescribed positions. (Sensor layout position, refer to par. 6.2.4).
- 8.2.5 Clearly identify pallets with temperature sensors with a brightly coloured **“PPECB temperature sensor”** sticker to ensure that the sensors are not damaged during discharge.

## 9. ON COMPLETION OF LOADING:

Authorized PPECB personnel will do the final checks. This will include the following:



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- 9.1 Fully complete the relevant pre-cooling and cold treatment certificate and carrying temperature instruction letter.
- 9.2 Cold treatment will continue for the respective periods stipulated. During this period and for the remainder of the voyage, a complete temperature history must be **printed or recorded at least once every hour**.
- 9.3 The PPECB carrying temperature letter will instruct the Master to maintain the prescribed temperature until discharge. The required commodity temperature will also be stipulated.
- 9.4 Containers will be sealed with standard shipping line seals. These seals may only be broken or removed on instruction by the Jordan official.

**10. DURING THE VOYAGE:**

Master shall be instructed to:

- 10.1 Maintain **E-mail contact with PPECB** supplying the relevant temperature data as requested in the carrying instructions. This is to ensure compliance with the temperature specification during the voyage. These temperature details will also be forwarded to the exporter or his agent.
- 10.2 PPECB must be informed of changes to temperature set points or fresh-air supply.

**11. AFTER THE VOYAGE:**

- 11.1 The documentation confirming that various actions were successfully carried out before the vessel left South Africa will be checked by the Jordan Officials to ensure compliance.
- 11.2 Container seals will be checked to establish that they are still intact.
- 11.3 The temperature recording equipment will be checked to establish that it has operated correctly, has not been tampered with and that the temperature for the entire duration of the cold treatment process was recorded as prescribed.

**12. GENERAL**

The mere fact that the PPECB has ensured that all equipment used and loading procedures applied, comply with Jordan requirements for in-transit cold treatment, does not imply that the Jordan authorities will accept that effective cold treatment took place en route.

**NB: IT IS IMPORTANT TO INFORM PPECB OF ANY COLD TREATMENT FAILURES THAT TOOK PLACE DURING AND/OR ON ARRIVAL AT THE PORT OF DISCHARGE.**

**13. CONTACT PERSONS**

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