Vine Industry Nursery Accreditation Scheme

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Introduction

The Vine Industry Nursery Accreditation Scheme (VINAS) is administered by the Vine Industry Nursery Association (VINA) and has been developed as a focus on quality assurance in the production of vine planting material through the publication of this procedures manual.

The accreditation program provides standard operating procedures, controls and documentation for vine nurseries that propagate vine planting material to standards developed by the Vine Industry Nursery Association. The manual is a GUIDE ONLY and sets a minimum standard for the types of procedures and controls that vine nurseries will be required to adopt in order to label vine planting material produced by the nursery under the Vine Industry Nursery Accreditation Scheme. ACCREDITED NURSERIES are required to adhere to the Vine Industry Accreditation Scheme standards and be successfully audited annually by a quality assurance auditor appointed by VINA.

It is recognised that individual nurseries have adopted protocols and operating procedures specific to the type of vine product produced.

This manual, therefore, can be tailored to suit the individual nursery by including or deleting various 'optional' procedures according to a verification of the 'Vine Nursery Process Flow Chart' particular to the nursery.

Following a successful independent audit of the nursery's procedures and controls, an Accreditation Certificate will be provided to identify what has been accredited and define the period of accreditation.

The commercial scope of a nursery accredited by VINA is not limited to propagate material derived only from certified sources, usually from accredited vine improvement groups. Planting material derived from non-certified sources cannot be sold as, or implied to be, *CERTIFIED, unless that nursery can certify its own propagation material or that material purchased elsewhere. See 'Certification' p4 of this manual.*

CERTIFIED and non-certified planting material must be clearly identified and held (stored) separately to prevent inadvertent mix-ups.

Certification

The International Council for the study of Virus and Virus-like diseases of the Grapevine (ICVG), recognises over 70 infectious agents (viruses, viroids and phytoplasmas) of grapevine many of which can be highly detrimental to this crop, having a negative impact on plant vigour and longevity, as well as on the quality and quantity of the yield.

Certification of grapevine nursery stock is a powerful and effective tool to control these agents It enables vineyards to economically and sustainably maintain quality and productivity.

Certified grapevines are derived from pathogen tested, clonally selected primary sources. The certification process specifies conditions to prevent and detect subsequent infection of nursery plants by regulated pests, ensures clonal integrity, and permits tracing the certified grapevines to the originally selected and tested plants.

In the past, the absence of certification standards has repeatedly resulted in disease problems for growers and nurserymen.

Infected propagation material is largely responsible for the spread of diseases among and within viticultural regions. However, valuable grape genetic resources exist which are infected with virus but are essential to the preservation of Australian viticultural heritage.

VINA provides an audit service to organisations which supply certified propagation material to nurseries.

Definitions

Accredited Nursery
A nursery which follows Quality Assurance protocols and has standard operating procedures, controls and documented methods of operations in accordance with VINA guidelines to produce vine planting material and has been successfully audited under the Vine Industry Nursery Accreditation Scheme by a quality assurance auditor appointed by VINA.

CERTIFIED

Refers to vine planting material that has been produced under guidelines developed by South Australian Vine Improvement Groups and the Vine Industry Nursery Association and complies with the protocols of the Vine Industry Nursery Accreditation Scheme.

CERTIFIED vine planting material will have the following qualities:

- A Certified Source Block's clonal identity can be established with an audit trail to the SAVII Nursery after 2002. Prior to 2002 the existing "A" Class system will be recognised as "certified" assuming that the source block meets all the other criteria.
- A Certified Source Block is established with generation 1 or 2 vine material, to maintain genetic stability.
- Certified cutting material is harvested from a generation 1 or 2 Certified Source Block and complies with * **VINA** Accreditation Scheme procedures.
- Certified Source Block procedure is audited annually by independent auditors to maintain integrity and compliance with VINA procedures.
- **Vinifera:** Starting in 2004, annually random vines from Certified Source Blocks will be sampled and ELISA tested as per SAVII QAS procedures. The ELISA results must be negative for Leafroll Type 1 and 3 for the Source Block to maintain Certification status.
- **Rootstocks:** Starting in 2004, annually random vines from Certified Source Blocks will be sampled and PCR tested as per SAVII QAS procedures. The PCR results must be negative for Leafroll type1, 2, 3, 4, 7, 9, GVA,GVB, and GVD to maintain Certified status. In the future, technology should make it possible to exclude additional disease causing viruses from the certified stock including the casual agents of fleck and rupestris stem pitting. Until that time, a moratorium will be established for these viruses. (SAVII and Private Rootstock suppliers have undertaken a 5 year replanting programme to eliminate fleck from current plantings)
- Is produced by an accredited nursery.
- A Plant Health Declaration showing its known health status is to be made available on request to the cutting supplier.

These testing protocols are currently under review (Jan 2019)

Must, Will or **Shall**
Indicates a mandatory procedure.

Should or **May**
Indicates a recommended procedure.

VINA Accredited Logo

Disclaimer

VINA takes no responsibility for the way an accredited nursery conducts its business or interfaces with its customer base. The Vine Industry Nursery Accreditation Scheme is strictly limited to the endorsement of businesses that have been independently audited as meeting the requirements and standards of the scheme

VINA does not test plant material. Other than expressly set out in the conditions of the Vine Industry Nursery Accreditation Scheme, in respect of planting material, VINA gives no conditions or warranties, express or implied, as to the quality or fitness for any particular purpose other than required by law.

VINA Policy

VINA's policy is for vine nurseries

- to supply the best possible vine planting material to the Australian Viticultural Industry.
- to have documentation consistent with this policy.

Licence and Logo

An accreditation licence agreement must be signed with VINA before a vine nursery can promote itself as VINA accredited and uses the VINA accredited logo.

Records

This manual contains sample record sheets for the collection of data, events, observations and measurements for the vine nursery to adopt and provide documentary evidence of compliance to the standards, specifications and procedures required by VINAS.

Terms and Conditions of Trade and other common law contracts must be reviewed to ensure the capacity of the vine nursery to supply the planting material to the expectations of the customer.

A strict adherence to the signing of contracts and Terms and Conditions of Trade by all relevant parties is strongly recommended.

Where records are kept electronically, computer records should be regularly backed up, preferably weekly. Hard copy records should be filed, indexed and archived. Both types of records should be kept for at least five years and be protected from deterioration in a secure place.

Product Specification
Vine Nurseries must document methods of operation and specifications of vine planting material produced. This is to ensure that all vine planting material meet these specifications. Specifications must include information such as:

Identity

- Genus, species, variety and clone
- Origin of planting material (source block identification)
- For grafted vines details of both the scion and the rootstock shall be specified

Where possible, and when requested, specifications should include information such as:

- Plant Health Declaration
- Quarantine history
- Virus indexed and results of index tests
- Other tests and results

Vine health

At point of sale to customers the vine planting material will be:

- alive
- free of any obvious disease symptoms and pests

Vine specification

Plants supplied to customers should conform to the following minimum standards:

- **Dormant rootling.** Have at least one fully matured shoot with a minimum of three prominent buds and at least three sound roots evenly distributed at the basal node.
- **Dormant grafted vine.** Have at least one fully matured shoot with a minimum of three prominent buds and at least three sound roots evenly distributed at the basal node. Have a visually completed union, strong enough to withstand flexing at the union.
- **Green container grown vine.** Must show active healthy growth, and be fully sun hardened.

Classification

CERTIFIED - (Blue Labels) **(UNDER REVIEW.....Jan 2018)**

- A Certified Source Block's clonal identity can be established with an audit trail to the SAVII Nursery after 2002. Prior to 2002 the existing "A" Class system will be recognised as "certified" assuming that the source block meets all the other criteria.
- Agencies whic h import vine propagation may certify the material provided it complies with the following accepted certification procedures:
  - A Certified Source Block's clonal identity can be established with an audit trail back to germplasm to 2001 and an audit trail to SAVII Nursery after 2001.
  - A Certified Source Block is established with generation 1 or 2 vine material, to maintain genetic stability.
  - Certified cutting material is harvested from a generation 1 or 2 Certified Source Block and complies with *** VINA** Accreditation Scheme procedures.
  - Certified Source Block procedure is audited annually by a VINA appointed independent auditor to maintain integrity and compliance with the SAVII QAS procedures.
  - **Vinifera:** Starting in 2004, annually random vines from Certified Source Blocks have been sampled and ELISA tested as per SAVII QAS procedures. The ELISA results must be negative for Leafroll Type 1 and 3 for the Source Block to maintain Certification status.

- **Rootstocks:** Starting in 2004, annually random vines from Certified Source Blocks have been sampled and PCR tested as per SAVII QAS procedures. The PCR results must be negative for Leafroll type1, 2, 3, 4, 7, 9, GVA.GVB.GVD. for the Source Block to maintain Certification status. In the future, technology should make it possible to exclude additional disease causing viruses from the certified stock including the casual agents of fleck and rupestris stem pitting. Until that time, a moratorium will be established for these two viruses. (SAVII and Private Rootstock suppliers have undertaken a 5 year replanting programme to eliminate fleck from current plantings)

UNCERTIFIED - (Yellow Labels)

An Uncertified Source Block may have been established with vine material 3 or more generations removed from germplasm and therefore does not qualify for certification.

- There is a real risk the cuttings from Uncertified Source Blocks have disease, virus or defect.

A graft of certified and uncertified material of any grade cannot be labelled as "*Certified*" material.

***A nursery may self certify own material and material purchased elsewhere, provided documentation and tracability are consistent with this manual*.**

LABEL

All vine planting material must be labeled clearly and accurately. Labels are to be coloured as above with the following information: One label per 100 cuttings and one label per 50 / 25 rootlings.

Front of Label

- Scion: - Variety, Clone
- Rootstock: - (if applicable) Variety, Clone
- Vine batch number that relates back to the Source Block I.D. of both the rootstock and scion
- CERTIFIED VINE (blue label) …..[UNCERTIFIED VINE (yellow label)]

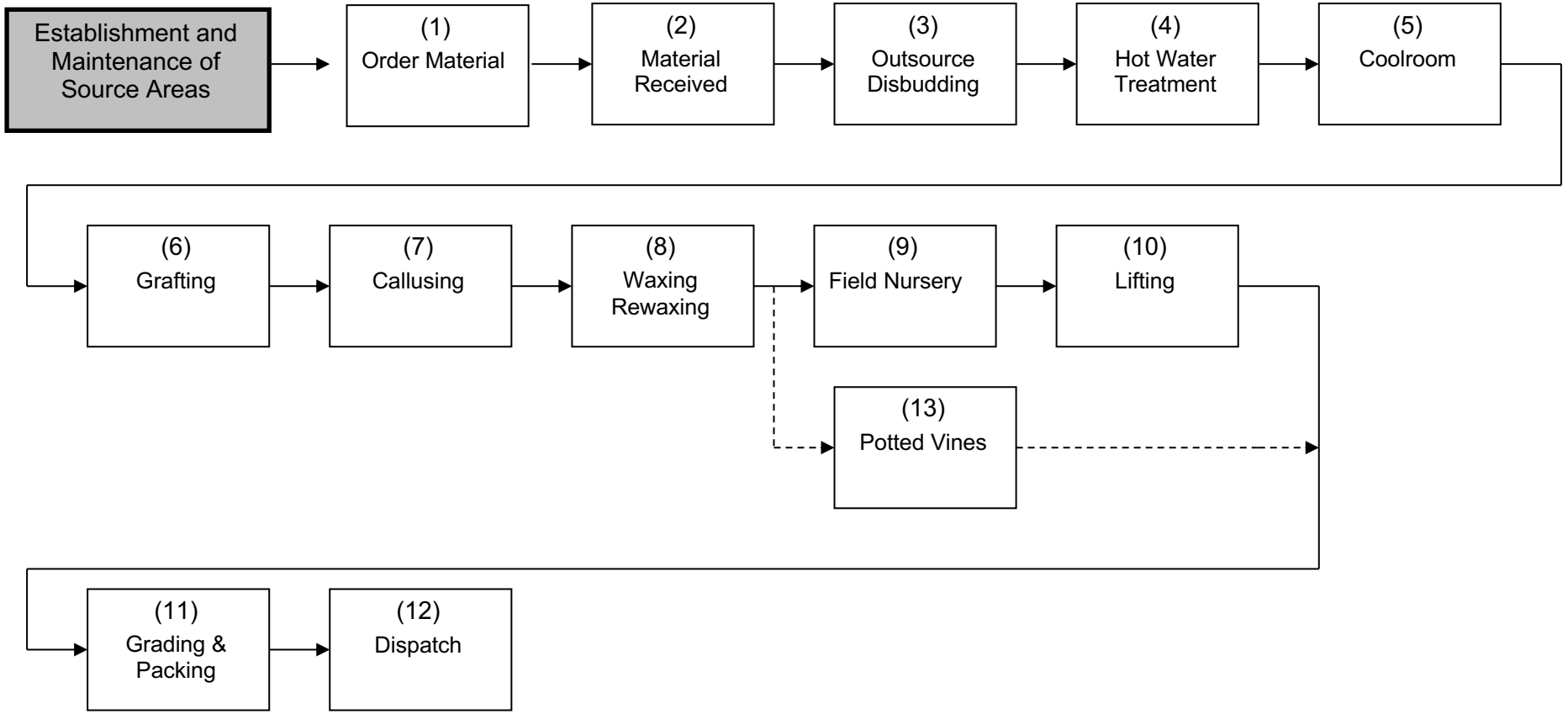
Reverse of Label (optional)

- Nursery name
- Nursery address
- Nursery phone/fax number
- VINA Accredited Nursery Logo

Process Planning

A Nursery Process Flow Chart must be included in SOP documents. This will illustrate all the essential processes and procedures necessary to conduct the nursery business.

Typical Vine Nursery Grafting Process Flow Chart



Source Area Cutting Collection Procedure

Purpose

To collect certified cuttings from a certified source block

Responsibility

Cutting Manager, Field Officer, Cutters,

Procedure

1. Cuttings should only be taken only when vines are fully dormant.
2. Identify blocks to be cut by verifying block and row details from the field plan.
3. Cuttings required are detailed on the Daily Cutting Sheet provided to the Cutters.
4. Strictly cut, bundle and label one variety/clone at a time, and ensure when moving into a new row that it matched the row ID info on the field plan.
5. Sterilise (eg. White King solution) snips for 30 seconds before each new area is entered or when changing variety/clone
6. Mature, live dormant canes with healthy buds are selected on the basis of shoot diameter; length and number of buds and cut to length using a standard length piece of dowel as a guide (see Cutting Specifications below).
7. Cut a horizontal cut at the base, 5-8mm from the bottom bud, remove tendrils and cut at an angle (45^0) above the top bud or as otherwise instructed.
8. Reject dead, damaged or diseased (showing symptoms of, for example, Phomopsis, powdery mildew) cuttings.
9. Take cuttings to the end of the row, bundled into 100 lots tied and labeled with the variety, clone, cutter's name and number of cuttings in the bundle and Source Block Identification Number.
10. Cutters check for length and diameter using gauges and record on Daily Cutting Sheet.
11. Details of the Variety/clone, cutter, number of cuttings and source identification must be recorded on a Daily Cutting Sheet.
12. Protect bundled cuttings from dehydration, and deliver to the shed on the same day as cutting.
13. Cuttings may then be processed, including Hydration.

Cutting Specifications

Scion cuttings

Table 1. The various specifications and general use of scion cuttings

Material definition	Length	Diameter	General
Ungraded (Standard grade)	>300mm	6 to 12mm, below top bud	Nearly straight, with at least 4 buds.
Bench graft grade	>300mm	>5mm top, 12mm base	As above, with at least 3 useable buds
Field/Chip bud grade	>300mm	>5mm top, 7mm base	As above, with at least 3 useable buds
Thin grade	>300mm	3 to 5 mm, below top bud	As above, with at least 3 useable buds

Rootstock cuttings

Table 2. The various specifications and general use of rootstock cuttings

Material definition	Length	Diameter	General
Bench graft grade	>400mm	7-12mm, below top bud	Nearly straight
Field graft grade	>400mm	5-12mm, below top bud	May be some curvature
Low Grade	>300mm	Varies, may be >12mm	May be too curved May be slightly damaged May have lateral growth
Thin grade	>400 mm	3 to 5 mm, below top bud	May be some curvature

Quality Control Procedure

The Cutting Manager checks performance of cutters in the field at random.
On arrival at the shed, cuttings are inspected for quality and specification and recorded on the Summary Stock Record. Cutters are advised of any faults.

Documentation

Daily Cutting Sheet
Cutting Collection Instructions
Field Plan
Inspector's Checklist

Daily Cutting Sheet

Date	Cutter Name & Number	Variety/Clone	Source Block Number	Q/A Check	Number Cut	Number Required	Tagged	Initial	Comments

Field Plan

Site: …….

Contact: ……. **Phone** …….

Location: …….

Site description:……..……..
……..

Local
warnings/hazards:……..……
……

Cert No.		Row number	
Variety		Panel numbers	
Clone		Vine numbers	
GPS marked with '*****'	X……Y……...	Year planted	

UTM H 54 AGD84, (GPS point in the field marked with pink painted post).

Site Map:

See attached plan

Source Area Block/Health Inspection Sheet

Vineyard Owner_____

Contact Person: _____Phone Number_____

Vineyard Location:_____

Vine Variety: _____ Clone: _____

Year Planted: _____Number Of Vines:_____

Map Accuracy Checked? ☐ **Row ID Correct?** ☐ **Map Revision Date Current?** ☐

Replants required_____Date Planted_____ Inv #_____

Replants required_____Date Planted_____ Inv #_____

SOURCE AREA REGISTRATION NUMBER_____

- **Inspectors Report**

INSPECTOR_____ Date Of Inspection _____

Number Of Vines Tagged_____
Row#_____Vine#_____Panel#_____
Row#_____Vine#_____Panel#_____
Row#_____Vine#_____Panel#_____

ACTION TAKEN_____

General Condition Of The Vineyard**: Acceptable / Not Acceptable** *Delete As Appropriate

SYMPTOMS OBSERVED **SUSPECTED CAUSE** **TAG NUMBER**

LEAVES _____

CANES _____

TRUNK _____

Comments:_____

OFF TYPE CHECK ☐ OFF TYPE DATE_____

CUTTING ESTIMATE PER VINE _____

COMMENTS / SUGGESTED FOLLOW UP REQUIRED

_____

Signed (Inspector 1)……. Signed (Inspector 2)…….

Health Inspector's Checklist

- A copy of the Growers Vineyard entry policy (if required)
- Certified Source Area field map
- Source Area Block/Health Inspection sheets
- A colour flagging tape to identify suspect vines.
- Virus sample sheet and plastic ID numbered labelled sample bags.
- Virus sample tie on labels to identify vines that samples have been taken from.
- Secateurs
- Waterproof marking pen
- Reference material, eg. IPM manual, Ute guide, Grape Production Series #1-Diseases and Pests
- Paper for rough notes (optional)
- Foot bath disinfestation kit (Refer to "Phylloxera Prevention Protocols, Sheet 5")
- Appropriate footwear (where required)
- Wash water for foot bath
- Soap
- Change of clothing or wet weather protection (optional)
- Sun screen
- Hat
- Drinking Water (2litres per person)
- First Aid Kit
- Mobile phone for emergency if required

STANDARD OPERATING INSTRUCTIONS

Vine Nurseries must establish and document appropriate standard operating procedures, addressing key elements such as:

- *purpose of the procedure*
- *who is authorised and responsible for the procedure*
- *details of procedure and quality control measures*
- *documentation required for the operating procedure*

Following are typical vine nursery standard operating procedures and work instructions. The list, although not fully comprehensive, may not apply to all nurseries. It provides a **GUIDE ONLY** to activities that are needed to achieve the required control of processes to comply with audit requirements.

1.1 Customer orders for vine rootlings

Purpose

To determine the amount of material needed to be propagated in order to meet customer orders.

Responsibility

Nursery Manager

Procedure

Fax / Post Official Nursery Order Form to customer

Order Form returned by customer with deposit if required.

Ensure order form has been signed acknowledging “Standard Terms and Conditions of Sale”, including cash sales.

If order is for ‘Grafted Pots or Rootlings for same year’ record on Summary of Orders for Grafted Pots/Rootlings Same Year Form.

If order is for Grafted Rootlings for following season, record on Summary of order for Field Grown Vines.

Variations to customer orders are to be documented, confirmed by the customer and filed appropriately.

Quality Control Procedure

No orders to be accepted without customer signing “Conditions of Sale”

Documentation

Official Nursery Order Form
Summary of Orders for Grafted Rootlings / Pots Same Year
Summary of Orders for Field Grown Vines
Ordering Instructions

1.2 Orders for propagation materials

Purpose

To determine the amount of material needed to be propagated in order to meet customer orders.

Responsibility

Nursery Manager

Procedure

Fill appropriate order forms for certified propagation material sourced from Vine Improvement and/or certified private source blocks to fullfil customer requirements for certified planting material.

Hard copy of order forms, confirmations and changes to orders are filed in Orders Folder.

Documentation

Importation/Exportation Instructions
Supplier (eg. Vine Improvement) Vinifera / Rootstock Order Form

Official Nursery Order Form

(Nursery to insert)

1.3 Importation/Exportation Instructions

It is the responsibility of the nursery to ensure the latest version of import documentation are available and are adhered to.

Details below are for guidelines only.

South Australia

Contact Phylloxera and Grape Industry Board of South Australia for declaration form.

Phone 08) 8226 0430, Fax 08) 8463 3330, Email phackworth@phylloxera.org.au

Complete and return import declaration form.

Check receipt of copy of approved declaration form.

Prior to entry, all planting material must be subject to a hot water treatment (54º C. for 5 minutes or 50º C. for 30 minutes) under the supervision of and certified by, a State Agriculture Department Inspector in the exporting state.

Cuttings and rootlings should be treated when fully dormant.

The material must be packaged securely and despatched to SA immediately after treatment together with the original declaration form and Plant Health Certificate.

On receipt of consignment check that original Declaration Form and Plant Health Certificate are attached. File these forms for at least 12 months.

Complete and fax the Imported Grapevine Notification Form to the Board.

New South Wales

Contact NSW Department of Agriculture declaration form.

Murray Valley and MIA Phone 02 6951 2639 Fax 02 6951 2602 (Mr Terry Rafferty)

Central Tablelands, Mudgee Phone 02 6391 3927 Fax 02 6391 3928 (Chris Wetherall)

Hunter Valley Phone 02 6763 1161 Fax 02 6763 1222 (Peter Daley)

Complete and return import declaration form.

Check receipt of copy of approved declaration form.

Comply with the conditions of the import certificate.

Cuttings and rootlings should be treated when fully dormant.

The material must be packaged securely and dispatched immediately after treatment together with the original declaration form and Plant Health Certificate.

On receipt of consignment check that original Declaration Form and Plant Health Certificate are attached. File these forms for at least 12 months.

Complete and fax the Imported Grapevine Notification Form to the Board.

Victoria

Contact Agriculture Victoria for import declaration form.

Phone 03 9210 9390 Fax 03 9210 9396

Complete and return import declaration form

Check receipt of copy of approved declaration form.

Comply with the conditions of the import certificate.

NOTE: There are different conditions of entry of vine material applied to Vine Protection Areas and other areas of Victoria

Cuttings and rootlings should be treated when fully dormant.

The material must be packaged securely and dispatched immediately after treatment together with the original declaration form and Plant Health Certificate.

On receipt of consignment check that original Declaration Form and Plant Health Certificate are attached. File these forms for at least 12 months.

Complete and fax the Imported Grapevine Notification Form to the Board.

Queensland

Contact Department of primary Industry or PIRSA for import declaration form.

Complete and return import declaration form

Check receipt of copy of approved declaration form.

Comply with the conditions of the import certificate.

Cuttings and rootlings should be treated when fully dormant.

The material must be packaged securely and dispatched immediately after treatment together with the original declaration form and Plant Health Certificate.

On receipt of consignment check that original Declaration Form and Plant Health Certificate are attached. File these forms for at least 12 months.

Complete and fax the Imported Grapevine Notification Form to the Board.

Northern Territory

Grapevine plants, cuttings and budwood are prohibited from entry unless accompanied by certification by a State Agriculture Officer

Tasmania

The grape vine plants shall be in the form of UNROOTED CUTTINGS, and shall be accompanied by a certificate signed by a State or Territory Dept. of Agriculture Officer.

Western Australia

All grapevine material imported into WA must undergo a quarantine protocol at the WA quarantine facility.

1.4 Ordering Instructions

1. Fax / Post Official Order Form to customer

2. Order Form returned by customer with deposit if required.

3. Ensure order form has been signed acknowledging “Standard Terms and Conditions of Sale.”

4. If Order is for Grafted Pot or Rootlings for same year record on Summary of Grafted Pots/Rootlings Same Year Form.

5. Vine Improvement Vinifera / Rootstock Order Form is sent out to appropriate Vine Improvement Society for cutting order to supply customer orders.

6. Hard copy of Vine Improvement order and confirmation is filed in Vine Improvement Orders Folder.

Summary of Orders for Grafted Rootlings/Pots Same Year

Date	Customer Name	Variety	Clone	Qty	Rootstock	Clone	% Extra	Batch #

1.6 Summary of Order for Field Grown Vines

Date	Customer Name	Variety	Clone	Qty	Rootstock	Clone	% Extra	Batch #

2.1 Material Received

Purpose

To take receipt of incoming vines and determine treatments required and/or verified prior to storage for further use.

Responsibility

Nursery Manager.

Procedure

On arrival at the shed Rootstock and Vinifera is unpacked and recorded on the Summary of Rootstock Incoming Sheet and Summary of Vinifera Incoming Sheet.

Record Plant Health Certificate Registration # on the Summary of Rootstock Incoming Sheet and Summary of Vinifera Incoming Sheet. In addition, and where applicable, importation and plant health certificate, and material treatment records (e.g. Cutting dates, HWT, hydration, etc) must be available.

Cuttings and rootstocks should be assessed, evaluated and treated accordingly. Treatments, such as hydration, are to be recorded on the Tank Chlorination/Treatment Record.

Stock is repacked in new plastic lining and placed into labelled wooden bins.

Material is placed in the Cold room and recorded on Cold Room Storage Log.

Cold room temperature is monitored daily at 2-4 +/- 1.0 Degrees Celsius.

Temperature monitoring devices are to be calibrated against certified reference thermometers at least annually.

Temperatures are recorded either electronically or manually on the Cold Room Temperature Record sheet.

Quality Control Procedure

No stock is received without verification of appropriate Hydration Records.
Stock received is documented on “Summary of Vinifera Incoming Sheet/ Summary of Rootstock Incoming Sheet”.

Documentation

Summary of Vinifera Received Sheet Hydration Tank Chlorination/Treatment Sheet
Summary of Rootstock Received Sheet Hydration Instructions Cold Room Storage Log

2.4 Sanitation, Hydration

Sanitation practices during the propagation process are of the utmost importance for nursery success. There are several formulations used in the deterrence of horticultural diseases caused by micro-organisms and their spores and can be used;

- To decontaminate plant tissue of harmful organic elements
- To disinfect greenhouses, propagation benches and storage rooms
- Depending on formulation, can be applied as a dip, drench, spray, cold or thermal fog.

In all cases it is important that all surfaces are thoroughly wetted.

The following treatments have been applied in trials to various stages in the propagation process and have shown positive results in the reduction of the incidence of superficial fungal contamination, and the incidence of pathogens in the graft union and in the basal end of the rootstock.

Captan (Merpan 50 SC at 1000mL / 100L water) – a contact fungicide.

Benlate (100g / 100L) – benomyl, a fungicide with a very broad spectrum of activity.

Sporekill (150 ml / 100L water) – a quaternary ammonium compound used as a sterilizing agent.

Chinosol (0.25%) – 8-hydroxyquinoline sulphate, an effective fungicide now no longer available in Australia.

Trichoderma ssp. (Trichoflow at 2 g/l water) – contains several *T. harzianum* strains.

Sporekill, benomyl and captan, using the above concentrations, have shown positive results in the reduction of *Botryosphaeria, Cylindrocarpon, Phomopsis, Phaeomoniella, Phaeoacremonium* in propagation material.

Trial data suggests the following minimum times to be effective;

- During hydration, prior to cold storage – 1 h drench
- After cold storage, one day prior to grafting – 10min drench
- After callusing, prior to planting – 5 s dip

Nurseries are advised to conduct 'in house' trials before adopting any one, or combination, of above treatments to confirm effectiveness under local conditions.

2.2 Summary of Vinifera Receival Sheet

Date	Qty	Grade	Variety	Clone	Batch number	Delivery docket number	Supplier Hydration time	Plant Health #	Sign	Comments

2.3 Summary of Rootstock Receival Sheet

Date	Qty	Grade	Variety	Clone	B/No	Delivery docket number	Supplier Hydration time	Plant Health #	Sign	Dis-budded Y/N	Comment

2.4 Cold Room Storage Log

Variety	Clone	Bin #	Date In	Sign	Date Out	Sign	Comments

2.5 Hydration Tank Chlorination/Treatment Sheet

Short term surface sanitation of vine cutting cool room storage has been found to be effective by some nurserymen using the following procedure;

1. Fill tank with water.
2. Add 5grams of Sodium Dichloroisocyanurate (Stabilised Pool Chlorine R70) per 1000 litres of water.
3. Add Captan at a rate of 400grams per 1000litres of water.
4. Add Sporekill at a rate of 30mls per 1000litres of water.
5. Cuttings are soaked for an appropriate time to ensure adequate moisture content to maximise propagation viability.
6. Hydration time recorded on Summary of Rootstock or Vinifera Incoming Sheet and signed.
7. Remove cuttings and allow to become touch dry prior to repacking into bins for cold room storage

Date	Chlorine added 5grams	Captan Added 400grams	Sporekill Added 30mls	Tank #	Tank Use	Date Emptied	Test Level	Sign

3.1 Disbudding

Purpose

To remove all dormant rootstock buds to avoid suckering when grown on in the field.

Responsibility

Shed Supervisor.

Procedure

Disbudding can take place under the following circumstances

- On receival of material
  Record all information on disbudding record sheet

- Outsourced
  Where applicable, remove rootstock to be disbudded from cold room and adjust coolroom records.

  Record all information on disbudding record sheet prior to shipment to contract disbudders.

  Upon receipt back from disbudders ensure adequate hydration prior to storage.
  Ensure disbudding record sheet has been completed with relevant details

- Immediately before grafting.
  Remove rootstock to be disbudded from cold room and adjust coolroom records.

  Record relevant information on grafting record sheet.

Quality Control Procedure

Random selection and inspection of bundles to ensure disbudding procedure has been completed correctly.

Documentation

Outsource Disbudding Record Sheet
Cool Room Storage Log
Disbudding Instruction Sheet

3.2 Disbudding Instruction Sheet

Disbudding prepares rootstock cuttings for grafting. This procedure eliminates the possibility of rootstock buds shooting at the expense of the scion bud.

1. Hygiene of all equipment in contact with budwood is critical. All knives secateurs and other equipment must be sterilised prior to use and periodically during use.

2. Disbudding takes place using secateurs and disbudding knives.

3. Whenever possible all disbudding will take place before cuttings are treated and cold stored.

4. Using the secateurs or disbudding knife, all buds are removed, making sure not to cut too deeply into the cane.

5. The disbudded canes are tied into bundles of 100 and labelled appropriately.

6. Rootstocks that have been coldstored before disbudding will have been fungicide dipped as part of the coldstore process. Staff should be made aware that residual fungicide may still be present on the surface of the cuttings. Personal protection equipment should be worn.

7. Material must not be allowed to dehydrate. Rehydrate as required prior to restorage.

3.3 Disbudding Record Sheet

Date out of coolroom	Qty	Variety	Clone	Batch number	Number of rejects	Who disbuds ?	Re-Hydration Time	Date into coolroom	Sign	Comments

3.4 Cold Room Storage Log

Variety	Clone	Bin #	Date In	Sign	Date Out	Sign	Comments

4.0 Hot Water Treatment for Grapevine Cuttings, Rootstock Cuttings, Rootlings, and Scion Wood.

Compiled by: **John Crocker 1, Helen Waite 2, Paul Wright 3.**
(see acknowledgements, section 4.7)

4.1 Purpose, Responsibilities, and Disclaimer

4.1.1 Purpose of HWT

Hot water treatment is the process of immersing dormant vine cuttings or rootlings in clean hot water at defined temperatures and for defined time periods to significantly reduce the probability of transferring specific insect pests or specific bacterial and fungal pathogens to new vineyards through propagation material.

4.1.2 Responsibility

VINA recommends that only suitably trained and accredited hot water treatment operators are employed to carry out this process.

4.1.3 Disclaimer

The protocols discussed in this document are provided in good faith by the Australian Vine Industry Nursery Association (VINA) and are considered to be accurate at the date of publication. The following protocols are compiled from the collective commercial experience of VINA members, information available in the public domain, published scientific literature and the results of GWRDC sponsored research by Australian scientists.

Any individual using the information presented in this document must do so in the knowledge that VINA or SARDI cannot be held liable for any loss incurred by the individual or associated commercial entities. Control cannot be exerted by either VINA or SARDI over the activities of individuals using this protocol or the range of biological, engineering and procedural issues critical to the successful execution of individual hot water treatment batches.

Persons using the information contained in this document do so at their own risk

4.2. Definition of Hot Water Treatment

Australian vine nurseries routinely use two main types of hot water treatment, namely:

4.2.1 Short Duration Hot Water Treatment

> 'The immersion of good quality, dormant vine cuttings or rootlings in clean hot water at *54^{0}C for 5 minutes with a temperature variation no more than +/-1^{0}C* during the treatment period.'

Short duration hot water treatment is the minimum requirement specified by Government Authorities for the movement of propagation material between regions in Australia and is an effective surface treatment for use against *Phylloxera*, nematodes and a discrete range of plant pathogens.

4.2.2 Long Duration Hot Water Treatment (referred to as 'HWT' in this document)

> 'The immersion of good quality, dormant cuttings or rootlings in clean hot water at *50^{0}C for 30 minutes with a temperature variation no more than +/-1^{0}C* during the treatment period.'

Long duration HWT is a surface and penetrating treatment that satisfies quarantine regulations for the movement of propagation material between regions in Australia. It also provides control of *Phylloxera* and nematodes, the initial suppression of fungi including *Phytophthora* and *Phomopsis* and the suppression of bacteria including Crown Gall.

Note: *Hot water treatment is not suitable for the removal of viral infections from cuttings or rootlings and will not improve the performance of poor quality propagating material.*

4.3 Selection and storage of cuttings or rootlings suitable for Hot Water Treatment

Not all grapevine cuttings or rootlings will respond in the same manner to HWT. Research has shown that cuttings of some varieties (for example Pinot Noir, Merlot, Riesling and to a variable extent, Chardonnay) show an initial delay in their ability to form roots when subjected to long duration HWT. Cuttings generally recover from this through good management and avoidance of moisture and heat stress when planted directly into field sites. Poor post-HWT nursery and management practices may result in varying degrees of mortality in sensitive varieties.

Grapevine cuttings have been shown to perform well following HWT where the cuttings were collected from well managed, source blocks that have received routine vine health inspections and comply with the following general criteria:

- The cutting source vines have been well managed, have received adequate nutrition, have not been overcropped, and are visibly free from pests and disease
- The cutting source vines have not been subjected to excessive moisture stress during the cropping season and have received either post harvest irrigation or regular post harvest rainfall prior to cutting collection

- The source vines have not been subjected to severe frost

- The source vines are fully dormant - Best results are generally observed from cuttings that are collected 4 weeks after leaf fall and 4 weeks before bud burst with no visible sign of sap flow when collected and no sign of budswell. (*Research into vine dormancy has shown that vines at Lenswood (SA) show internal signs of increased activity as early as 5 weeks before budswell)*.

Cuttings will perform well if handled carefully and are processed without delay – the same general principles apply for rootlings. Research has shown that good cutting moisture status and the protection of cuttings against moisture loss following collection have a significant, positive impact on root initiation and performance following HWT. Attention to the following critical points has the potential to significantly improve cutting performance following HWT:

- Cuttings collected and bundled in the field should not be contaminated by soil, should be shaded following collection and should be protected from dehydration

- All cuttings should be labelled at the point of collection. The label should clearly identify at least the following…1) cutting variety and clone, 2) source area location and 3) date of cutting collection

- Cuttings should be delivered as quickly as possible (for example within 8 hours of harvest) to the nursery or packing shed and should be protected from wind, sunlight and dehydration during transportation

- Cuttings should be hydrated by immersing in clean, sanitised water (e.g. for between 1 and 8 hours) as soon as possible after delivery to the nursery or processing shed. At this point, some nurseries chose to treat cuttings with fungicides to prolong cold storage.

- Hydration water should be clean and sanitised through chlorination. (e.g. chlorinated up to 10ppm free chlorine using stabilised pool chlorine or similar product). Note that cuttings and rootlings absorb chlorine from water during hydration.

A poorly managed hydration tank is a rapid method of spreading disease to successive cutting batches – care and frequent change of chlorinated hydration water is advised.

- Following hydration (or fungicide treatment), cuttings can be packed into plastic bags or plastic lined bulk storage bins. The cuttings should be packed with no free surface moisture and with one or two 5mm vent holes per bag.

- Cuttings should be stored at 2^0C to 4^0C +/-1^0C and high humidity. Good air circulation and temperature uniformity within the cool room is advised. A regular electronic or manual log of cool room temperature should be maintained (see point 6.0 below).

Note – poor performance has been recorded where cuttings are cold stored for extended periods without storage bag ventilation…particularly following HWT. Dormant rootlings have been known to perform poorly if exposed to HWT and are returned to the cool room.

Good performance is regularly observed if cuttings are removed from the cool room and allowed to return to room temperature just before HWT and propagation/ grafting. Similarly, few problems are experienced with rootlings if they are removed from the cold room and are allowed to equilibrate before HWT immediately prior to dispatch to the customer.

4.4 HWT tank design, engineering, equipment and operating considerations

4.4.1 HWT Tank Design

Several HWT tank designs are currently in use by commercial nurseries. There is little standardisation between designs, however, all successful HWT tanks have the following elements in common:

- HWT tanks are commonly constructed from biologically inert, corrosion resistant materials including galvanised steel, stainless steel and reinforced plastics.
- The tank may be insulated to improve operating efficiency and may be constructed with a lid to exclude foreign matter and prevent heat loss between batches.
- Total tank volume will be determined by the batch size. HWT tanks capable of processing in excess of 10,000 cuttings per batch are common.
- Tank water can be heated by a variety of techniques ranging from steam injection, gas fired heat exchangers and gas burners to electric and oil fired heat sources. The only limitations are that the heat must be applied to the HWT tank water indirectly, uniformly and at a sufficient distance from the treated material to avoid local hot spots.
- A high capacity external re-circulation pump agitates the hot water through the treated material and achieves a uniform target temperature through-out the entire load mass.
- When cuttings are immersed in the HWT tank, the combination of tank heating source and agitation employed in each individual tank design must be capable of allowing the tank to rapidly recover to target temperatures at which point the treatment time commences
- A second tank of similar or larger volume as the HWT tank and filled with clean chlorinated cool water (maintained at 20^0C or less) will be required to immediately submerge and cool down material following the required duration in the HWT tank.

4.4.2 Treatment basket or dipping cage design

To facilitate ease of handling and allow appropriate control over the duration of HWT, a basket or cage must be constructed to contain bundled cuttings or rootlings. The basket should be constructed with the following key design considerations:

- The basket should be composed of corrosion resistant, biologically inert material
  It should be constructed of mesh or a similar open design to permit unimpeded water circulation through the treatment batch and may need a mesh lid to prevent cuttings from floating during HWT
- The basket should be designed to fit within the HWT tank while allowing 300mm to 350mm clearance on all sides to permit water circulation and allow easy entry and extraction from the HWT tank
- The basket should be sufficiently robust to safely carry the batch size to be treated

- The basket must be fitted with lifting points and approved lifting tackle rated to carry the wet weight measured from the maximum load of bundled cuttings possible within the basket's dimensions

4.4.3 HWT Tank commissioning and certification

Prior to treating cuttings or rootlings in a new or modified HWT tank, the unit must be calibrated and certified by an appropriate ISO9001 Quality Certified or NATA accredited certifying agency to ensure that the HWT tank is heating uniformly and is performing to the specifications detailed in AS2853.

In some regions within Australia, appropriate hot water vessel compliance testing will need to be completed by State authorities.

Following analysis of temperature and performance data by the certifying agency, the HWT tank will either be certified as operationally satisfactory or the certifying agency will indicate areas for tank design improvement to rectify hot or cold points and raise tank performance before HWT tank certification is approved. The period of tank certification is three years provided there is no modifications to tank design. When modifications occur, the tank will need to be re-certified before the next production season commences.

4.4.4 Temperature control and record keeping

The nursery must accurately monitor HWT tank performance for every batch processed. The data, either electronic or manual, must be able to be readily retrieved as required.
Batch temperature monitoring is typically achieved with a three-channel data logger connected to three temperature probes with a minimum sensitivity of 0.5^0C.

Temperature probes are distributed within the hot water treatment tank to record:

- load temperature,
- tank water temperature
- recirculation water temperature.

Automatic or thermostatically controlled temperature regulation can be unreliable. An experienced HWT operator should be employed to monitor HWT treatment progress as indicated by the tank's data logger/temperature probe array. The operator should be capable of manually adjusting HWT tank temperature if it begins to vary from the acceptable standard.

The data logger should be configured to provide the following minimum information for every treatment batch:

- 3 probe temperature measurement
- Temperature logging every 5 minutes, all 3 probes
- Data printing or manual data recording, all 3 probes
- Electronically data stored as appropriate.

Regardless of the treatment duration, the following minimum information must be recorded for every treatment batch:

- Batch reference number
- Identification of the operator

- Treatment date
- The maximum and minimum temperature recorded during the treatment period

4.4.5 Temperature probe testing and test record keeping

All temperature measuring equipment must be tested at least annually (before the start of treatment). Generally conducted by an accredited certifying agency, calibration of temperature probes may be self tested by the nursery operator. A Certified Thermometer must be used as a reference point and calibration tool. Frequent testing will ensure that temperature probe calibration does not vary with time.

Testing by an approved instrument calibration testing service is preferred.

Self Testing Procedure for Temperature Probes

Where nurseries wish to self-test their temperature probes, the following procedure may be used and must be fully documented:

- Place the temperature probes and Certified Thermometer together in a suitable water bath. Ensure that the probes and thermometer are located at the same depth, do not touch the bottom of the water bath and are not in contact with each other.
- Start the data logger and gradually heat the water to a target temperature of 50^0C either directly by heating on a stove, or indirectly by pouring in very hot (not boiling) water and gently stirring the water to mix and stabilize the water temperature.
- The operator must read and record the temperature of each of the probes against the certified thermometer when 50^0C is reached on the certified thermometer
- Probes returning different temperatures to the certified thermometer must be marked and clearly identified
- Where testing indicates that probes need adjustment and the measuring equipment has the facility to do so, each temperature probe can be adjusted to read precisely the same value as the certified thermometer.
- Repeat this process for a 55^0C target temperature

Where measuring equipment has no adjustment facility, temperature probes that do not read the same temperatures as the certified thermometer must be replaced or clearly marked with the temperature differential for continued use.

For all calibration tests, the following information must be recorded:

- The date the test was performed
- The name of the operator performing the test
- The identification number or serial number of the Certified Thermometer
- The identification numbers or serial numbers of the temperature probes tested
- A record of the temperatures reported by each probe against the temperatures shown on the certified thermometer
- Signature or initials of the operator confirming that each temperature probe is accurate

4.5 Hot Water Treatment Procedure

Thoroughly clean the HWT tank and cool down tank to remove any plant matter, soil residue or other foreign matter.

1. Fill the HWT tank with clean water free of sediment or foreign matter
2. Fill the cool down tank with clean water free of sediment or foreign matter. Chlorinate cool down water (e.g., to 10ppm free chlorine using stabilised pool chlorine or similar product)
3. Raise the water temperature of the HWT tank to between 1^0C and 2^0C above the target temperature. This will allow the load to heat up to the target temperature rapidly while the bath temperature recovers to approximately the target temperature
4. Load a treatment basket with cuttings and position temperature probes.
5. Lower the treatment basket into the HWT tank until the cuttings or rootlings are completely submerged and at least 100mm below the water surface
6. Allow the tank to recover to target temperature.
7. Begin to log treatment temperatures, record treatment batch details on record sheet. Adjust tank temperature during treatment as necessary
8. At the required duration (5 or 30 minutes), lift the treatment basket from the HWT tank and immediately lower the into the cool down tank
9. Keep the treatment basket in the cool down tank for an equivalent period of time as the HWT
10. Unload the treatment basket and avoid contamination of the material. Clearly label the batch as 'hot water treated' to avoid inadvertent re-treatment.
11. Check chlorine levels in the cool down tank and re-chlorinate as required (see note 4.5.2 below).

4.5.1 Hot Water Treatment Tank Maintenance

The maintenance water quality in the hot water treatment tank is critical to the success of this process and to the health of treated cuttings or rootlings.

- Use only the best quality water available to fill the hot water tank.
- Ensure the water is free from sediment, silt or foreign matter.
- During continuous operation, empty and clean the tank at the end of each day.

4.5.2 Cool Down Tank Maintenance

As the cool down tank is the last stage in the HWT process it is essential to keep the water sanitised. Your attention to cool down tank hygiene is critical to the health of material that you treat. Maintain chlorine levels of up to 10ppm in your cool down tank between batches. Empty and clean the tank frequently.

If the cool down tank becomes visibly contaminated with soil, sediment or foreign matter, the tank should be emptied, cleaned and refilled with clean chlorinated water before proceeding.

4.6 Cool store monitoring and record keeping

Cuttings should be stored at 2^0C to 4^0C +/-1^0C and at high humidity. Good air circulation and temperature uniformity within the cool room is advised. A regular electronic or manual log of cool room temperature should be maintained

Cool rooms can be fitted with audible alarms to indicate that the room temperature has varied over or under the set point. The cool room could also have an automatic messaging facility linked to a phone or pager to alert the storage supervisor of problems at any time.

Freezing damage can rapidly kill stored cuttings and temperatures above 5^0C will progressively reduce storage life.

4.7 Acknowledgements

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4.3 Hot Water Treatment Record Sheet

Date	Contract Customer Name	Variety	Clone	Batch ID	Quantity	Re-hydration Tank/Time	Temperature Treatment Applied	Cooldown Tank /Time	Operator signature

4.4 Calibration Record

Equipment	I.D.	Date Calibrated	Reference reading (Certified thermometer)	Actual reading	Correction	Action taken	Name	Signature

5.1 Cold Room

Purpose

To store material and maintain viability until required.

Responsibility

Nursery Manager, Nursery Staff.

Procedure

Material must be stored freshly hydrated.

All material to be cold stored must be placed in the appropriate plastic liners and sealed with tie wire. The top of the plastic liner is to be bunched and sealed with tie wire so as to allow for air exchange.

Each bin must have an external label once stacked to show batch ID, Variety/Clone and quantity and date into coldroom.

Attempt to keep storage uniformity when storing the bins in the cold store. ie, similar location within cold store.

Record ingoing bins on the cold room storage log including location number.

Record outgoing bins on the cold room storage log.

Cool store material at a temperature of 2-4°C +/- 1°C and a high relative humidity to prevent dehydration.

Ensure an even temperature distribution and airflow throughout the coolroom by careful bin placement, and monitor the temperature daily.

Record daily temperature on the Cold Room Temperature Record Sheet and notify Nursery Manager if temperature falls outside the above range.

Quality Control Procedure

Wall mounted thermometers and thermostats only provide a guide to the actual storage temperature. Annually all thermometers must be checked against a Certified Thermometer provided by an approved testing authority and the variation against actual noted on the temperature variation record form.

Documentation

Cold Room Temperature Record Sheet
Cold Room Storage Log
Cold Storage Instructions / Plan.
Calibration records

5.2 Cold Room Temperature Record Sheet

Date	Time	Temp (°C)	Sign	Date	Time	Temp (°C)	Sign

5.3 Cold Storage Instructions / Plan

1. All material to be cold stored must be placed in the appropriate plastic liner and sealed.
2. Each bin must have an external label once stacked to show batch ID, Variety/Clone and quantity, date into cold room.
3. The quantity in each bin must be adjusted on the label as cuttings are removed or added to the bin.
4. Attempt to keep storage uniformity when storing the bins in the cold store. ie, similar location within cold store.
5. Record ingoing bins/outgoing bins on the Cold Room Storage Log.
6. Record daily temperature, either electronically or manually on the Cold Room Temperature Record Sheet. Notify Nursery Manager if temperature varies outside temperature range of 2-4°C +/- 1°C.

5.4 Cold Room Storage Log

Variety	Clone	Bin #	Date In	Sign	Date Out	Sign	Comments

6.1 Bench Grafting

Purpose
To ensure complete graft union

Responsibility
Grafting table operators

Grafting Supervisor

Procedure

Check scion and rootstock material for correct identity

Ensure rootstocks and/ or scions are H.W.T. prior to grafting.

Cut scion buds and place in plastic container.

Cut ends of rootstock below node and place in plastic container.

Place scion buds to the right of the machine and a bundle of disbudded rootstocks to the left.

Select a scion of the same diameter as that of the rootstock cutting to be grafted

Scion is measured approx. 25 mm below the bud

Rootstock is measured against 350 mm length indicator and grafted at this length. Rootstock cuttings with a node positioned at 350 mm are grafted below this node.

Place the scion into the right hand side of the grafting machine and make the first cut 25 mm below the bud. The bud of the scion should face upwards so that the scion is cut at its widest point.

Depress the foot pedal

The blade will cut the stem of the scion, clamping the scion in the blade.

Place the basal end of the rootstock against the length indicator. Hold the rootstock cutting in the groove of the grafting machine.

The scar of the removed rootstock bud should face downwards so that the blade cuts at its widest point.

Fully depress the foot pedal.

The blade will make a complimentary omega cut in the rootstock.

As the foot pedal is fully returned to the start position, the machine will release the rootstock with the scion inserted into the omega cut.

Carefully check the union to see that the scion is pressed completely into the rootstock. Align gently with fingers if necessary.

Place grafted cutting in adjacent plastic container for collection by the waxer / packer.

Maintain clean work environment.

Quality Control Procedure

Random inspection of finished product to ensure correct uniformity of scion and rootstock.

Documentation

Daily Grafting Record

Grafting Work Instruction Sheet

6.2 Daily Grafting Record Sheet

Wax Batch ID …… **Type**……..…. **Wax Batch ID** ……

Vinifera Variety	Clone	Batch ID	Rootstock Variety	Clone	Batch ID	Qty Required	Qty Achieved	Wax Temp	Date in Callus Rm	AGV Batch Nos	Date re-wax	Wax Temp

6.3 Grafting Instruction

1. Check scion and rootstock material for correct identity
2. Ensure rootstock and/or scion are H.W.T. prior to grafting.
3. Cut scion buds and place in plastic container.
4. Cut ends of rootstock below node and place in plastic container.
5. Place scion buds to the right of the machine and a bundle of disbudded rootstocks to the left.
6. Select a scion of the same diameter as that of the rootstock cutting to be grafted.
7. Scion is measured approx. 25 mm below the bud.
8. Rootstock is measured against 350 mm length indicator and grafted at this length. Rootstock cuttings with a node positioned at 350 mm are grafted below this node.
9. Place the scion into the right hand side of the grafting machine and make the first cut 25 mm below the bud. The bud of the scion should face upwards so that the scion is cut at its widest point.
10. Depress the foot pedal.
11. The blade will cut the stem of the scion, clamping the scion in the blade.
12. Place the basal end of the rootstock against the length indicator. Hold the rootstock cutting in the groove of the grafting machine.
13. The scar of the removed rootstock bud should face downwards so that the blade cuts at its widest point.
14. Fully depress the foot pedal.
15. The blade will make a complimentary omega cut in the rootstock.
16. As the foot pedal is fully returned to the start position, the machine will release the rootstock with the scion inserted into the omega cut.
17. Carefully check the union to see that the scion is pressed completely into the rootstock. Align gently with fingers if necessary.
18. Place grafted cutting in adjacent plastic container for collection by the waxer / packer.
19. Spray work bench and grafting machine head with Methalated Spirits or other appropriate sanitiser prior to breaks and at end of day.

7.1 Callusing (Bench Grafting)

Purpose

To ensure optimum callus development.

Responsibility

Grafting Supervisor

Procedure

This procedure has been kindly supplied by Orlando Jacobs Creek Nursery.

New (or recycled pasteurised) grade 4 vermiculite (or other suitable callusing medium) is dampened with water chlorinated to 10 p.p.m.

Waxed cuttings are packed in sanitised lined bins with the dampened callusing medium.

Bins or containers of grafted cuttings are placed in the callus room and recorded on the Daily Grafting Record Sheet.

Air temperature is controlled by a thermostatically controlled heater and held at a temperature high enough to produce callus (typically 25-30°C). Log daily room and/or bin temperatures.

Maintain high relative humidity.

Continuous air movement is maintained using ceiling fans to eliminate temperature hot / cold spots inside the callus room.

When a visually complete ring of callus at the graft union of approximately 1-2mm thick forms, the bins are removed from the callusing room. This period is typically 14 to 21 days.

Progress is checked regularly. Spray applications to control fungal disease eg. Botrytis may be necessary.

Once the bins are removed from the callusing room they are transferred directly for unpacking and waxing.

The used vermiculite is then recycled or disposed in a manner suitable with local disposal regulations.

NOTE: Callus rooms are a critical hygiene area and unauthorised access should be restricted

Quality Control Procedure

Daily checks of callus room to ensure no contamination of callus boxes. Observe room condition and should be clean and free from mould.

Documentation

Callus Room Temperature Record Sheet
Daily Grafting Record Sheet
Callusing Instruction

7.2 Sand Callusing

Purpose

To ensure optimum callus development.

Responsibility

Field Supervisor

Procedure

Cuttings can be effectively callused using clean washed sand.

Soon after cuttings are harvested, bundles are stood inverted side-by-side and covered with washed sand to a depth of approximately 100mm. To avoid air pockets use liberal amounts of tap water to wash sand down around the cuttings.

Place physical barrier between varieties, label clearly and reflect relevant data on a sand bed map.

During late winter and early spring regularly check sand for moisture. Re-apply water as required. As warm spring weather approaches callusing and root initials will develop. At this point cuttings are removed from the sand bed and planted into the field nursery.

Documentation

Sand bed map.

7.2 Callus Room Temperature Record Sheet

Date	Time	Visual check	Temp (°C)	Sign	Date	Time	Visual check	Temp (°C)	Sign

7.3 Daily Grafting Record Sheet

Wax Batch ID……..

Vinifera Variety	Clone	Batch ID	Rootstock Variety	Clone	Batch ID	Qty Required	Qty Achieved	Wax Temp.	Date in Callus Rm	AGV Batch Nos	Date re-waxed

7.4 Callusing Instruction (Bench Grafting)

1. New (or recycled pasteurised) grade 4 vermiculite (or other suitable callusing medium) is dampened with Chlorinated Water at 10 p.p.m.
2. Waxed cuttings are packed in sanitised lined bins with the dampened callusing medium.
3. Bins or containers of grafted cuttings are placed in the callus room and recorded on the Daily Grafting Record Sheet.
4. Air temperature is controlled by a thermostatically controlled heater and held at a temperature high enough to produce callus (typically 25-30°C). Log daily room and/or bin temperatures.
5. Maintain high relative humidity.
6. Continuous air movement is maintained using ceiling fans to eliminate temperature hot / cold spots inside the callus room.
7. When a visually complete ring of callus at the graft union of approximately 1-2mm thick forms, the bins are removed from the callusing room. This period is typically 14 to 21 days.
8. Progress is checked regularly. Spray applications to control fungal disease eg. Botrytis may be necessary.
9. Once the bins are removed from the callusing room they are transferred directly for unpacking and waxing.
10. The used vermiculite is then disposed or recycled in a manner suitable with local disposal regulations.

NOTE: Callus rooms are a critical hygiene area and unauthorised access should be restricted

Quality Control Procedure

Daily checks of callus room to ensure no contamination of callus boxes. Observe room condition and should be clean and free from mould.

Documentation

Callus Room Temperature Record Sheet
Daily Grafting Record Sheet
Callusing Instruction

7.5 Sand Callusing

Purpose

To ensure optimum callus development.

Responsibility

Field Supervisor

Work Instructions

1. Cuttings can be effectively callused using clean washed sand.

2. Soon after cuttings are harvested, bundles are stood inverted side-by-side and covered with washed sand to a depth of approximately 100mm. To avoid air pockets use liberal amounts of tap water to wash sand down around the cuttings.

3. Place physical barrier between varieties, label clearly and reflect relevant data on a sand bed map.

4. During late winter and early spring regularly check sand for moisture. Re-apply water as required. As warm spring weather approaches callusing and root initials will develop. At this point cuttings are removed from the sand bed and planted into the field nursery.

Documentation

Sand bed map.

7.6 Hot bed callusing

Purpose

To ensure optimum callus development.

Responsibility

Field Supervisor

Work Instructions

1. Cuttings can be stored prior to hot bed callusing by methods described previously:
   - Coldstore (refer section 2.1)
   - Sand bed (refer section 7.5)

2. At start of propagation season remove sand from hot bed, taking care not to damage the heating cables. Replace with new, clean, course horticultural sand (eg. AFS-20) making sure there is 50mm below and 50mm above the heating cables (total depth 100mm).

3. Fourteen to twenty one days prior to planned potting / planting date place bundles of cuttings on the heat bed so that the bases of the cuttings are 50mm above the heating cables. Do not place bundles right to the outer edge of the heating cables where there is a possibility of cold spots.

4. Place and water in additional sand, AFS-20, around the cuttings up to a depth of at least 50mm from the base.

5. Insert the heating cable thermostat probe and a spirit thermometer at the cutting base level and near the center of the hot bed.

6. Turn on the heat bed(s) and adjust the temperature to 25°C.

7. Check the moisture level of the heat bed(s) sand daily and water as required.

8. Record temperature(s) daily in the Hot Bed Temperature Record Sheet.

Documentation

Sand bed map.
Hot Bed Temperature Record Sheet

7.7 Hot Bed Temperature Record Sheet

Date	Time	Bed 1	Bed 2	Moist OK?	Sign / comment

8.1 Waxing

Purpose

Maximise viability of waxing process

Responsibility

Grafting Supervisor

Procedure

This procedure has been kindly supplied by Orlando Jacobs Creek Nursery.

Prepared wax is added to thermostatically controlled wax bath, and maintained at a temperature determined by the nursery as being adequate to cover the grapevine cutting at an acceptable thickness.

Cuttings are held inverted by the basal end, and the graft ends are spread to prevent touching each other

The graft end of the cuttings is dipped quickly into the wax to give a thin coating over the scion and graft union. Small “pin holes” in the wax will be avoided if there is no free moisture on the cuttings.

The grafts are dipped in cool chlorinated water immediately after waxing to cool them down and set the wax. Cooling water is replaced regularly. Alternatively, wax may be air-cooled.

The supervisor records wax temperatures and Wax Batch ID on Daily Grafting Sheet.

Quality Control Procedure

Random Inspection of waxed finish product
Recording of wax temperature on Daily Grafting Record.

Documentation

Waxing Instruction
Daily Grafting Record

8.2 Waxing Instructions (pre callusing)

1. Prepared wax is added to thermostatically controlled wax bath and maintained at a temperature determined by the nursery as being adequate to cover the grapevine cutting at an acceptable thickness.

2. Cuttings are held inverted by the basal end, and the graft ends are spread to prevent touching each other.

3. The graft end of the cuttings is dipped quickly into the wax to give a thin coating over the scion and graft union. Small “pin holes” in the wax will be avoided if there is no free moisture on the cuttings.

4. The grafts are dipped in cool chlorinated water immediately after waxing to cool them down and set the wax. Alternatively, wax may be air-cooled.

5. Cooling water is replaced regularly.

6. Grafted waxed cuttings are placed in callus grafting boxes as per callusing procedure (7.1)

7. The supervisor records wax temperatures and Wax Batch ID on Daily Grafting Sheet.

8.4 Daily Grafting Record Sheet

Wax Batch ID……..

Vinifera Variety	Clone	Batch ID	Rootstock Variety	Clone	Batch ID	Qty Required	Qty Achieved	Wax Temp.	Date in Callus Room	AGV Batch Nos	Date re-waxed

8.5 Re-waxing (post callusing)

Purpose
Maximise viability of scion bud development upon field planting

Responsibility
Grafting Supervisor

Procedure
Bins of callused cuttings are removed from the callus room and emptied carefully, separating the cuttings.

Compressed air or electric brushed are can be used to remove loose vermiculite from the callused cuttings.

Prepared wax is added to a thermostatically controlled wax bath, and maintained at a temperature determined by the nursery as being adequate to cover the cutting at an acceptable thickness.

Cuttings are held inverted by the basal end, and the graft ends are spread to prevent touching each other

The graft end of the cutting is dipped into the wax to give a thin coating over the scion and graft union. Small “pin holes” in the wax will be avoided if there is no free moisture on the cuttings.

The grafts are dipped in cool chlorinated water immediately after waxing to cool them down and set the wax. Cooling water is replaced regularly. Alternatively, wax may be air-cooled.

The supervisor records wax temperatures on Daily Grafting Sheet and records new AGV Batch number.

Quality Control Procedure
Recording of wax temperature on Daily Grafting Record.

Documentation
Waxing Instruction
Daily Grafting Record

8.6 Waxing Instructions (post callusing)

1. Prepared wax is added to a thermostatically controlled wax bath, and maintained at a temperature determined by the nursery as being adequate to cover the cutting at an acceptable thickness.

2. Cuttings are held inverted by the basal end, and the graft ends are spread to prevent touching each other

3. The graft end of the cutting is dipped into the wax to give a thin coating over the scion and graft union. Small “pin holes” in the wax will be avoided if there is no free moisture on the cuttings.

4. The grafts are dipped in cool chlorinated water immediately after waxing to cool them down and set the wax. Cooling water is replaced regularly. Alternatively, wax may be air-cooled.

5. The supervisor records wax temperatures and Wax Batch ID on Daily Grafting Sheet.

8.7 Daily Grafting Record Sheet

Wax Batch ID……..

Vinifera Variety	Clone	Batch ID	Rootstock Variety	Clone	Batch ID	Qty Required	Qty Achieved	Wax Temp	Date in Callus Rm	AGV Batch Nos	Date re-wax	Wax Temp

9.1 Field Nursery

Purpose

To ensure growth of high quality/healthy vines for resale.

Responsibility

Nursery Manager
Field Nursery Manager

Procedure

Ensure that the vines are clearly labelled at the beginning and end of each variety and finish planting one variety/clone before starting another.

Leave a large vacant space in row between each variety. Insert solid marker pegs, clearly identifying change in variety.

Draw up a field map as each variety is planted.

Estimate saleable numbers of vines.

General Maintenance

Vines should be watered and fertiliser to maintain active growth. Weeds should be controlled to avoid competition with vines and harbouring of pests.

Disease Control

Foliar growth should be controlled to maintain optimum growing conditions, trimming may be necessary.

Fungal diseases and vine pests should be controlled with an integrated spray program.

Field Inspection

The field nursery should be inspected for the presence of Off Types during the growing season. Off-types that are identified should be tagged and/or removed.

Diseased vines should be removed and destroyed.

Quality Control Procedure

To monitor the vines' health status by regular inspection of the Field Nursery.

Documentation

Field Map
Field Nursery Health Inspection
Field Maintenance Record Sheet

9.2 Field Map

Site:.....

Contact: .....Phone: .....

Location: .....

Site Description:

.....

.....

.....

.....

Local warnings/hazards:

.....

.....

.....

.....

Site Map:

Nursery to insert

9.3 Field Nursery Inspection

Nursery Owner: _____

Contact Person: _____ Phone Number: _____

Nursery Location: _____

Vine Variety: _____ Clone: _____

Map Accuracy Checked ☐ **Row IDs Correct** ☐

Inspectors Report

INSPECTOR _____ Date Of Inspection _____

Number Of Vines Tagged (Off type) _____
Row #_____ Vine # _____
Row #_____ Vine # _____

ACTION TAKEN _____

	SYMPTOMS OBSERVED	SUSPECTED CAUSE	TAG NUMBER
LEAVES			
CANES			

Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Signed (Inspector 1)……. Signed (Inspector 2)…….

1.4 Field Maintenance Record

Year ……

Date	Chemical/Fertilizer Irrigation	Spray Target	Rate per Litre	Total Amount Used	Portion of Nursery Sprayed	Location of usage	Protective Equipment Used	User of Chemical	Sign	Comments

10.1 Lifting

Purpose
Lift vines during dormancy to allow grading/packing and distribution to customer.

Responsibility
Nursery Manager, Field Nursery Manager.

Procedure
Rootlings are to be lifted only during dormancy.

Using the field map and the daily/weekly digging plan dig rootlings as required.

Digging machine lifts the rootlings and operator places bundles on ground for collection.

Field staffs collect rootlings, tying them into bundles and place in trailer for dispatch to shed for grading and packing.

Only one variety per trailer/bin is to be dispatched at a time to the packing shed.

Trailer/bin is covered by tarps etc, to ensure no dehydration

Quality Control Procedure
Field Nursery Manager to check dispatching of trailer/bin between varietal changes.

Documentation
Daily/Weekly Digging Schedule
Field Map

10.2 Lifting Work Instruction

Rootlings are to be lifted only during dormancy.

Using the field map and the daily/weekly digging plan dig rootlings as required.

Digging machine lifts the rootlings and operator places bundles on ground for collection.

Field staffs collect rootlings, tying them into bundles and place in trailer for dispatch to shed for grading and packing.

Only one variety per trailer/bin is to be dispatched at a time to the packing shed.

Trailer/bin is covered by tarps etc, to ensure no dehydration

10.3 Daily / Weekly Digging Schedule

Date Dug	Qty	Variety	Clone	Batch No	No. of 1st. Grade	Supervisor Signature	Comments

10.4 Field Map

Site:.....

Contact: .....Phone: .....

Location: .....

Site Description:

.....

.....

.....

.....

Local warnings/hazards:

.....

.....

.....

.....

Site Map:

Nursery to insert

11.1 Grading and Packing

Purpose

To ensure best quality planting material is dispatched to customers.

Responsibility

Nursery Manager
Shed Supervisor, Despatch Operator

Procedure

On arrival at the shed, rootlings may be trimmed for ease of handling.

All rootlings should be graded as follows:

- **Dormant rootling.** Have at least one fully matured shoot with a minimum of three prominent buds and at least three sound roots evenly distributed at the basal node.
- **Dormant grafted vine.** Have at least one fully matured shoot with a minimum of three prominent buds and at least three sound roots evenly distributed at the basal node. Have a visually completed union, strong enough to withstand flexing at the union.

Discard dead / damaged plants.

Count and bundle vines as required (e.g. in quantity of 25, 50, 100, etc.).

All rootlings must be labeled clearly and accurately with the following information:

Front of Label

- Scion: - Variety, Clone
- Rootstock: - (if applicable) Variety, Clone
- Vine batch number that relates back to the Source Block I.D. of both the rootstock and scion
- CERTIFIED VINE (blue label) ….. UNCERTIFIED VINE (yellow label)

Reverse of Label (optional)

- Nursery name
- Nursery address
- Nursery phone/fax number
- VINA Accreditation Nursery

Record final numbers onto the Graded Field/Pot Stock Summary Record Sheet.

Vines are washed and hydrated in Chlorinated Water before being packed into wooden bins, with plastic liners and stored in the cold room. For added protection Fungicides such as Sporekill and Captain may be added to the hydration water (Refer W/I 2.1)..

Hydration is recorded on the Graded Stock Summary Record Sheet.

Temperature of the cold room is monitored daily 2-4°C +/- 1°C and recorded on the Cold room temperature log.

Grading and Packing (cont.)

Vine rootlings are H.W.T. to minimise soil borne pathogens. Some customers may request this procedure not be done. Communicate with customer on this matter.

Quantities are recorded in the Graded Stock Summary Record Sheet.

Quality Control Procedure

To monitor the vines' health status by regular inspection of the Field Nursery.

Documentation

Graded Field/Pot Stock Summary Record Sheet
Summary of Orders for Field Grown Vines
Coolroom Temperature Record Sheet
Grading and Packing Instructions

11.2 Summary of Orders for Field Grown Vines

Date	Customer Name	Variety	Clone	Qty	Rootstock	Clone	% Extra	Batch #

Graded Field Stock Summary Record Sheet

Variety	Qty 1st Grade	Qty 2nd Grade	B/No	Hydration Time	Supervisor signature	Comments

11.3 Cold Room Temperature Record Sheet

Date	Time	Temp (°C)	Sign	Date	Time	Temp (°C)	Sign

11.4 Grading and Packing Instructions

1. On arrival at the shed, trim rootlings for ease of handling.

2. Grade material by visual inspection of completed union, strong enough to withstand flexing at the union, discard dead / damaged plants.

3. Count and bundle vines as required (e.g. in quantity of 25, 50, 100, etc.).

4. Labelled with scion variety/clone rootstock variety/clone, Batch number and source I.D.

5. Record final numbers onto the Graded Field/Pot Stock Summary Record Sheet.

6. Vines are washed and hydrated for in Chlorinated Water before being packed into wooden bins, with plastic liners and stored in the cold room. For added protection Fungicides such as Sporekill and captain may be added to the hydration water (Refer W/I 2.1)..

   Note: Do not cool store rootlings after H.W.T.

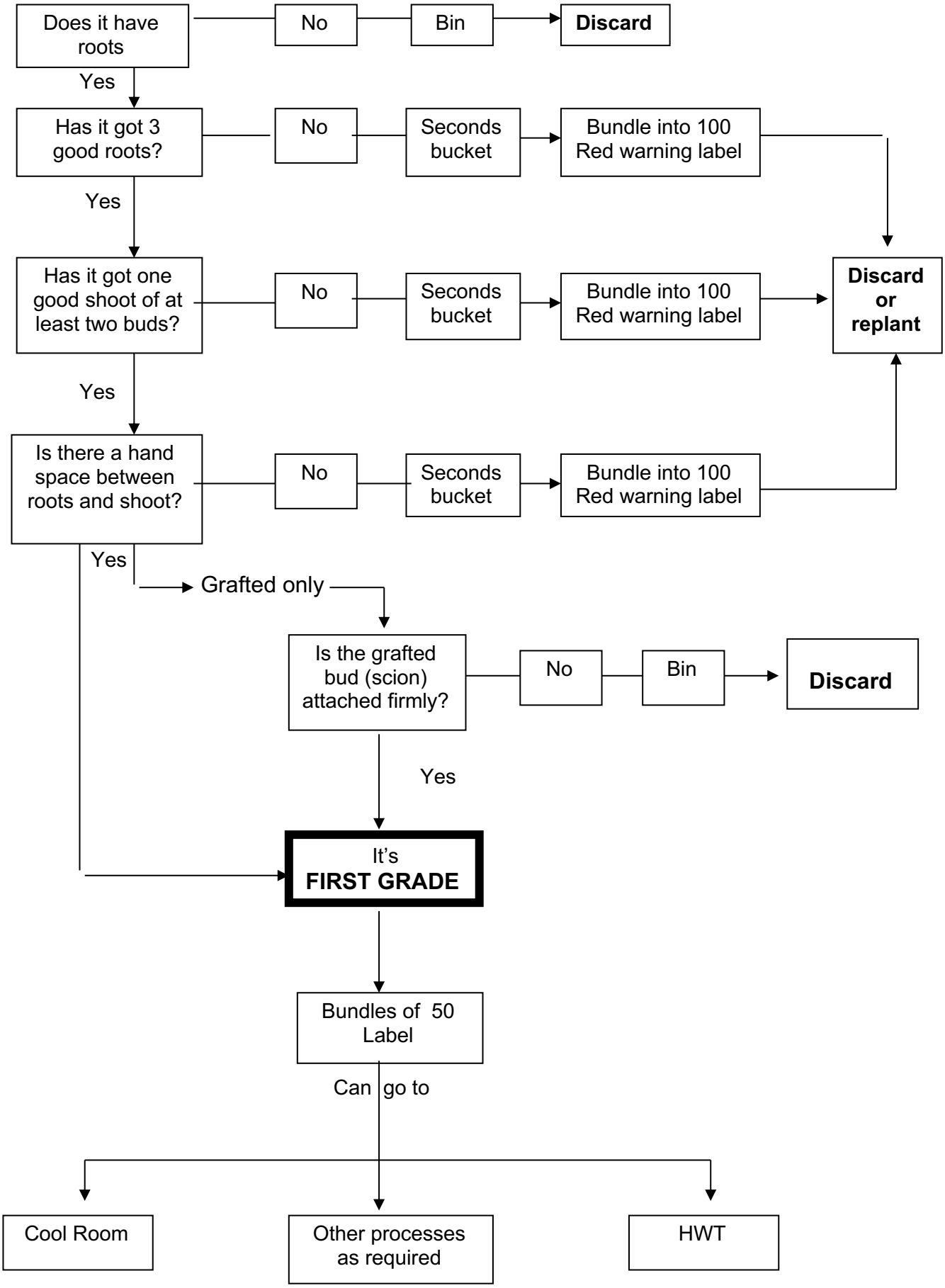
7. Hydration is recorded on the Graded Stock Summary Record Sheet.

8. Temperature of the cold room is monitored daily 2-4°C +/- 1°C and recorded on the Cold room temperature log.

9. Vines are only H.W.T. if specifically requested by the customer.

10. Quantities are recorded in the Graded Stock Summary Record Sheet.

11.5 Typical Grading Instructions



12.1 Dispatch

Purpose

To ensure vines are dispatched in accordance with customer specifications and as quickly as possible.

Responsibility

Nursery Manager, Shed Supervisor, Dispatch Staff.

Procedure

Quantities of grapevine material produced are recorded in the Graded Field / Pot Stock Summary Record Sheet, and totalled to indicate current stocks of material available.

Customers are notified when their material is available to be picked up or suitable freight/ postage arrangements are made.

Material is held in cold store for collection at a later date.

The temperature of the cool room is monitored daily to ensure the temperature remains at 2° - 4 °C +/- 1°C. Temperatures are manually recorded on the Coolroom Temperature Record Sheet or printed from stored data in a data logger.

Despatches are recorded on the Invoice Book, a copy of which is provided to the customer.

Grapevine Material is distributed consistent with State quarantine regulations.

Quality Control Procedure

Each entry in dispatch book is signed off to indicate Quantity, Clone, Batch ID is checked.

Documentation

Graded Field / Pot Stock Summary Record Sheet
Dispatch / Invoice Book
Interstate Movement Form
Plant Health Certificate

12.2 Graded Field / Pot Stock Summary Record Sheet

Variety	Qty 1st Grade	Qty 2nd Grade	B/No	Hydration Time	Supervisor signature	Comments

13 SAFE HANDLING OF POTTING MIX

Pot media, composts and like organic products are potentially hazardous. It is important that both production and retail nurseries realise this and meet their obligations under workplace health and safety.

Research funded by NIAA / HRDC has shown that a bacteria called Legionella can survive and grow in pot media, composts and other organic substances. Previously it was thought that this group of normally water borne bacteria could not live in such an environment. It also showed that even after pasteurisation the bacteria could easily reinfect the mix and live for more than twelve months in bagged product. It seems that the bacteria is able to live within a micro organism called amoeba and could be found in the vast majority of pot media and composts produced.

It is recommended to prominently display signage similar to the following:

HEALTH WARNING

THIS PRODUCT CONTAINS
MICRO-ORGANISMS THAT MAY BE
HARMFUL TO YOUR HEALTH

AVOID BREATHING DUSTS OR MISTS
FROM THIS PRODUCT

KEEP PRODUCT MOIST WHEN HANDLING

WASH HANDS IMMEDIATELY AFTER USE

Legionella bacteria may cause pneumonia symptoms in those it infects. Recent advances in medicine have allowed pathologists to more accurately identify the exact cause of some pneumonia, even being able to pinpoint the exact strain (or species) that is involved.

Two bacteria of most concern to doctors are *Legionella pneumophilla* and *Legionella longbeachae.* Both can be isolated in the natural environment and in certain conditions (like composting) are able to breed up quickly. **Both bacteria have the capacity to cause illness and death.** In 1997 approximately 200 people contracted Legionellosis in Australia, with *L. longbeachae* identified in about one third of cases. *L. longbeachae* has been associated with Legionellosis contracted by handling pot media.

LEGISLATION

This information when added to other known risks, like tetanus, dermatitis and dust diseases has led pot media manufacturers to review the health status of their products. The result of the review and **legal advice** obtained is that most have recognised that their product meets criteria set out by Worksafe Australia for being a ‘Hazardous Substance’ and have labeled them as such.

In Western Australia labeling is a legal requirement, and is also needed for pot media identified as meeting Australian Standards. Nursery Industry Association of Australia (NIAA) recommends that all nurseries only purchase and sell labeled product.

Occupation Health and Safety (OHS) legislation in each State details steps that need to be followed when dealing with hazardous substances. An inventory needs to be held, a risk analysis needs to be conducted and if necessary certain controls need to be put in place. All workplaces that use hazardous substances need to have current Material Safety Data Sheets (MSDS) available and ensure that the workers are not put at risk. There are also other steps that have to be followed.

WORKPLACE PRACTICES

Most nurseries will need to change some practices to meet the legislative OHS requirements for ensuring a safe workplace when using and selling pot media. For some the changes will be minimal and may be no more than simple changes to their operating procedures. Others may need to modify their pot media handling equipment, relocate their potting area or ensure workers use appropriate safety equipment.

Lack of action may leave nurseries liable for a fine, face being sued or worse still being responsible for the injury or death of a worker.

A workshop called 'Safe handling of pot media and other organic material' has been developed to assist people to ensure they are able to cover these new requirements. It covers the legal issues, health aspects and other steps necessary when handling Hazardous Substances. All businesses that sell or use pot media are encouraged to do the course. Further information can be obtained from your State Nursery Industry Association**.**

SUMMARY

Research has identified health risks in the use of pot media, composts and other organic material.

Pot media manufacturers are now identifying their products as meeting Worksafe Australia's criteria for a hazardous substance.

All workplaces are obliged to have systems in place for handling hazardous substances.

ACKNOWLEGEMENTS AND FURTHER READING

The original work by Dr Trevor Steele " Final report NY234 – Control of Legionella spp particularly Legionella longbeachae in potting mixes" is available for $20 from HRDC.

Also available is "Guidance for the control of Legionella" by Clive Broardbent, published by National Environment Health Forum, phone 08 8266 7100.

This paper was written by Greg McPhee, National Training Officer, and the workshop is an outcome of the NIAA instigated HRDC Project NY96029 ' Transferring Research into Training'

13.1 Potted Vines (Plant bands)

PURPOSE

Provide instruction on the complete range of activities occurring within the potting process.

RESPONSIBILITIES

- Nursery staff under the direction of the potting and packing shed supervisor.

DEFINITIONS

- Plant bands: individual vine containers.
- Plant band roller: machine used to roll out plant bands.

EQUIPMENT USED

- Plant bands
- Plant band roller
- Plant trays
- Potting machine
- Front-end loader

PREPARATION FOR POTTING.

Preparation for potting requires that there is a plentiful supply of pre-rolled bands in plant trays for filling by the potting machine. At a grafting rate of 35,000 per week a supply of about 170 plant trays per day should be pre-rolled and packed ready for filling.

Media is loaded to capacity into the potting machine hopper using the front end loader.

MEDIA

Potting media should be sourced from an approved supplier. If the nursery mixes its own media, the components of potting media, other than those generally accepted as being pathogen free (eg. Peatmoss, perlite, vermiculite) and those which are routinely disinfected by approved methods, should also be sourced from an approved supplier.
An approved supplier is an accredited entity which supplies pathogen tested materials from pathogen tested extraction, storage and mixing sites.
Storage facilities should be effective in preventing infestation or re-infestation by root rot organisms.

Floors are to be swept daily and thoroughly washed weekly

13.1 Potted Vines (Cont.)

POTTING GRAFTED CUTTINGS

Waxed grafted cuttings enter the potting shed from the waxing shed in containers holding approximately 300 cuttings. Each container also has 10 labeled grafted cuttings to ensure no mix in varieties.

The potting machine is operated to fill the trays of plant bands with potting media.

Grafted cuttings are then placed by hand into the plant bands to half the depth of the pot.

Each tray of grafted cuttings has at least one label identifying the scion and the rootstock and the potting date.

Trays are then transferred on to pallets at a rate of 9 foam trays per pallet.

Pallets of trays are then transferred by forklift into the glasshouse.

For each batch by variety a large yellow display stake will be placed in one pallet for quick glasshouse recognition. Information on stake are - date potted, variety combination and ID number.

Documentation

Graded Field / Pot Summary Record Sheet
Potting Record Sheet
Pot Maintenance Record Sheet

13.2 Graded Field / Pot Stock Summary Record Sheet

Variety	Qty 1st Grade	Qty 2nd Grade	B/No	Hydration Time	Supervisor signature	Comments

13.3 Pot Maintenance Record

Year……

Date	Chemical/Fertilizer Irrigation	Spray Target	Rate per Litre	Total Amount Used	Total Volume Mixed	Location of usage	Protective Equipment Used	User of Chemical	Sign	Comments

13.4 Potting Record Sheet

Bin number	Variety / GRN	Rootstock / GRN	Number of Pallets Potted	Total Number	Comments	Sign

14.1 Field Budding

Purpose
To ensure complete graft union to field growing rootstock.

Responsibility
Budding operators
Nursery supervisor

Procedure
Vigorous rootstock rootlings planted in early September can be chip budded using cold-stored scions from mid-October to December or from mid-September the following season.

Rootstock foliage may require trimming back a little for easy access by the budder. Sufficient foliage must remain so there is no interruption to the growth of the rootstock.

Chip buds are prepared from selected vinifera canes and stored in a small container to prevent dehydration during the budding process.

At a point below and in line with the upper shoot of the rootstock, two cuts are made in the rootstock to remove a chip of wood the same size as the chip bud that is to replace it.

Moisten the chip bud and place it on the cut surface of the rootstock. Push the wedge end of the chip bud down under the cut lip of the rootstock incision. The edges must line up on both sides for maximum cambium contact.

The only way the bud will take is if the cambium layer of both the chip bud and rootstock line up exactly and are firmly pressed together during budding and tying.

12mm plastic budding tape is used for tying in the chip bud. Using an overlapping figure-of-eight winding pattern, firmly seal in the chip bud, but leave the point of the bud exposed. Tie off the loose ends of the tape.

Documentation
Daily Budding Record

14.1 Daily Budding Record Sheet

Date	Vinifera Variety	Clone	Batch ID	Rootstock Variety	Clone	Batch ID	Qty Required	Qty Achieved	Date Topped	Signature	Comments

14.2 Top Cut off Budded Vines

Purpose
To safely remove rootstock tops and force chip bud growth

Responsibility
Budding operators
Nursery supervisor

Procedure
After approximately three to five weeks of warm weather after budding, the scion buds will be at various stages of budburst.

Cut the rootstocks back to about 10cm or two leaves to force scion buds to make further growth.

Apply sprays as necessary for pest and disease control. Maintain weed control.

During moderate weather, and when individual buds have produced a leaf and an active growing tip, remove the rootstock top completely above the point of budding.

Do not over water at this stage until the shoot has fully developed and then water to satisfy the needs of the vines.

As the scion shoot grows, pinch out the growing tip when the shoot reaches 40 to 50 cm in length. The shoot will harden up and side shoots will grow making a strong bushy vine that is less prone to wind damage.

Documentation
Daily Budding Record Sheet

APPENDIX 1

Deviation Report

1. Person Submitting Report

NAME:

---

2. Work Area Concerned

- ❒ Material intake
- ❒ Establishment and maintenance of Source Areas / Harvest cuttings
- ❒ Material received
- ❒ Disbudding
- ❒ Hot Water Treatment
- ❒ Cool storage
- ❒ Grafting, Callusing, Waxing
- ❒ Potting
- ❒ Field nursery, Budding
- ❒ Lifting, Grading, Labelling, Packaging
- ❒ Despatch
- ❒ Other

3. Type of Concern

- ❒ Non-conformance (Internal)
- ❒ Non-conformance (Supplier)
- ❒ Customer Complaint
- ❒ Other

- ❒ Impacts on Safety
- ❒ Impacts on Business
- ❒ Impacts on Customers
- ❒ Impacts on Staff

APPENDIX 1 - DEVIATION REPORT

Comments/ Situation/ Problem

(Include Customer or Supplier details if applicable)

Customer/ Supplier contact details:

Complaint received by:

Details

Form directed to:

- ❒ Manager
- ❒ Field Supervisor
- ❒ Other

APPENDIX 1 - DEVIATION REPORT

Action Taken

❒ Issue Resolved
❒ Continued

Details

Immediate Action

❒ Re-Work
❒ Re-Grade
❒ Concession
❒ Reject

Detail: Eg. Returned goods, visit customer, reject supplier etc.

APPENDIX 1 - DEVIATION REPORT

Preventative Action

Details

Name:

Signed:

Date:

Close out (To Be Completed by Quality Manager)

- ❒ Action completed and reviewed to be satisfactory
- ❒ Audit required
- ❒ Changes to procedures/ instructions
- ❒ Report raiser notified of outcome
- ❒ Customer notified

Quality Manger:

Signed:

Date: