CRI GUIDELINES FOR

Packaging Material and Palletisation

for the

2024 Citrus Export Season

PREAMBLE

This set of guidelines were compiled specifically for southern African citrus growers to support them to follow best practice in the supply of export product to their global customer base.

Other participants and/or stakeholders in the value-chain such as paper-, carton-, pallet- and diverse packing material manufacturers, exporters, logistics service providers and importers/ receivers of southern African citrus, are encouraged to support the growers to follow these guidelines with the objective to:

- Foster confidence in and promote the integrity of southern African packed citrus products in the global export markets.
- Maintain the reputation of excellence in presentation of southern African product worldwide.
- Protect growers and other participants in the value chain against losses due to substandard packaging material.
- Promote good manufacturing and appropriate quality controls by packaging manufacturers.

IMPORTANT NOTES:

- *These guidelines have been developed through extensive historic engagement with participants in, inter alia, the CRI Postharvest Technical Forum and Packaging Working Group. The highly valuable historic contributions by the participants in these forums are gratefully acknowledged.*
- *It is intended that the guidelines will be updated annually, following feedback and information on new developments, and innovation options, provided by the packing material manufacturers and other role players in the citrus industry.*
- *The subscription to, and the use of these guidelines by manufacturers and growers, is done on a voluntary basis.*
- *Carton manufacturers and growers remain ultimately responsible for ensuring that the cartons manufactured and / or purchased are of an acceptable quality and conforms with the required health and safety standard required by target markets and legislation.*
- *The guidelines in this document are overarched by the statutory prescriptions in the Agricultural Product Standards as stipulated under section 4(3)(a)(ii) of the Agricultural Product Standards Act, 1990 (Act No. 119 of 1990), regarding the quality of citrus fruit and the requirements regarding the packing, marking and labelling thereof.*
- *The guidelines do not deal with food safety aspects of packing material which is addressed by the CGA's Consumer Assurance Portfolio.*
- *The CRI or any of its affiliates shall not be held liable nor be responsible for the use and application of these guidelines or any actions and consequences arising from the use of the guidelines.*

Contents

1. Cartons and Bulk bins

Paper used for carton manufacturing is commonly sourced from local (RSA) paper suppliers whilst some carton manufacturers have reported successful use of imported paper. Notwithstanding whether local or imported paper is used, it is highly advisable that Virgin Paper Liners and Semi-chemical Fluting be used for all applications.

1.1 Carton Specifications for Open Display Cartons

Display carton configurations (or types) have changed significantly over the past few years with exporters and their customers requiring specific differentiation parameters to set them apart or in competitive positions in the marketplace.

As the CRI has not been exposed to sufficient experience with the in-practice success of the whole range of these carton types, it can only provide the guidelines based on best practice experience for the following range of the most popularly used carton types.

1.1.1 Carton types

- 600 x 400 x
  - 100mm (A06D),
  - 110mm (D64O),
  - 122mm (A10D),
  - 139mm (B10D),
  - 146mm (C15D),
  - 160mm (D15D),
  - 170mm (E15D),
  - 200mm (H15D)
  - 215mm (G15D)
- 500 x 400 x 190mm (F15D)
- 500 x 300 x 170mm (E10D)
- 500 x 300 x 160mm (D10D)
- 400 x 300 x 135mm (E06D)
- 300 x 200 x 110mm (A02D)

1.1.2 Liners and Fluting

Best practice experience to date has shown that open display cartons be manufactured with Virgin Kraft and Virgin White Top Linerboard.

It is highly advisable that open display cartons be manufactured with Semi-chemical fluting and virgin liner. The fluting to be essentially free from abrasive constituents and of such a nature that it does not crack during the corrugating process.

It is also highly advisable that double-wall corrugated board of “B” and “C” flute construction be used for all of the carton types listed above with the exception of the 300 x 200 x 110mm (A02D) carton where double-wall corrugated board of “B” and “E” flute construction be used. Adherence to the following physical properties is advised.

Property	Average for all cartons with footprint 400 x 300 mm or greater	Average for 300 x 200 mm footprint cartons
Board and Fluting	Double walled Combined board (B and C Flute)	Double walled Combined board (B and E Flute)
Caliper unprinted board, mm, minimum.	6,5	5,1
Difference between board calipers of printed and unprinted areas, % maximum.	5,0	5,0
Ply adhesion (damp) N/Meter of length of corrugation, maximum.	400	400
Water absorption of outer/inner facings, g/m² per 5 minutes, maximum.	80	80

Other corrugated board profiles and any other new designs can at this stage be considered as experimental and growers are encouraged to engage specifically with their manufacturers to ensure that appropriate in-practice test process and load capacity determination is followed before they extensively use these “experimental” cartons.

1.1.3 Design and End-pieces

Over the past couple of years some carton manufacturers have developed their own open display carton designs. Due to the confidentiality of the various designs, it is not possible to include all the designs/die drawings in these guidelines.

The use of loose end-pieces is of utmost importance for Hand-erected cartons and individual manufacturers should be consulted for end-piece best practice for Machine-erected cartons.

Graphic designs are considered a matter to be determined by the grower or exporter in consultation with their customers and manufacturer/s.

1.1.4 Mass Load at Failure

Mass load at failure (commonly measured by a BCT test) is considered a very important measure of a cartons’ ability to withstand the rigorous handling and atmospheric conditions experienced from packhouse gate through to the warehouse of the customer in the export market.

Growers are encouraged to engage with their manufacturer/s to ensure that the manufacturer regularly runs, and records for inspection by the grower, an atmospherically controlled BCT test of all batches of cartons manufactured.

The following example of the theoretical carrying capacity of the bottom carton of a stack of cartons serves as an example of the minimum desired BCT value:

- Dry, unconverted carton sample tested at 23^0C @ 50% humidity for 24 hours:
  - 12 layers x 15kg product weight x A dynamic safety factor of 8 = **1440kg**
- Dry, converted carton sample tested at 23^0C @ 50% humidity for 24 hours:
  - 1440 kg x 20% weight loss during manufacturing = 1200kg
  - 1200 kg x 30% loss in cold chain = **923 kg**

The following BCT values have been confirmed in practice as sufficient for exports to a wide range of markets from a wide range of locations in southern Africa.

Carton (mm)	**Carton Type**	**Mass Load at Failure (BCT/Kgf)** (At 32°C ± 1°C and 87% RH ± 1%RH for 24 hours)
600 x 400 x 100	A06D	700
600 x 400 x 110	D64O	720
600 x 400 x 122	A10D	875
600 x 400 x 139	B10D	875
600 x 400 x 146	C15D	875
600 x 400 x 160	D15D	875
600 x 400 x 170	E15D	875
600 x 400 x 200	H15D	800
600 x 400 x 215	G15D	800
500 x 400 x 190	F15D	800
500 x 300 x 170	E10D	750
500 x 300 x160	D10D	750
400 x 300 x 135	E06D	500
300 x 200 x 110	A02D	260

1.2 Carton Specifications for Telescopic Cartons

1.2.1 Carton types

- 600 x 400 x
  - 160mm (D15C)
  - 170mm (E15C)
  - 215mm (G15C)
- 400 x 300 x 270mm (New A15C-S2)
- 400 x 300 x 150mm (A07C)

1.2.2 Liners and Fluting

Based on best practice experience, cartons are to be manufactured with Virgin Kraft and Virgin White Top Linerboard and Semi-chemical fluting.

Preferably with the following board characteristics

Property	Outer box	Inner box
Board and Fluting	Single - wall simplex board of “C” flute construction	Double - wall corrugated board of “B” and “C” flute construction
Caliper unprinted board, mm, minimum -	3,9	6,2
Difference between board calipers of printed and unprinted areas, % maximum	5,0	-
Ply adhesion (damp) N/Meter of length of corrugation, maximum.	400	400
Flat crush resistance of printed board, kPa, minimum (not on flaps) - C Flute	250	-
Water absorption of outer/inner facings, g/m² per 5 minutes, maximum.	80	80

Other corrugated board profiles and any other new designs can at this stage be considered as experimental and growers are encouraged to engage specifically with their manufacturers to ensure that appropriate an in-practice test process and load capacity determination is followed before they extensively use these “experimental” cartons.

1.2.3 Mass Load at Failure

See section 1.1.4 for the theory behind mass load at failure and the importance of BCT test and the monitoring thereof.
The following BCT values have been confirmed in practice as sufficient for exports to a wide range of markets from a wide range of locations in southern Africa.

Carton (mm)	Carton Type	Mass Load at Failure (BCT/Kgf) At 32°C ± 1°C and 87% RH ± 1% for 24 hours
600 x 400 x 160	D15C	875
600 x 400 x 170	E15C	875
600 x 400 x 215	G15C	800
400 x 300 x 270	A15C-S2	600
400 x 300 x 150	A07C	500

1.3 Bulk Bins

1.3.1 Bulk bin types and characteristics

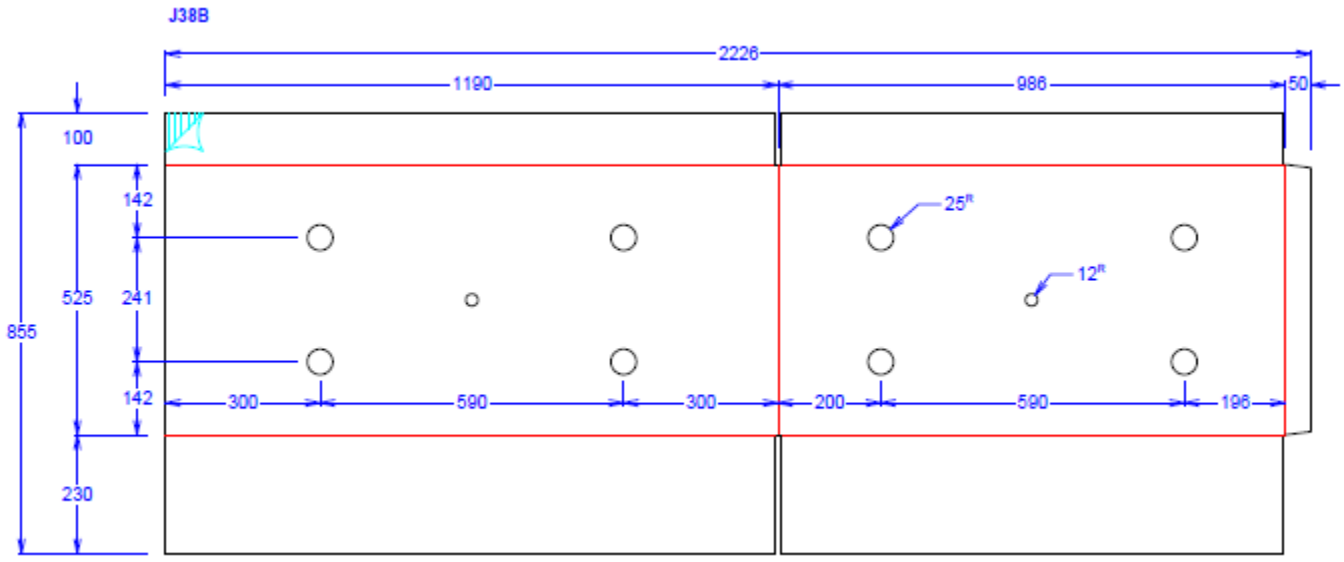
The following guidelines are based on best practise experience

Type	**J38B**	**J50B**	**J60B**
Stacking per pallet	3-high	2-high	2-high
Paper	Virgin Liners and Semi-chemical fluting		
Board/Fluting	Double wall board - “B” and “C” flute		
Paper/Board combination	300/170Ultraflute+ (UF+)/300/170UF+/300g/m²		
Flute direction	855 mm	1200mm	1290mm
Paper Cores Lengths	510mm	855mm	945mm
Paper core thickness	Outside dimension: 76mm minimum Wall thickness: 8mm minimum		

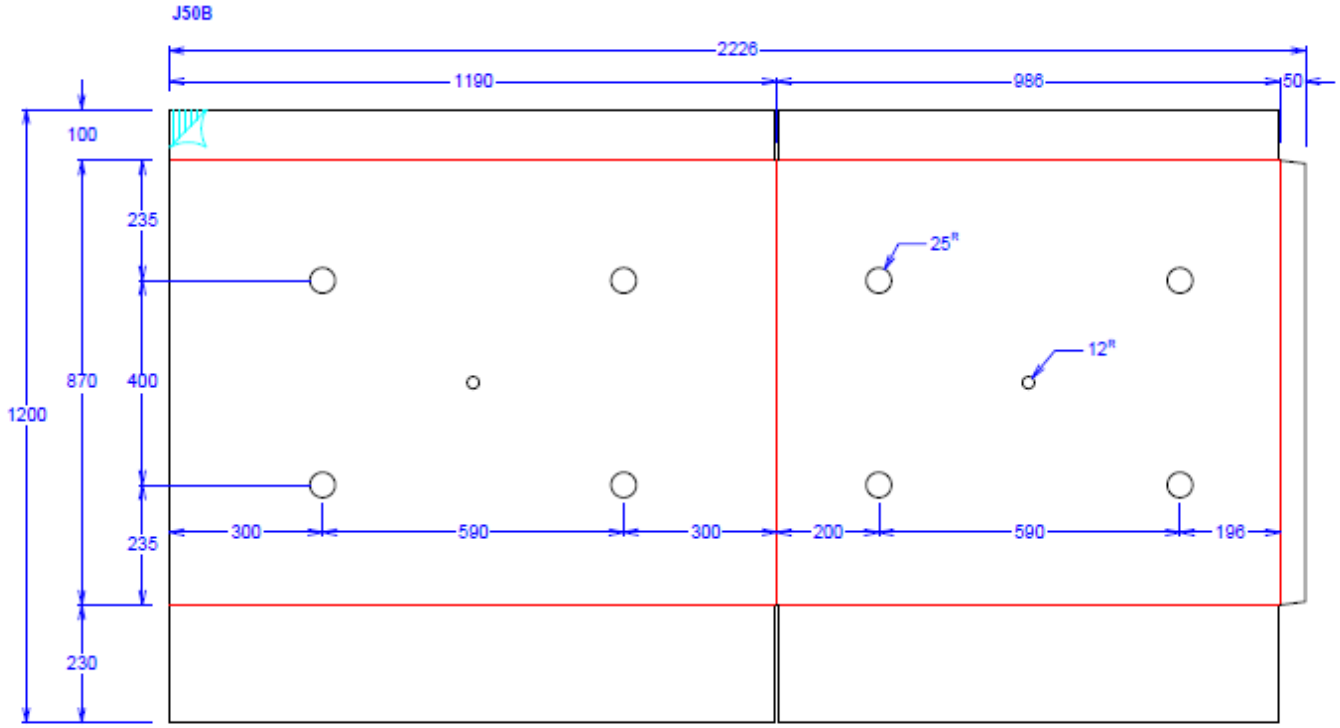
1.3.2 Bulk bin dimensions

The following dimension configurations proved to be successful in practice:

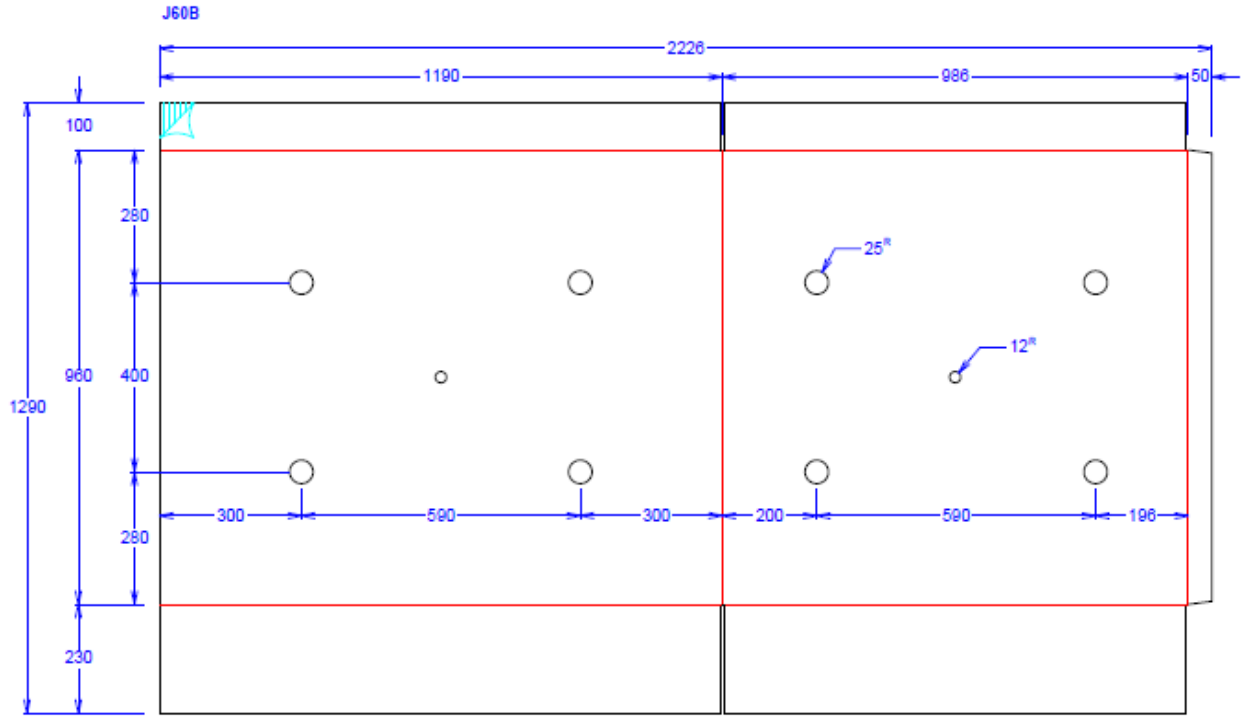
- J38B bins



- J50 bins



- J60B bins



1.4 Quality Control and Assurance

Citrus growers are encouraged to formally engage with their carton manufacturers to ensure that their cartons have been manufactured to strict quality control- and assurance measures

and that each batch of cartons comply to the specifications agreed upon between the grower and the manufacturer (the guidelines in the previous sections of this document could serve to assist growers with defining the specifications agreed upon with their manufacturer)

Growers are also encouraged to regularly visit their manufacturers to avail themselves of operational processes employed as well as the quality control measures undertaken by the manufacturers.

Typical current quality control and assurance assessments, audited by external parties, currently employed by manufacturers include:

- ISO 9001:2015 – for the development, manufacturing, printing and conversion of corrugated packing and related products.
- BRC Global Standard for Packaging Materials – for the conversion and lamination of fibre-board corrugated packaging including print design, flexographic printing, die cutting and gluing for secondary food contact and non-food contact applications.

It is highly advisable that growers engage with their carton manufacturers to provide regular atmospherically controlled BCT testing by an independent SANAS accredited testing laboratory of batch samples of cartons to ensure the internal testing results of a manufacturer conforms to independent verification.

1.5 Codes, markings and traceability

It is advisable that growers insist on the following markings - in order to ensure comprehensive traceability of cartons – especially for cases where claims for inferior standard packing might arise:

- For open top cartons:
    - For identification purposes a unique manufacturer's code should be printed on the business panel of the carton.
    - A batch number must be printed on the bottom of each carton.

- For telescopic cartons
    - For identification purposes a manufacturer's code should be printed on the business panel of all outer components.
    - A batch number should be printed on one of the inner flaps.

Manufacturers are free to stamp the wording "Manufactured in accordance with the 2024 CRI Packaging Guidelines" on the bottom of cartons – after appropriate engagement and agreement with their grower customers that their cartons are manufactured in accordance with the guidelines in this document.

Other markings typically stamped on carton bottoms include stamps that indicate that the cartons have either or all of a Quality Assurance Certification, a FSC mark indicating materials used from responsible source, confirmation of the usage of lead-free printing ink.

2. Wood pallets

2.1 Standards

The quality of pallets play a fundamentally important role in the presentation and stable arrival of palletised southern African citrus in global export markets.

The following indicators integrate best practice findings as well as statutory export requirements and it is highly advisable that growers, packhouses, pallet manufacturers and logistical service providers implement appropriate quality control systems to conform to these indicators.

Citrus pallets conforming to export standards are best described as a disposable four-way entry pallet with a non-reversible perimeter base, constructed from either SA Pine or Saligna.

Important note: The density of SA Pine and Saligna to be at least 400kg/m³ at a moisture content of 12%. For SA Pine, no wood may have a moisture content of more than 20% when used in constructing the pallet. The following dimensions and tolerances are applicable:

Dimensions (mm)	**Tolerances (mm)**
Length: 1210	+ 0 - 2
Width: 1010	+ 0 - 2
Height: 153	+ 2 - 2

The overall dimensions and tolerances for the pallet as a whole are critical and overriding irrespective of the tolerances permitted for individual timber components below.

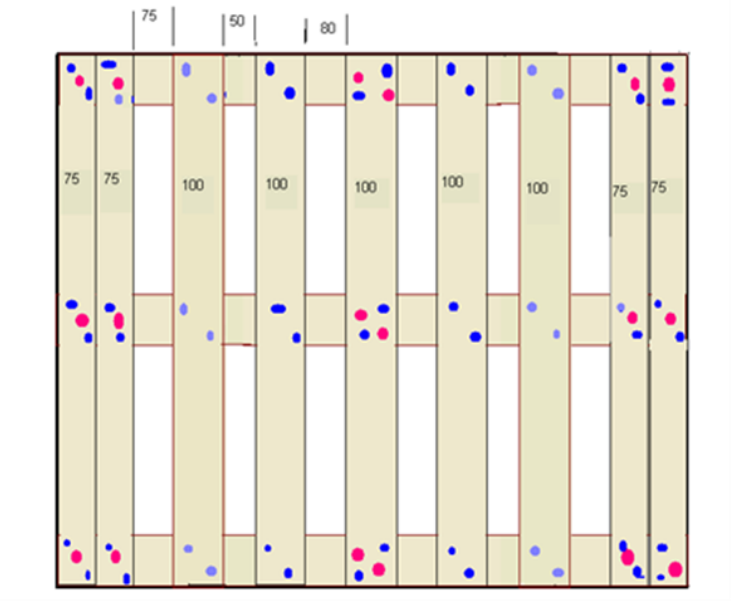
Timber components:				
	Number	**Length (mm)**	**Width (mm)**	**Height/Thickness (mm)**
Top slats	5 *2	1010 1010	100 150	19 19
Bearers	3	1210	100	25
Bottom stringers	5	1010	100	19
Blocks	6 3	150 100	100 100	90 90

*Two 75mm wide top slats may be used to replace the 150mm wide top slats.

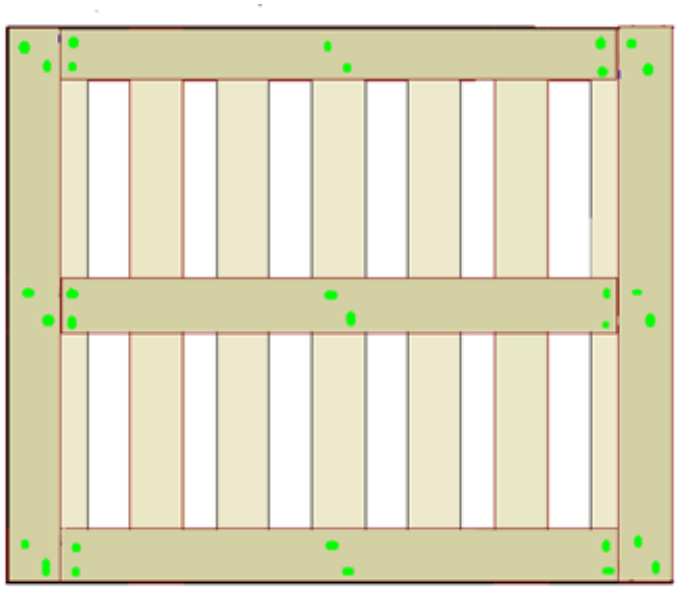
Timber Tolerances			
	Length (mm)	**Width (mm)**	**Height/Thickness (mm)**
Slats, stringers and bearers	+ 0 - 2	+ 3 - 2	+ 2 - 0
Blocks	+ 2 - 2	+ 2 - 2	+ 1 - 1

2.2. Other physical requirements

- The variation in thickness on top deck planks next to each other must not be more than 2mm.
- Squareness:
  - Ends of slats to be cut square: Two (2) mm over width.
  - The diagonal dimensions of a complete pallet must not differ by more than 8mm from each other.
- Finish: All components to be finely sawn.
- Discoloration: No discoloration by paint, lacquer, pitch or any other substance which may taint fruit is permissible.
- Sawn Lumber Defects:
  - Permissible wane on slats: Wane can be up to 25% of the total surface area of any one side of the top or bottom slats, provided that the opposite side has full-face area. The full face area must always be on top.
  - The presence of wood beetles or signs of wood beetles will be a reason for rejection.
  - The twist should not exceed 4 degrees.
  - Splitting/cracking is not permitted.
- Knots and Knotholes:
  - The permissible size of knots should not be in excess of 35% of the width of any timber used. Knots on edges of any timber not to exceed 25% of the width.
  - The following type of knots should be avoided:
    - Knots and knotholes interfering with nails.
    - Split splay (spike) knots and knotholes having sharp edges which could damage cartons on pallets.
- Grain: The grain of the timber must run along the length of the blocks and slats.
- Construction and Fasteners:
  - See diagrams below for the positioning of slats and fastening patterns. Nails to be positioned as shown on the drawings:
    - Tops slats to bearers: 54 of 42mm x 2,5mm.
    - Top deck to blocks: 18 of 75mm x 3,15mm.



- Bottom slats to blocks: 30 of 60mm x 2,5mm.



- All nails to be annular – ringed (ring-shank) type nails.
- Nail guns should be set so that nails are not driven more than 2mm below the surface of the plank to prevent cracking.
- The bottom stringers of slats should be flush against each other, leaving no gaps where they are joined.

2.3 Phytosanitary requirements

It is a statutory requirement that wood used in the manufacturing of wooden pallets for export citrus must be treated to prevent infestation with pests/insects. No fungal growth is allowed on pallets.

Wooden packaging must be treated according to ISPM 15 “Guidelines for Regulating Wood Packaging Material in International Trade.” Treatment can either be with heat (including a kiln drier), Methyl Bromide or Sulphuryl Floride (SF).

Comprehensive information on the treatment regulations is available at:

http://www.old.dalrrd.gov.za/Branches/Agricultural-Production-Health-Food-Safety/Inspection-Services/Wood-Packaging

The following points serves as a summary of these regulations:

- Heat treatment (HT): Wood packaging material should be heated in accordance with a specific time-temperature schedule that achieves a minimum wood core temperature of 56°C for a minimum of 30 consecutive minutes.
- Kiln-drying (KD), chemical pressure impregnation (CPI), or other treatments may be considered to the extent that these meet the HT specifications. For example, CPI may meet the HT specification through the use of steam, hot water or dry treatment.
- Methyl bromide (MB): Although Methyl Bromide (MB) may still be used, product availability is likely to become very limited.
- Wood that is susceptible, or prone (e.g., pine), to fungal growth must be treated to prevent fungal growth.
- SOPP may no longer be used on pallets for organic fruit.
- In all other cases, the presence of SOPP will add to the number of active ingredients on conventional fruit and may cause rejections in markets with restricted MRL’s.
- Alternative products that were tested successfully are ETCH-10 (APM Disinfects), GS75 (Goldshield) and Zoono Z71 (Zoono). All of these products are suitable for both organic and conventional consignments. Pallet manufacturers are encouraged to conduct their own tests regarding suitability of application in their timber yard.
    - For Etch-10 the guideline is a minimum concentration 10%, with submerged contact time of 3 to 5 minutes. This product to be applied after Kiln-drying.
    - For both Zoono Z71, and GS75 full coverage spray application at maximum 40 micron on all surfaces is required. The product can be applied before or after kiln drying. Both of these products can be applied by the end-user at the point of use, as long as excellent coverage is ensured, with particular attention to crevices and joints.
    - For more information contact: Dr Wilma du Plooy (013 759 8012).
- Marking: The regulations regarding markings is included in the ISPM 15 “Guidelines for Regulating Wood Packaging Material in International Trade” For full information please see website mentioned under **“Treatment requirements”** above. The key features of the ISPM 15 regulations are:
    - ISPM 15 applies only to solid wood.
    - Permanent and legible marking of the packaging must be provided on two opposite sides of the package.
    - Pallet manufacturers and service providers of heat and fumigation treatment must be registered with the Department of Agriculture, Land Reform and Rural Development, Directorate Inspection Services to use the ISPM mark on treated wood. The mark should at minimum include the following (See example below):
        - The IPPC Symbol.

- ISO two letter country code (ZA the country code) followed by a code assigned to the producer/treatment provider of the wood packaging material, who is responsible for ensuring appropriate wood is used and properly marked.
- IPPC abbreviation according to the approved treatment used - (e.g., HT, MB or SF).
- The mark should have a clear border around it.
- The use of red or orange should be avoided because these colours are used in labelling of dangerous goods.
- The date of treatment must be shown on two opposite sides of all pallets.
    - It must be placed strictly outside the borders of the IPPC mark in a visible location.
    - The treatment date shall consist of a day, month and year. (E.g., 07-01-2024, 07/01/2024 or 07 Jan 2024.
    - If the date of treatment is not 100% legible, pallets may be rejected.

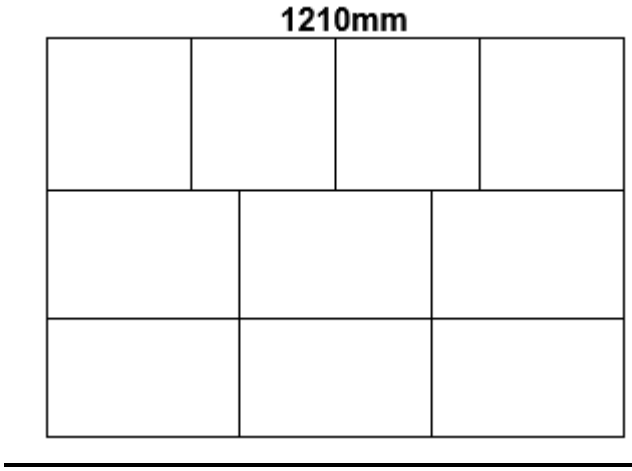
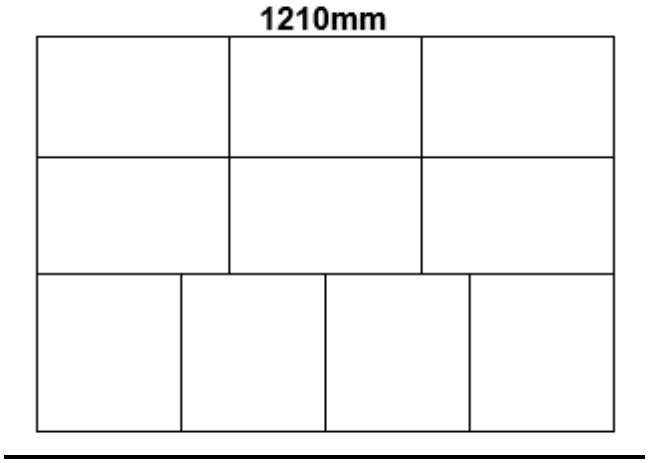
- Packhouses should be aware that the any wooden material- including dunnage used to secure bulk bins should also comply with the ISPM regulation which states that:
    - Wooden dunnage in its raw form poses a very high pest risk if not treated and marked according to methods prescribed under ISPM 15 regulation.
    - Dunnage is wood packaging material used to secure or support a commodity, however, which does not remain associated with the commodity (ISPM 15).
    - Dunnage includes items such as load boards, bracing within cargo containers, and other loose wood used in securing a cargo during transit. For example:
        - Dunnage is often used on bulk bins when packing fruits, in marine vessels to stabilize consignment.
        - Brace cargo during ocean transport or to stabilize pallets inside the container.
    - Role players need to choose the right type of dunnage material depending on the items they need to ship to avoid notification non-compliance associated with wood packaging material from our trading partners.
    - ISPM 15- Guidelines for regulating wood-packaging material in international trade can be accessed on: http://www.fao.org/3/mb160e/mb160e. pdf

3. Palletisation Guidelines

The stacking and stabilization of the cartons on the pallets are extremely important.
The cartons on the first (bottom) layer must be positioned in such a way that the four (4) corners of the cartons are always placed on a top slat of the pallet. (The 4 corners of each carton must always rest squarely on wood). It must be noted that should the base sag, the cartons on the base will be damaged and create a safety and reputational risk.

3.1 Stacking of Telescopic cartons

<table>
<tr><th colspan="2">Standard Containers and Conventional Vessels</th></tr>
<tr><th colspan="2">A15C-S2 (400 x 300 x 270mm) and
A07C (400 x 300 x 150mm):</th></tr>
<tr><td>Stacking patterns (A15C-S2) – Layers 1, 2, 3, 5 and 7.
Stacking patterns (A07C) – Layers 1, 2, 3, 4, 5, 6, 8, 10 and 12.</td><td>Stacking patterns (A15C-S2) – Layers 4 and 6

Stacking patterns (A07C) – Layers 7,9,11 and 13.</td></tr>
<tr><td> 
</td><td> 
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<tr><th colspan="2">D15C (600 x 400 x 160mm), E15C (600 x 400 x 170mm), and
G15C (600 x 400 x 215mm)</th></tr>
<tr><td>Stacking patterns (160) – Layers 1, 2, 3, 4, 6, 8, 10 and 12
Stacking patterns (170) – Layers 1, 2, 3, 4, 6, 8 and 10</td><td>Stacking patterns (160) – Layers 5, 7, 9 and 11

Stacking patterns (170) – Layers 5, 7, 9 and 11</td></tr>
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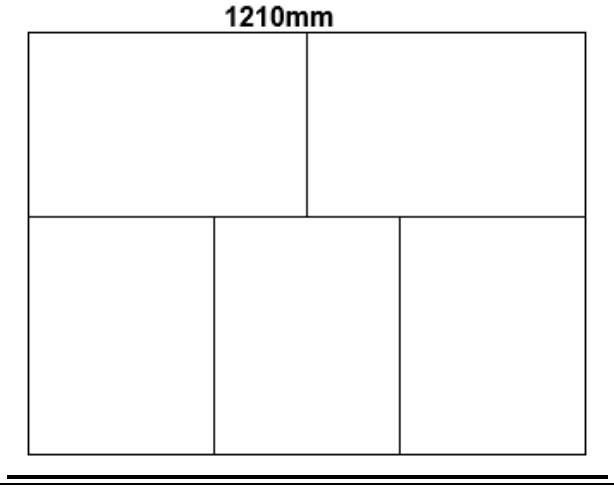
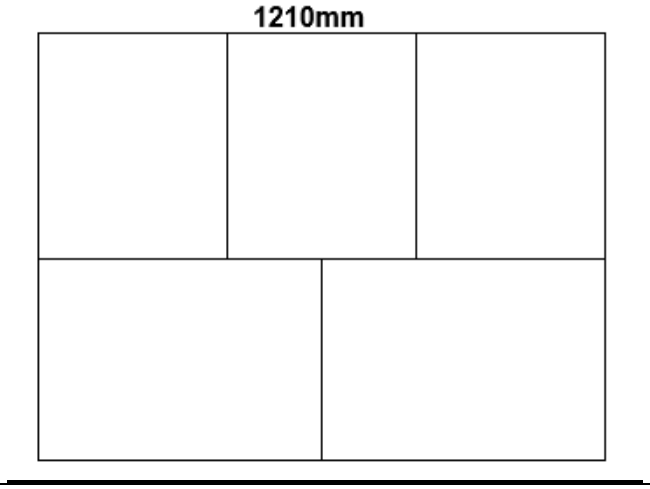
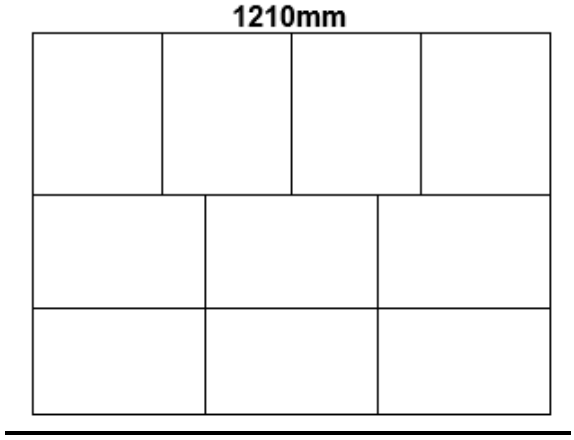
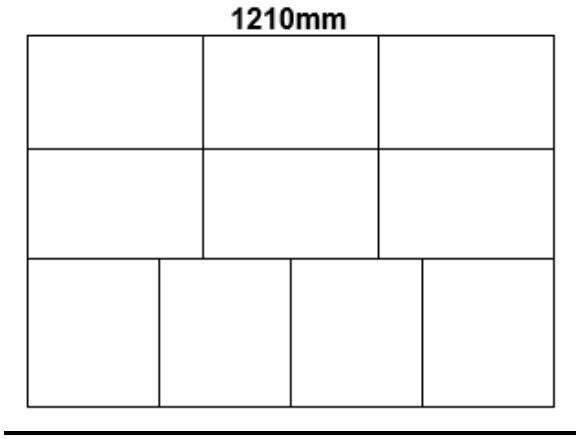
	

Hi-cube Shipping Containers	
A15C-S2 (400 x 300 x 270mm) and A07C (400 x 300 x 150mm)	
Stacking patterns (A15C-S2) – Layers 1, 2, 3, 5 and 7. Stacking patterns (A07C) – Layers 1, 2, 3, 4, 5, 6, 8, 10, 12 and 14	Stacking patterns (A15C-S2) – Layers 4, 6 and 8. Stacking patterns (A07C) – Layers 7, 9, 11, 13 and 15.
	
D15C (600 x 400 x 160mm), E15C (600 x 400 x 170mm) and G15C (600 x 400 x 215mm)	
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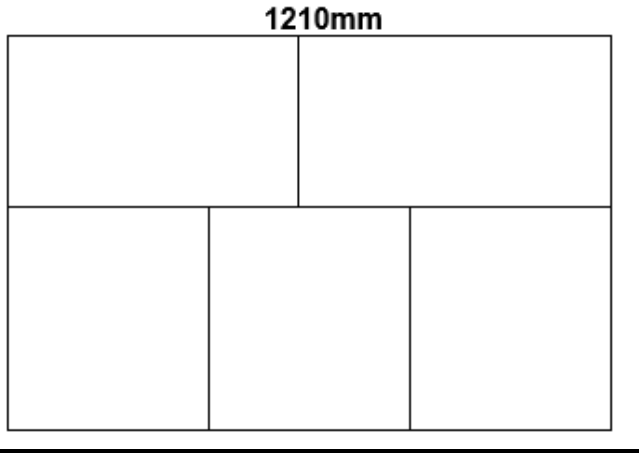
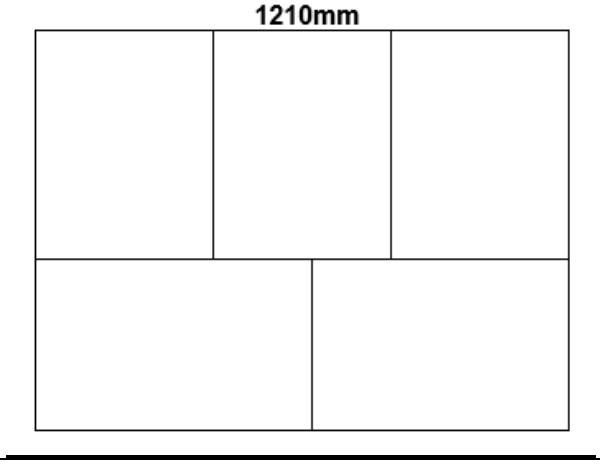
Stacking patterns (215) – Layers 1, 2, 3, 4, 6, 8 and 10.	
	

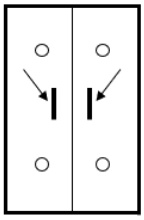
3.2 Stabilisation of Telescopic Cartons on Pallets

Each specific carton type or design requires a unique securing method. Should cartons and pallets not be correctly secured, there may be a risk for cartons / pallets to compress and / or collapse.
The following is regarded as best practice for telescopic cartons:

- Corner pieces: Pallet loads should be stabilised with four (4) laminated paper corner pieces. The corner pieces (use only high quality materials) are to be placed on top of the pallet base:
  - Standard Containers and Conventional vessels:
    - Length: 1850mm
    - Dimensions: 50 x 50 x 5mm
    - The water absorption of the outer face of the laminated paper corner pieces: 80 maximum g/m² per 5 minutes.
  - Hi-cube Shipping Containers:
    - Length: 2130mm
    - Dimensions: 50 x 50 x 5mm
    - The water absorption of the outer face of the laminated paper corner pieces: 80 maximum g/m² per 5 minutes.

- Spot Gluing: In cases where spot gluing can be done successfully and the use of corner pieces for certain markets is not compulsory, cartons may be stabilised/secured with spot glue.

Positioning of Hot Melt Spot Glue



- Horizonal plastic strapping: The ultimate securing of pallet loads is achieved by horizontal strapping per the following minimum requirements for telescopic cartons.

Carton type	Cartons per layer	Layers	Cartons per pallet	Layers to be strapped
Standard Shipping Containers and Conventional Vessels				
A15C-S2 400x300x270	10	7	70	1, 2, 3, 5 & 7
A07C 400x300x150	10	13	130	1, 2, 3, 5, 8, 11 & 13
D15C 600x400x160	5	12	60	1, 2, 3, 4, 6, 9 & 12
E15C 600x400x170	5	11	55	1, 2, 3, 4, 6, 9 & 11
G15C 600x400x215	5	9	45	1,2,3,4,7 & 9
High-Cube Shipping Containers				
A15C-S2 400x300x270	10	8	80	1, 2, 3, 5, 7 & 8
A07C 400x300x150	10	15	150	1, 2, 3, 5, 7, 9, 11,13 & 15
D15C 600x400x160	5	14	70	1, 2, 3, 4, 6, 9,11 & 14
E15C 600x400x170	5	13	65	1, 2, 3, 4, 6, 8,10 & 13
G15C 600x400x215	5	10	50	1, 2, 3, 4, 6, 8 & 10

Refer also to the diagrams in Addendum A for illustrations of the best practice for strapping of appropriate carton layers.

3.3 Stacking of Open Display Cartons

The following configurations reflect standard best practice for conventional, standard-container and high-cube container shipping (all cartons column stacked all the way up to the top of the loaded pallet).

600 x 400mm open display cartons.	500 x 400mm (F15D) open display cartons.

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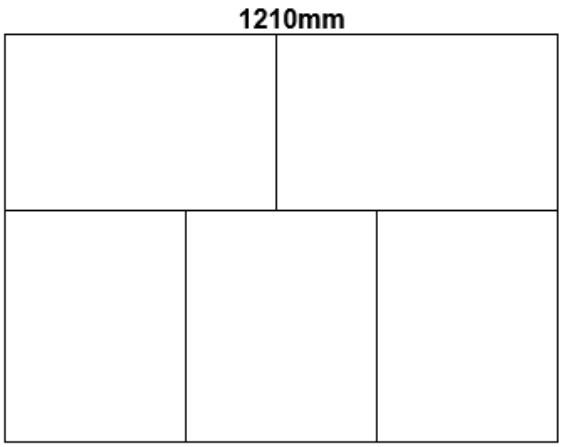
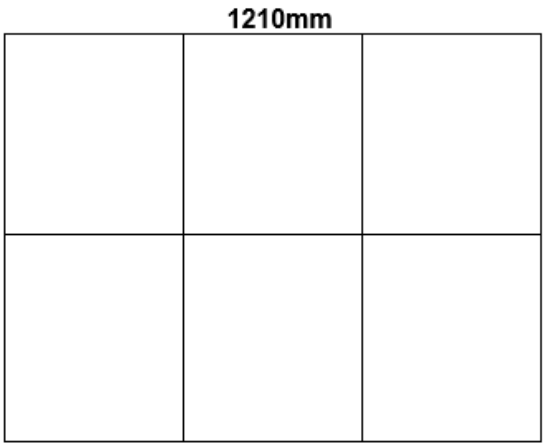
<tr><td> 
</td><td> 
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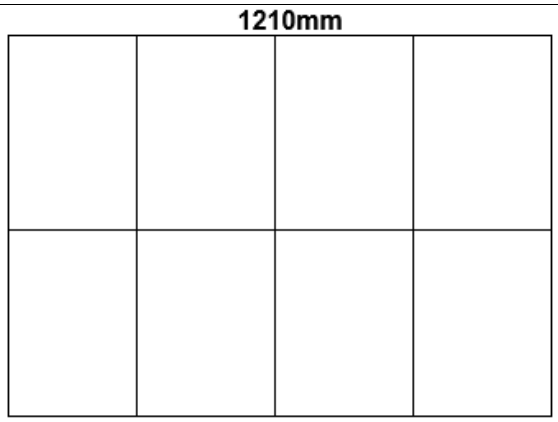
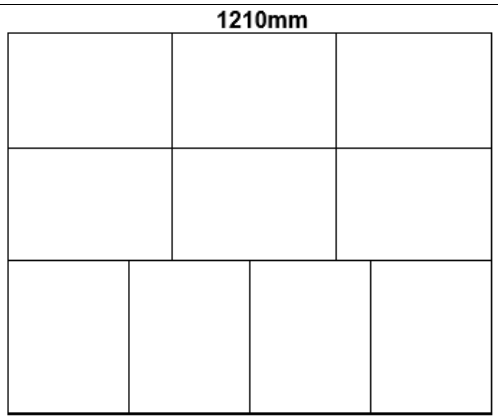
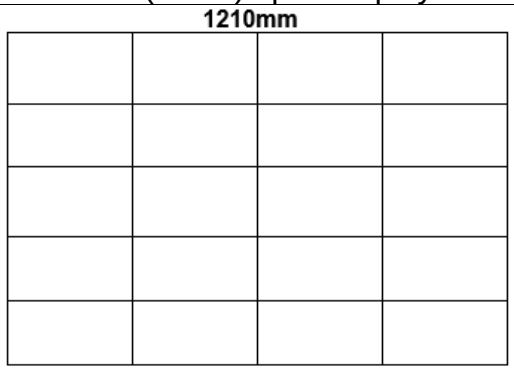
<tr><td>500 x 300mm (E10D) and 500 x 300 mm (D10D) open display cartons.</td><td>400 x 300mm (E06D) cartons</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>300 x 200mm (A02D) open display cartons</td><td></td></tr>
<tr><td> 
</td><td></td></tr>
</table>

3.4 Stabilisation of Open Display Cartons on Pallets

Each open display carton type or design requires a unique securing method to mitigate the risk for cartons / pallets to compress and / or collapse. It is, therefore, advisable to consider the guidelines below:

All pallet loads should be stabilised with four (4) laminated paper corner pieces, securing sheets and horizontal plastic straps. The corner pieces to be positioned on top of the pallet base. All open display cartons to be covered with corrugated board pallet caps.

- Corner Pieces
  - Length: 1850mm and 2130 for Standard Containers and Conventional and Hi-cube Shipping Containers respectively.
  - Dimensions: 50 x 50 x 5mm.
  - The water absorption threshold of the outer face of the laminated paper corner pieces should not exceed a maximum of 80 g/m² per 5 minutes.
  - Avoid inferior quality (cheap) corner pieces.

- Strapping, pallet caps, and securing sheets – Please refer to the diagrams in Addendum A for illustrations of best practise for covering pallets with caps, the insertion of securing sheets and strapping of appropriate carton layers. The current standards can be summarised as follows:

CONVENTIONAL VESSELS AND STANDARD SHIPPING CONTAINERS

Carton type	No of cartons per layer	No of layers	No of cartons per pallet	Layers to be strapped	Securing sheet layers
A02D 300x200x110	20	18	360	1, 3, 5, 7, 10,13,16 & 18	1, 2, 3, 5, 8, 12 & 15
E06D 400x300x135	10	14	140	1, 2, 3, 5, 8, 11 &14	1, 2, 3, 5, 7, 9 & 11
D10D 500x300x160	8	12	96	1, 2, 3, 4, 6, 9 & 12	1, 2, 3, 6 & 9
E10D 500x300x170	8	11	88	1, 2, 3, 6, 8 & 11	1, 2, 3, 6 & 8
F15D 500x400x190	6	10	60	1, 2, 3, 6, 8 & 10	1, 2, 3, 5 & 8
A06D 600x400x100	5	19	95	1, 3, 5, 7,10, 13,16 & 19	1, 2, 3, 5, 8, 11 & 15
D64O 600x400x110	5	16	80	1, 2, 3, 5, 8, 11,13 &16	1, 2, 3, 5, 8, 11 &13.
A10D 600x400x122	5	16	80	1, 2, 3, 5, 8, 11,13 & 16	1, 2, 3, 5, 8, 11 & 13
B10D 600x400x139	5	14	70	1, 2, 3, 5, 8, 11 & 14	1, 2, 3, 5, 7, 9 & 11
C15D 600x400x146	5	13	65	1, 2, 3, 5, 8, 11 & 13	1, 2, 3, 6 & 10
D15D 600x400x160	5	12	60	1, 2, 3,4 6, 9 & 12	1, 2, 3, 6 & 9
E15D 600x400x170	5	11	55	1, 2, 3, 6, 8 & 11	1, 2, 3, 6 & 8

Carton type	No of cartons per layer	No of layers	No of cartons per pallet	Layers to be strapped	Securing sheet layers
H15D 600x400x200	5	10	50	1, 2, 3, 6, 8 & 10	1, 2, 3, 6 & 8
G15D 600x400x215	5	9	45	1, 2, 3, 6 & 9	1, 2, 3, 5 & 7

HI-CUBE SHIPPING CONTAINERS

A02D 300x200x110	20	20	400	1, 3, 5, 7, 10,13,16 & 20	1, 2, 3, 5, 8, 12 & 16
E06D 400x300x135	10	16	160	1, 2, 3, 5, 8, 11, 14 & 16	1, 2, 3, 5, 7, 10 & 13
D10D 500x300x160	8	14	112	1, 2, 3, 5, 7, 9, 11 & 14	1, 2, 3, 5, 8 & 11
E10D 500x300x170	8	13	104	1, 2, 3, 5, 7, 9, 11 & 13	1, 2, 3, 5, 8 & 11
F15D 500x400x190	6	11	66	1, 2, 3, 5, 8 & 11	1, 2, 3, 5 & 8
A06D 600x400x100	5	22	110	1,3,5,7,10,13,16,19 & 22	1, 2, 3, 5, 8, 11, 15 & 19
D64O 600x400x110	5	20	100	1, 3, 5, 7, 10, 13, 16 & 20	1, 2, 3, 5, 8, 12 & 16
A10D 600x400x122	5	18	90	1, 2, 3, 5, 8, 11, 14 & 18	1, 2, 3, 5, 8, 11 & 14
B10D 600x400x139	5	16	80	1, 2, 3, 5, 8, 11, 14 & 16	1, 2, 3, 5, 8, 11 & 13
C15D 600x400x146	5	15	75	1, 2, 3, 5, 7, 9, 11, 13 & 15	1, 2, 3, 5, 8 & 12
D15D 600x400x160	5	14	70	1, 2, 3, 5, 7, 9, 11 & 14	1, 2, 3, 5, 8 & 11
E15D 600x400x170	5	13	65	1,2,3,5,7,9,11 & 13	1, 2, 3, 5, 8 & 11
H15D 600x400x200	5	11	55	1,2,3,6,8 & 11	1, 2, 3, 6 & 8
G15D 600x400x215	5	10	50	1,2,3,6,8 & 10	1, 2, 3, 6 & 8

4. Accommodating New developments

The guidelines in the preceding sections of this document are based on extensive research and practical experience with consignments to global markets. In this regard the contributions of the various packing material manufacturers that participated in the Citrus Packing Working Group needs to be greatly acknowledged.

As is the case in the entire citrus export value chain, the development of additional and/or alternative options based on technological progress, especially given the relatively high - and ever increasing - cost of packing material, should be encouraged and pursued.
In this regard, the initiatives by the various packing material manufacturers are extremely heartening.

Therefore, this document should be regarded as a “living” document that should be adapted if and when appropriately tested new options come to the fore.

It is especially foreseen that Citrus Growers, Carton Manufacturers, Exporters the CRI and even global Customers will have to pool resources and inputs to working to find creative solutions to cost and quality challenges going forward.

Anti-Competitive practices are strictly regulated in the southern African environment and therefore, apart from Statutory Regulations, prescriptive behavior or processes cannot be condoned. The result of this is that the final determination of specifications and quality is a matter of agreement between the customer (e.g., grower) and supplier (e.g., supplier/manufacturer.

There are various variables to consider when determining whether a carton will be suitable for the citrus value chain: for example, the cold chain, the humidity of the end destination, the packaging protocols, the required compression strength etc. Growers and carton manufacturers are advised to take cognizance of the guidelines above as well as the objectives as set out in the preamble of these guidelines when developing new and experimental cartons. This is to ensure that the high regard for the presentation of South African citrus on export markets are maintained.

It is, therefore, advisable that growers and carton manufacturers consider the following procedure (or a similar process) to determine the suitability of new and / or experimental cartons:

Phase 1:

- A full laboratory test to be conducted, at an accredited SANAS-laboratory, in terms of which the cartons are tested for inter alia strength, durability and safety taking in consideration the various variables that the cartons will be subjected to (typically therefore at 32°C ± 1°C and 87% RH ± 1% for 24 hours) coupled with appropriate record keeping of the test results. The current standard values are specifically for board combinations of virgin liner and semi-chemical fluting; therefore, it is important to note that alternative test procedures and values will have to be developed for alternative paper types.

Phase 2:

- A total of at least 60 pallets (50 Experimental - and 10 Control pallets) shipped in Hi-cube containers to each of at least three of the following markets: The UK, Europe, Middle-East or Far-East.
- A total of at least 60 pallets (50 Experimental - and 10 Control pallets) shipped in conventional vessels to each of at least three of the following markets: Russia, Europe, the USA, Middle-East or Far-East.
- Or a total of at least 1 000 000 cartons exported to any three markets without any failures reported due to inherent carton characteristics.
- Note: It is important that carton manufacturers duly advise growers and exporters when trialing new and / or experimental cartons which will be exported. It is also advisable that carton manufacturers obtain the written consent of growers and exporters (where applicable) when trialing new and / or experimental cartons which deviate from the guidelines outlined in the guidelines in this document.
- Manufacturers of experimental cartons should keep full records of the number of experimental cartons exported by batch number, packhouse, markets/receivers, quality reports, etc. to support the evaluation process for eventual uptake and implementation by the citrus industry. The onus is on the carton manufacturer to provide sufficient evidence of carton quality for the inclusion of the new carton into these guidelines.

Phase 3:

- Quality-on-arrival assessments and recording of the results thereof of the Phase 2 shipments by authorized representatives of the consignment participants: e.g., the grower, exporter and manufacturer as well as the end-customer/receiver.

Phase 4:

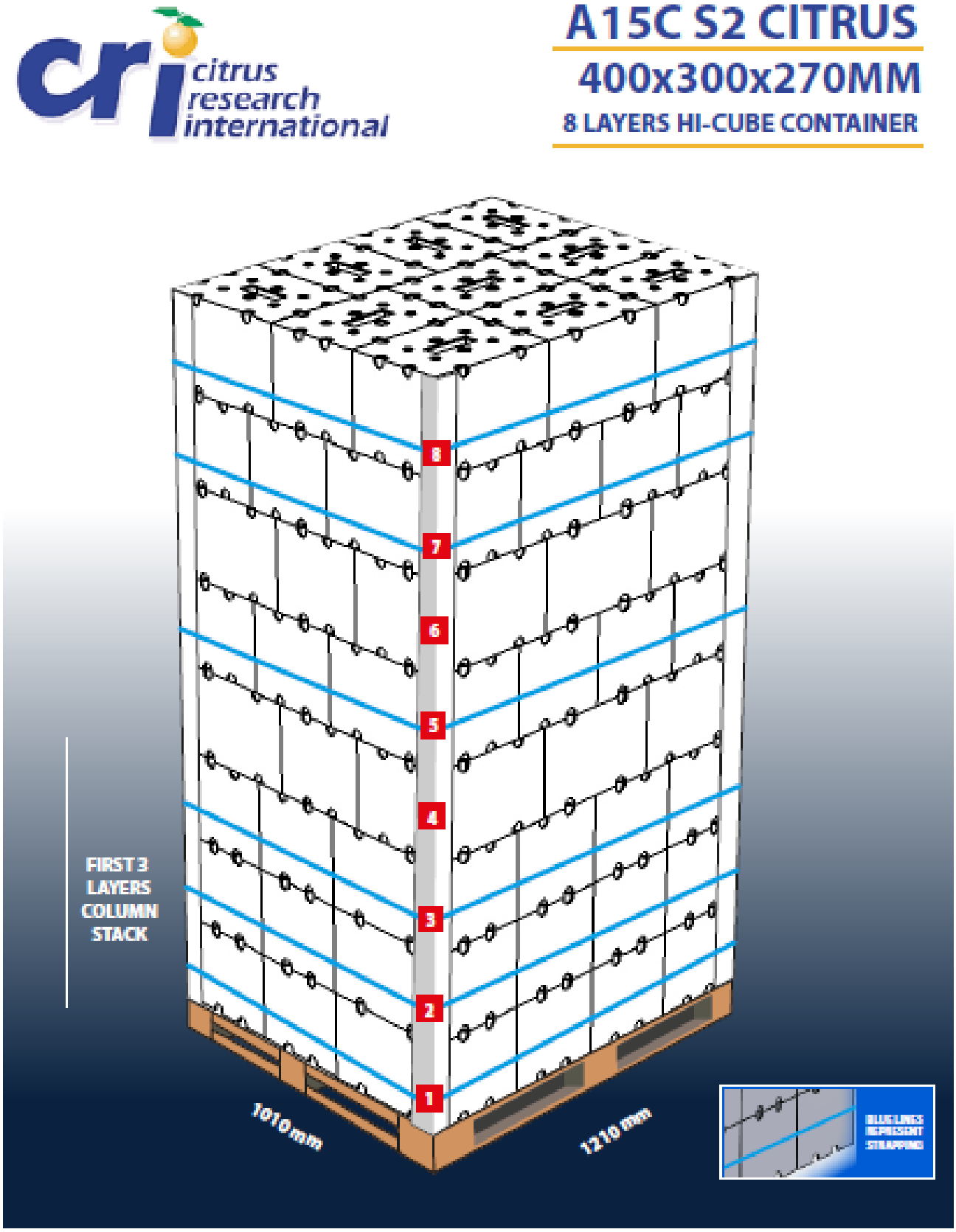
- A coordinated evaluation process, by the consignment participants, of the Quality-on-arrival assessments to aid decision making on whether to use the carton in future commercial consignments and/or whether further improvements or experimentation is required.
- A letter of consent by all participants for future commercial use of the carton and inclusion of the carton composition in these guidelines.

The CRI remains positioned (willing and able) to participate in this evaluation process, and further independent testing - if required, which could lead to inclusion of the new innovations in future CRI guidelines. In this regard the CRI will facilitate a PWG meeting early in 2024 to discuss the further evolution of the PWG and the CRI's support to it.

As far as possible it is suggested that all trials be packed at packhouses long distances from the ports and ideally that all trials be shipped out of Durban. Very high humidity and therefore a severe test for any experimental carton.

Generally good practice will entail that new and / or experimental cartons exceed the minimum specifications and thresholds of the guidelines in this document in which, the citrus industry may find further assurance that the new and / or experimental cartons are sustainably suitable for the citrus industry.

5. Addendum A: Illustrative diagrams - Strapping, pallet caps and securing sheets.

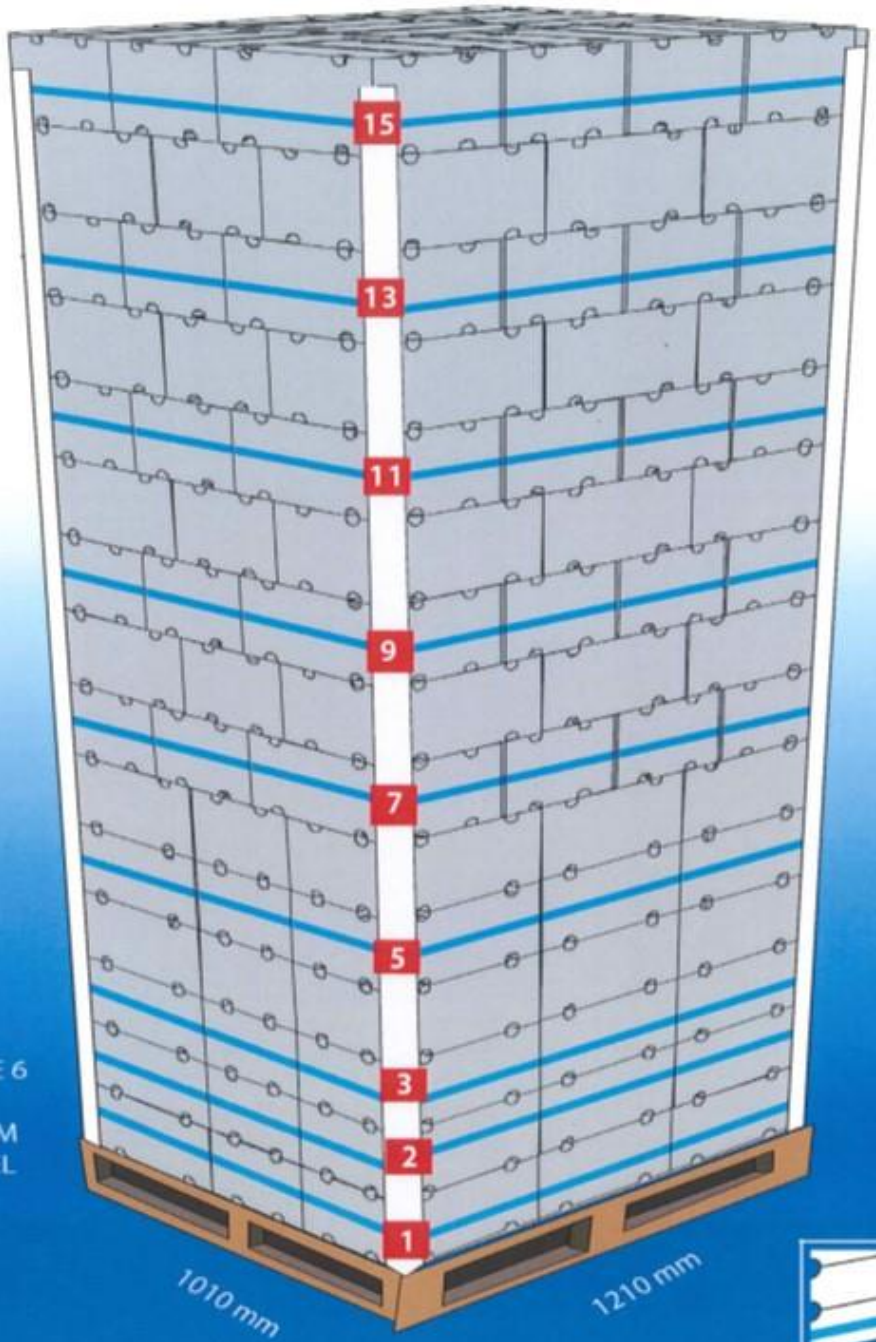


citrus research international

A07C CITRUS

400x300x150 mm

15 LAYER HIGH-CUBE CONTAINER



EERSTE 6 LAE KOLOM STAPEL

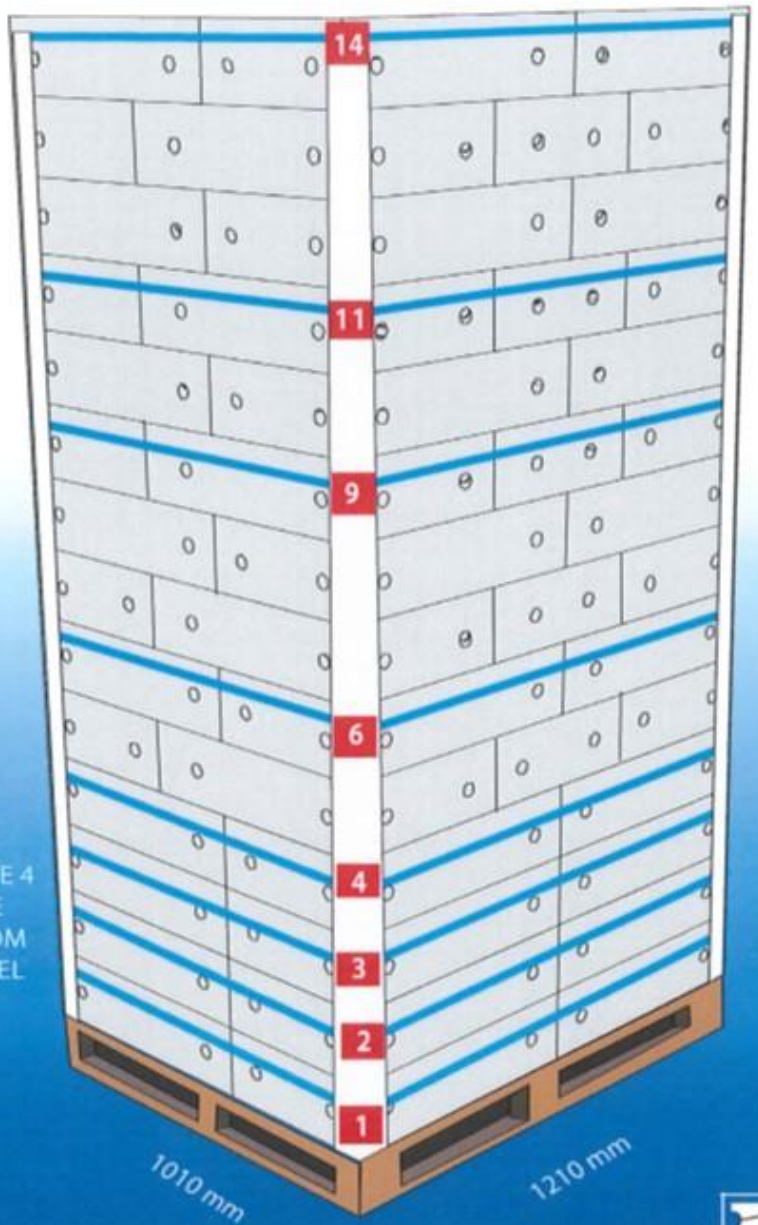
BLOU LYN VERWYS NA "STRAPPING"

citrus research international

D15C CITRUS

600x400x160 mm

14 LAYER HIGH-CUBE CONTAINER



EERSTE 4 LAE KOLOM STAPEL

citrus research international

E15C CITRUS

600x400x170 mm

13 LAYER HIGH-CUBE CONTAINER

citrus research international

G15C CITRUS

600x400x215 mm

10 LAYER HIGH-CUBE CONTAINER

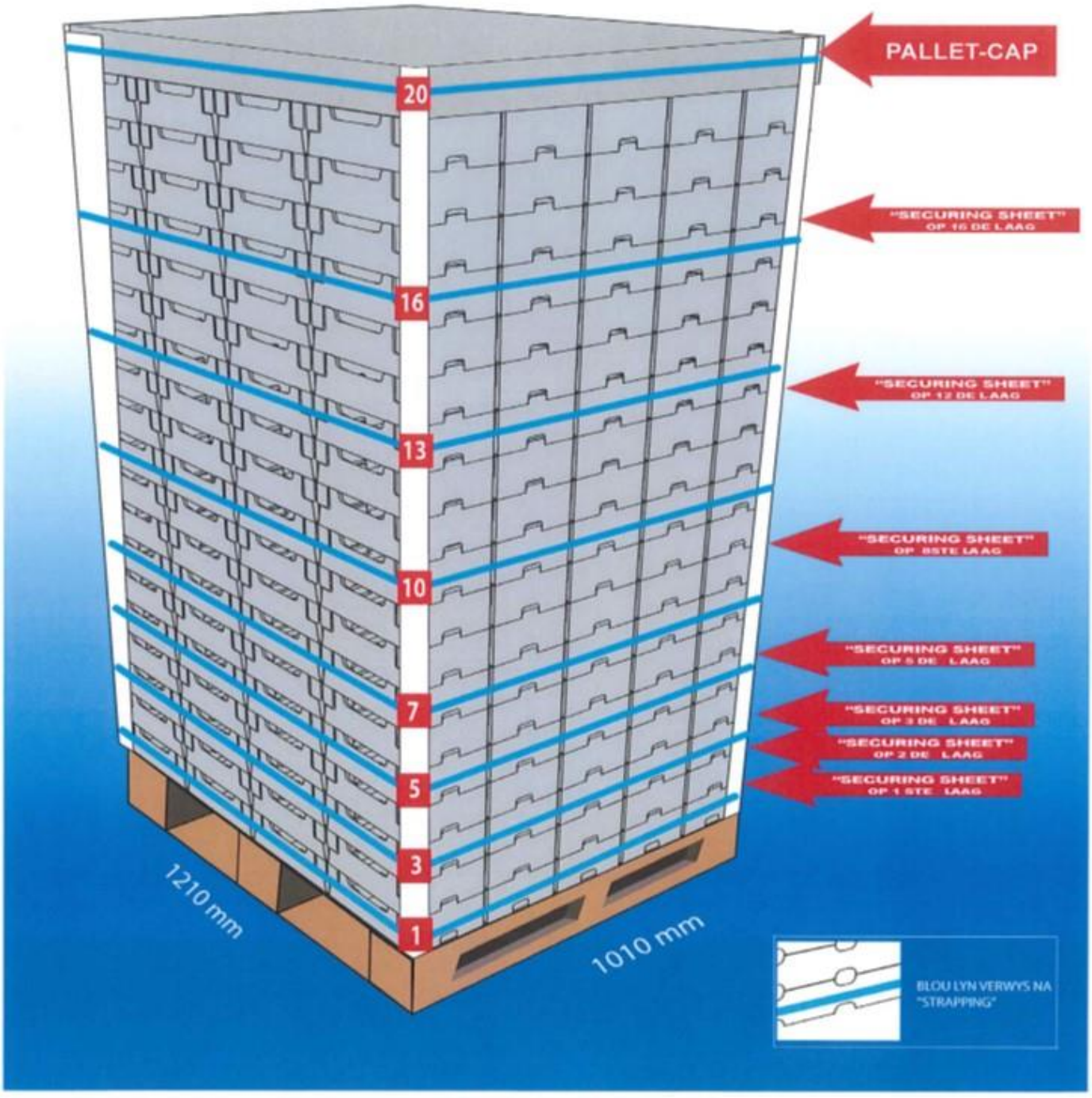
EERSTE 4 LAE KOLOM STAPEL

citrus research international

A02D CITRUS

300x200x110 mm

20 LAYER HIGH-CUBE CONTAINER

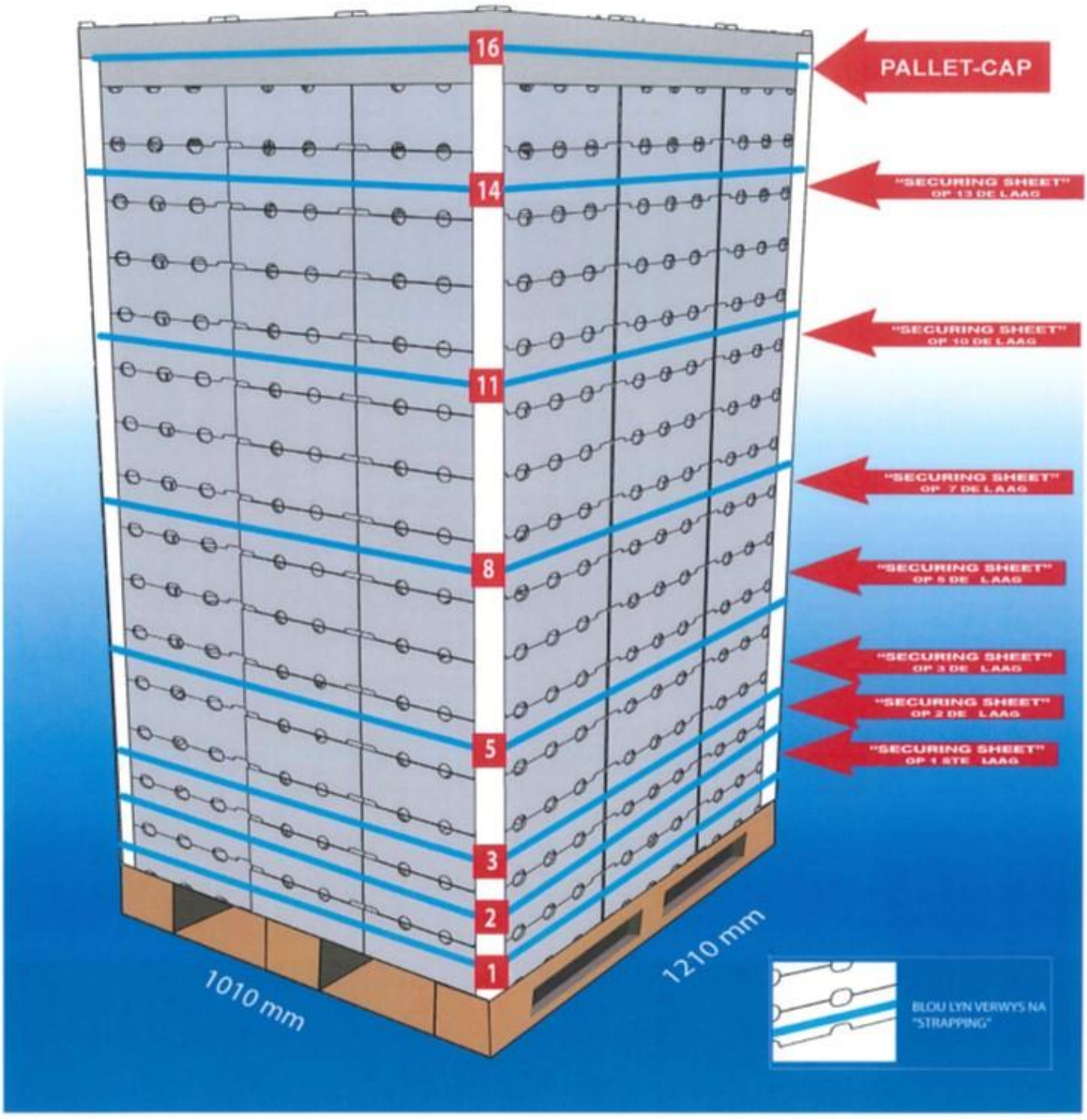


citrus research international

E06D CITRUS

400x300x135 mm

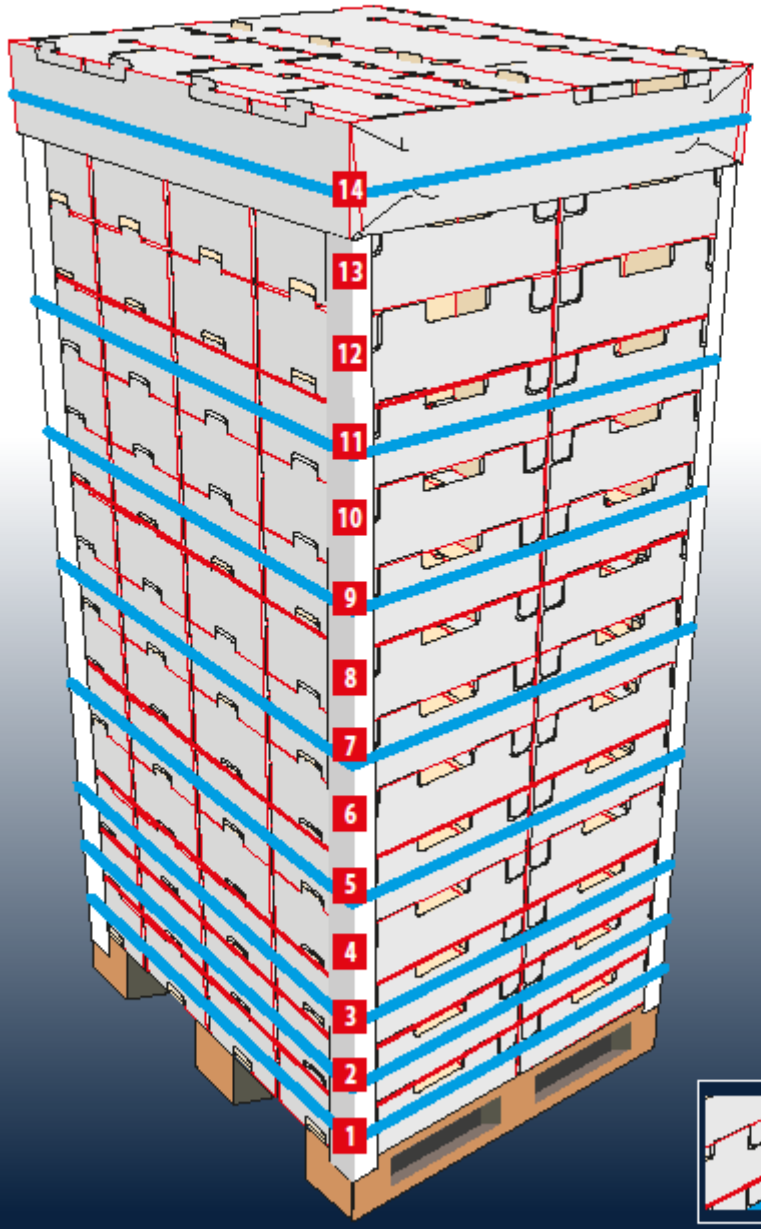
16 LAYER HIGH-CUBE CONTAINER



citrus research international

500x300x160 mm
D10D CITRUS
14 LAYER HIGH-CUBE CONTAINER

REV 02/2023



PALLET-CAP

"SECURING SHEET" OP 11 DE LAAG

"SECURING SHEET" OP 8 STE LAAG

"SECURING SHEET" OP 5 DE LAAG

"SECURING SHEET" OP 1 STE, 2DE & 3 DE LAAG

BLUE LINES = STRAPPING
RED LINES = SECURING SHEETS

LET WEL: DIT IS DIE VERANTWOORDELIKHEID VAN DIE PAKHUIS EN SY UITVOERDER OM TE VERSEKER DAT DIE MAKSIMUM PALET HOOGTE EN GEWIG TEN ALLE TYE VOLDOEN AAN DIE WETLIKE REËLS EN REGULASIES VAN BEIDE DIE RSA, ASOOK DIE LAND VAN BESTEMMING.

citrus research international

E10D CITRUS

500x300x170 mm

13 LAYER HIGH-CUBE CONTAINER

citrus research international

F15D CITRUS

500x400x190 mm

11 LAYER HIGH-CUBE CONTAINER

citrus research international

A06D CITRUS

600x400x100 mm

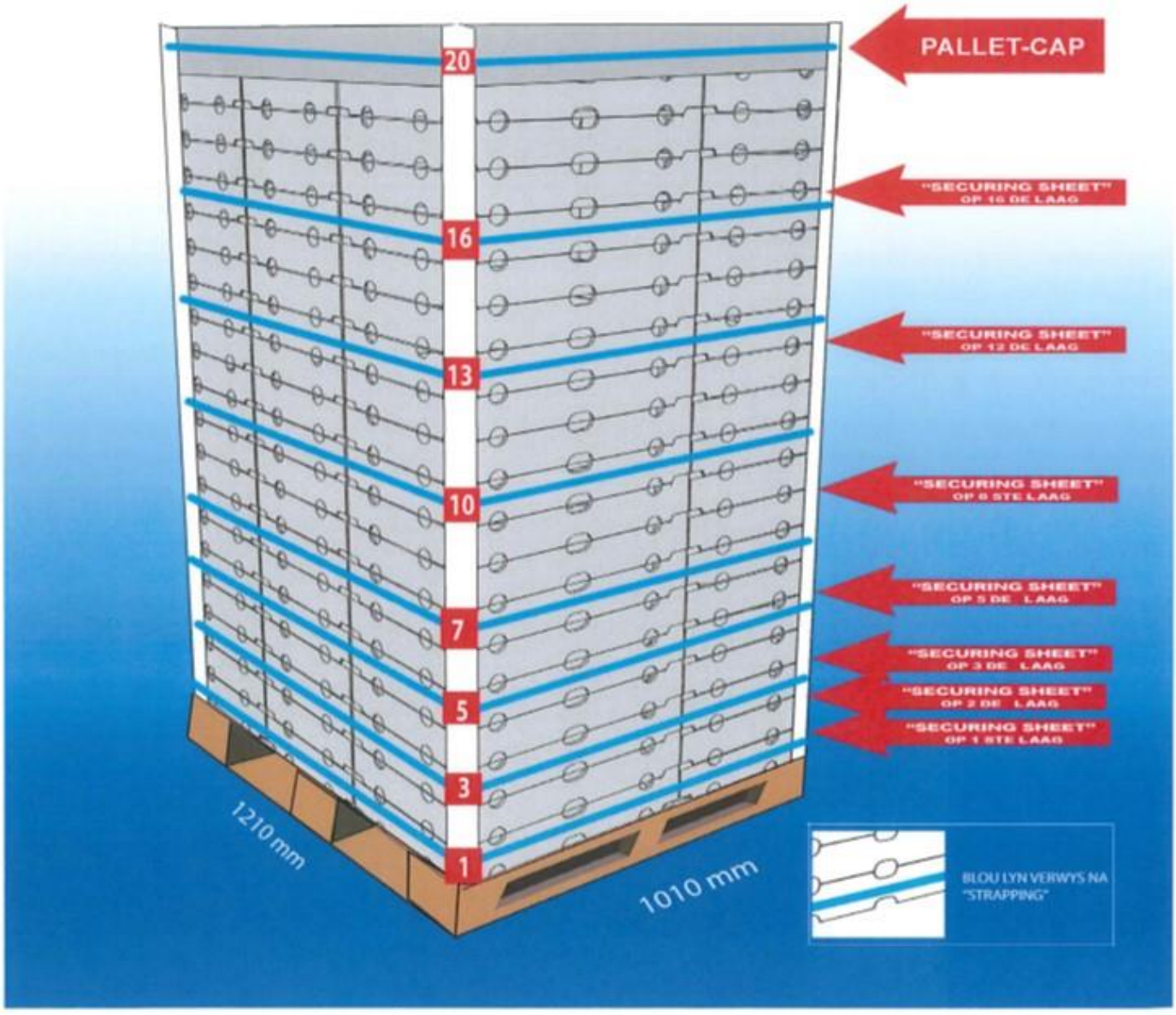
22 LAYER HIGH-CUBE CONTAINER

citrus research international

D640 CITRUS

600x400x110 mm

20 LAYER HIGH-CUBE CONTAINER



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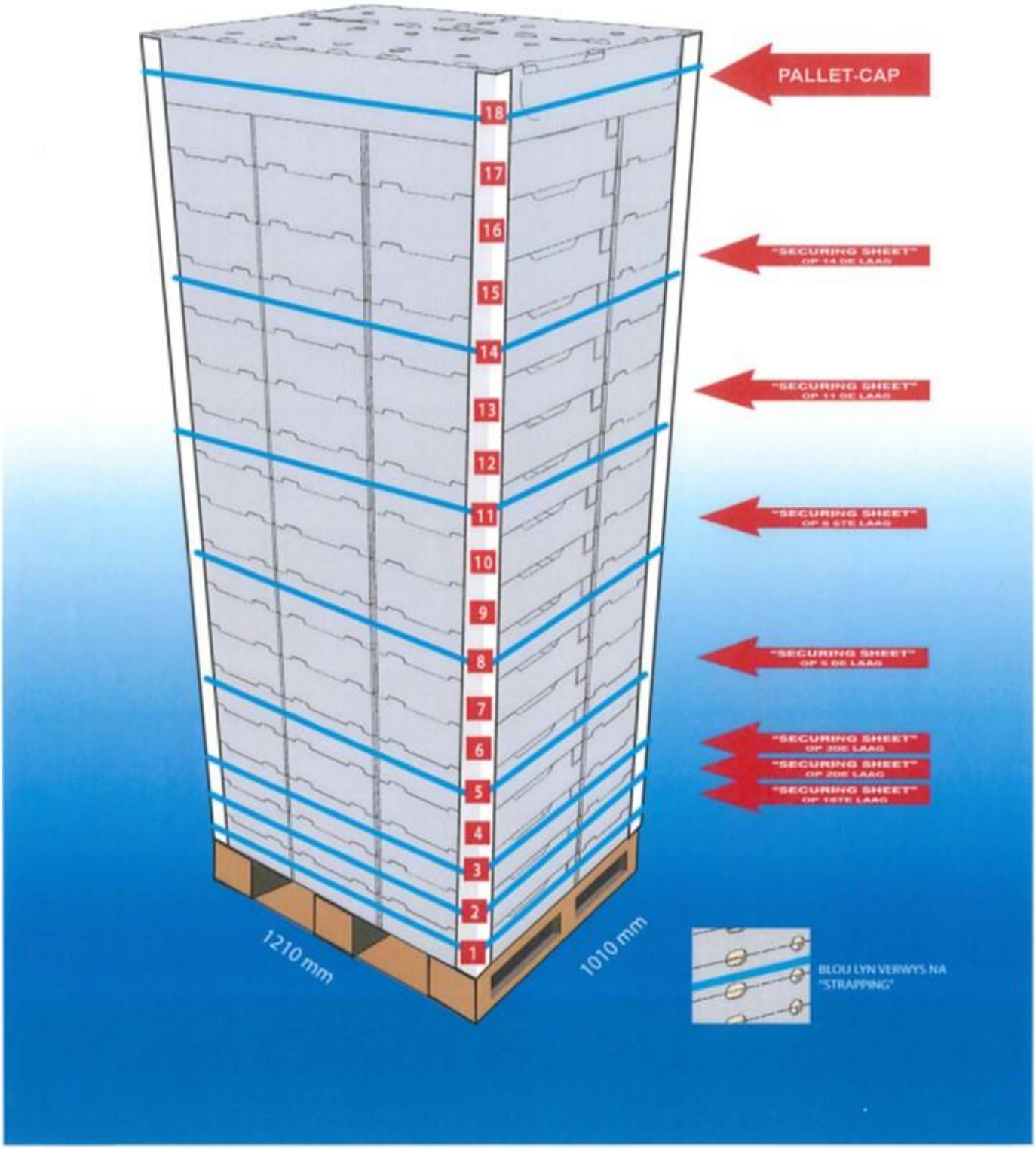
A10D CITRUS

600x400x122 mm

18 LAYER HIGH-CUBE CONTAINER

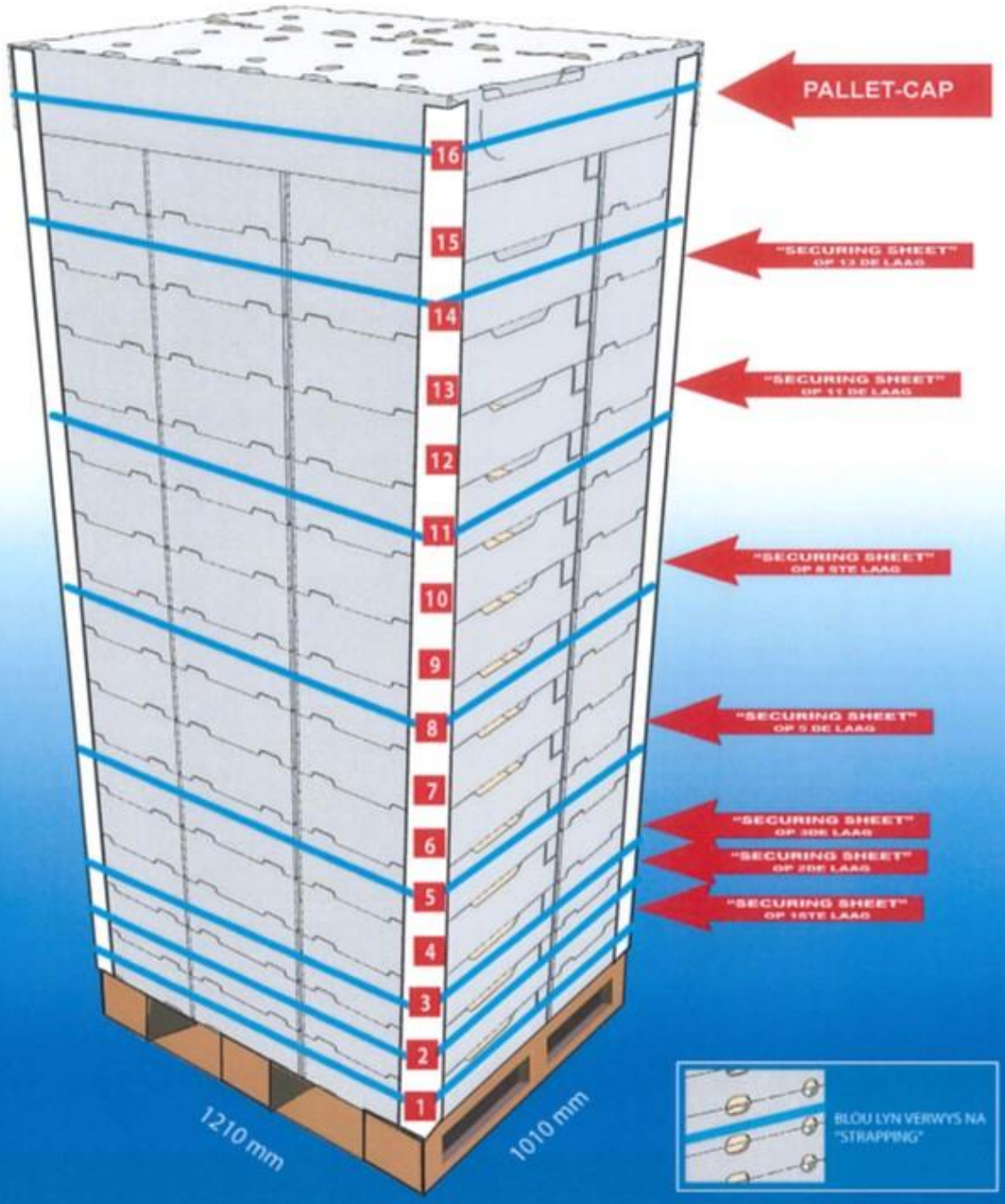


citrus research international

B10D CITRUS

600x400x139 mm

16 LAYER HI-CUBE CONTAINER



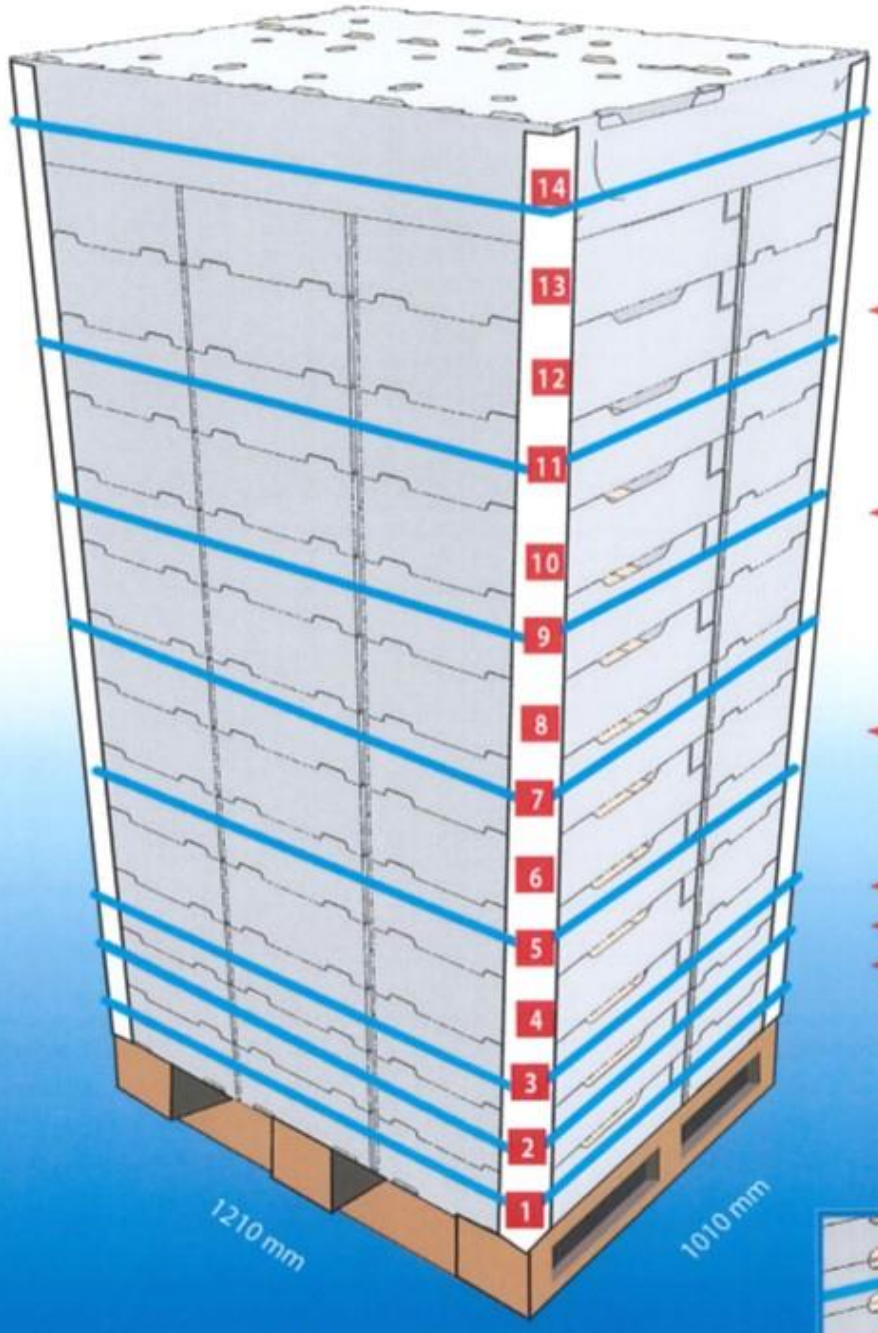

citrus research international
C15D CITRUS
600x400x146 mm
15 LAYER HIGH-CUBE CONTAINER
PALLET-CAP
"SECURING SHEET"
OP 12 DE LAAG
"SECURING SHEET"
OP 8 STE LAAG
"SECURING SHEET"
OP 5 DE LAAG
"SECURING SHEET"
OP 3DE LAAG
"SECURING SHEET"
OP 2DE LAAG
"SECURING SHEET"
OP 1STE LAAG
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1210 mm
1010 mm
BLOU LYN VERWYS NA "STRAPPING"

citrus research international

D15D CITRUS

600x400x160 mm

14 LAYER HIGH-CUBE CONTAINER



PALLET-CAP

"SECURING SHEET" OP 11 DE LAAG

"SECURING SHEET" OP 8 STE LAAG

"SECURING SHEET" OP 5 DE LAAG

"SECURING SHEET" OP 3DE LAAG

"SECURING SHEET" OP 2DE LAAG

"SECURING SHEET" OP 1STE LAAG

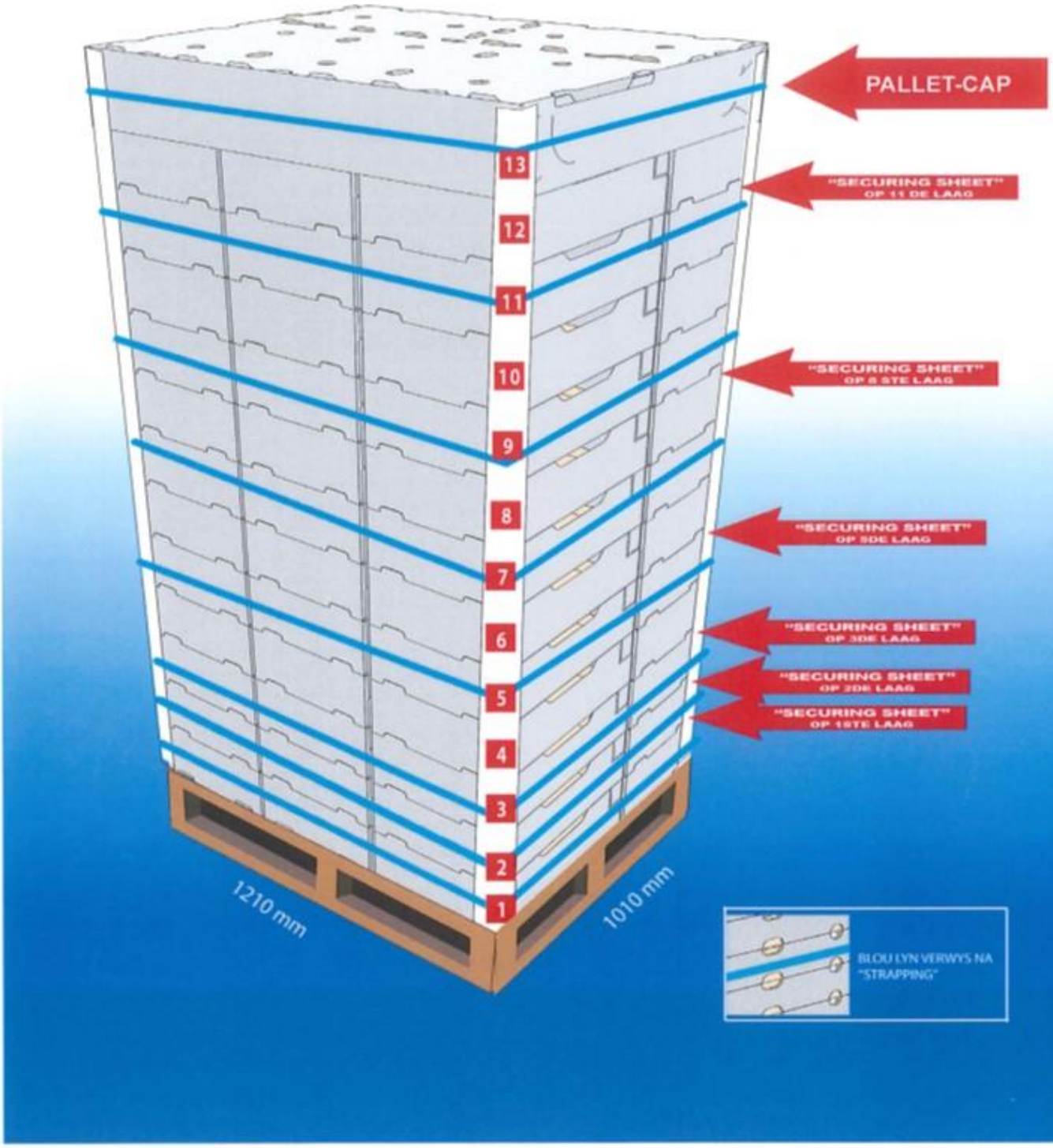
BLOU LYN VERWYS NA "STRAPPING"

citrus research international

E15D CITRUS

600x400x170 mm

13 LAYERS HI-CUBE CONTAINER



citrus research international

H15D CITRUS

600x400x200 mm

11 LAYERS HI-CUBE CONTAINER

citrus research international

G15D CITRUS

600x400x215 mm

10 LAYERS HI-CUBE CONTAINER

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