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[1] **ISPM 15:2009 draft revision of Annex 1: Approved treatments associated with wood packaging material (2006-011)**

[2]

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[3] This annex was adopted by the [Xth] Session of the Commission on Phytosanitary Measures in [Month Year].

[4] The annex is a prescriptive part of ISPM 15:2009.

[5]

ANNEX 1: Approved treatments associated with wood packaging material

[6] The approved treatments may be applied to units of wood packaging material or to pieces of wood that are to be made into wood packaging material.

[7]

Use of debarked wood

[8] Irrespective of the type of treatment applied, wood packaging material must be made of debarked wood. For this standard, any number of visually separate and clearly distinct small pieces of bark may remain if they are:

[9]

- less than 3 cm in width (regardless of the length) or
- greater than 3 cm in width, with the total surface area of an individual piece of bark less than 50 square cm.

[10] For methyl bromide treatment, the removal of bark must be carried out before treatment as the presence of bark on the wood may affect treatment efficacy. For heat treatments, the removal of bark may be carried out before or after treatment. If diameter limitations are recommended for certain heat treatments (e.g. dielectric heating) any bark remaining must be included in the dimension measurement.

[11]

Heat treatments

[12] Various energy sources or processes may be suitable to achieve the required treatment parameters. For example, conventional steam heating, kiln-drying, heat-enabled chemical pressure impregnation, dielectric heating (microwave, radio frequency) or other treatments may all be considered heat treatments provided they meet the heat treatment parameters specified in this standard.

[13] NPPOs should ensure that the treatment temperature is monitored by providers at a location likely to be the coldest, which will be the location taking the longest time to reach the target temperature in the wood, to ensure that the target temperature is maintained for the duration of treatment throughout the batch of wood being treated. The point at which a piece of wood is the coldest may vary depending on the energy sources or processes applied, the moisture content and the initial temperature distribution in the wood. When using dielectric radiation as a heating source, the coldest part of the wood usually is the surface.

[14]

Heat treatment using a conventional steam or dry kiln heat chamber (treatment code for the mark: HT)

[15] When using conventional heat chamber technology, the fundamental requirement is to achieve a minimum temperature of 56 °C for a minimum duration of 30 continuous minutes throughout the entire profile of the wood (including at its core).

[16] This temperature can be measured by inserting temperature sensors in the core of the wood. Alternatively, when using kiln dry heat chambers or other heat treatment chambers, treatment schedules may be developed based on a series of test treatments during which the core temperature of the wood at various locations inside the heat chamber has been measured and correlated with chamber air temperature taking into account the moisture content of wood and other substantial parameters (such as species, thickness of wood, air flow rate and humidity). The test series must demonstrate that a minimum temperature of 56 °C is maintained for a minimum duration of 30 continuous minutes throughout the entire profile of the wood.

[17] Treatment schedules should be specified or approved by the NPPO.

[18] Treatment providers should be approved by the NPPO. The following factors should be considered by the NPPO when evaluating the capability of a heat chamber to meet the heat treatment requirements:

[19]

1. Heat chambers are sealed and well insulated, including insulation in the floor.
2. Heat chambers are designed in a manner that permits uniform flow of air around and through the wood stack. Wood to be treated is loaded into the chamber in a manner that ensures adequate air flow around and through the wood stack.
3. Air deflectors in the chamber area and spacers are used as required to ensure adequate air flow.
4. Fans are used to circulate air during treatment, and air flow from fans is sufficient to ensure the core temperature of the wood is maintained at the specified level for the required duration.
5. The coldest location within the chamber is identified for each load and temperature sensors placed there, either in the wood or in the chamber.
6. Where the treatment is monitored using temperature sensors inserted into the wood, at least two temperature sensors are recommended. These temperature sensors should be suitable for measuring wood core temperatures. The use of multiple temperature sensors ensures that any failure of a temperature sensor is detected during the treatment process. The temperature sensors are inserted at least 30 cm from the end of a piece of wood and penetrate to the centre of the wood. For shorter boards or pallet blocks, temperature sensors are also inserted in the piece of wood with the largest dimensions to ensure that the temperature at the core is measured. Any holes drilled in the wood to place the temperature sensors are sealed with appropriate material to prevent interference in temperature measurement by convection or conduction. Special attention should be drawn to external influences to the wood such as nails or metal insertions which may lead to incorrect measurements.
7. Where treatment schedules are based on monitoring chamber air temperature and used for treatment of different wood types (e.g. specific species and sizes), these schedules take into account the species, moisture content and thickness of wood being treated. A minimum of two temperature sensors are used in chambers treating wood packaging according to treatment schedules.
8. If the air flow in the chamber is routinely reversed during treatment, an increased number of temperature sensors may be used to account for a possible change in the location of the coldest area.
9. Temperature sensors and data recording equipment are calibrated in accordance with the manufacturer's instructions at a frequency specified by the NPPO.
10. Temperatures are monitored and recorded during each treatment to ensure that the prescribed minimum temperature is maintained for the required period of time. If minimum temperatures are not maintained, the treatment is restarted or the treatment time extended and the temperatures raised to ensure that all wood is treated to meet the requirements. During the treatment period, the frequency of temperature readings is sufficient to ensure that treatment failures can be detected.
11. For purposes of auditing, the treatment provider keeps records of heat treatments and calibrations for a period of time specified by the NPPO.

[20]

Heat treatment using dielectric radiation (dielectric heating, treatment code for the mark: DH)

[21] Dielectric heating is a process that is caused by a dielectric radiation. Where dielectric heating is used (e.g. using microwaves), wood packaging material composed of wood not exceeding 20 cm^1 when measured

across the smallest dimension of the piece or the stack must be heated to achieve a minimum temperature of 60 °C for 1 minute throughout the profile of the wood (including its surface). The prescribed temperature must be reached within 30 minutes from the start of the treatment[2].

[22] Treatment schedules should be specified or approved by the NPPO.

[23] The NPPO should approve the treatment provider. When approving and auditing a treatment provider, the NPPO should ensure that the following factors are appropriately addressed:

[24]

1. Irrespective of whether dielectric heat treatment is conducted as a batch process or as a continuous (conveyor) process, the treatment is monitored on the wood where the temperature is likely to be the coldest (normally on the surface). For measuring the surface temperature, at least two temperature sensors are used. The operator has initially validated that the wood temperatures reach or exceed 60 °C for 1 minute throughout the entire profile of the wood (including its surface).
2. For wood exceeding 5 cm in thickness, dielectric heating at 2.45 GHz requires bidirectional application or multiple waveguides for the delivery of microwave energy to ensure uniformity of heating.
3. Temperature sensors and data recording equipment are calibrated in accordance with the manufacturer's instructions at a frequency specified by the NPPO.
4. For purposes of auditing, the treatment provider keeps records of heat treatments and calibrations for a period of time specified by the NPPO.

[25]

Methyl bromide treatment (treatment code for the mark: MB)

[26] NPPOs are encouraged to promote the use of alternative treatments approved in this standard[3]. Use of methyl bromide should take into account the CPM recommendation on the replacement or reduction of the use of methyl bromide as a phytosanitary measure (CPM, 2008).

[27] Wood packaging material containing a piece of wood exceeding 20 cm in cross-section at its smallest dimension must not be treated with methyl bromide. Wood packaging material fumigated with methyl bromide must be in accordance with a schedule, specified or approved by the NPPO, that achieves the minimum concentration-time product[4] (CT) over 24 hours at the temperature and final residual concentration specified in Table 1. Slight increases in the treatment time (e.g. 1–2 hours) may be permitted to achieve the required CT if the minimum final concentration is not met (see footnote to Table 1). This CT must be achieved throughout the profile of the wood, including at its core, although the concentrations would be measured in the ambient atmosphere. The minimum temperature of the wood and its surrounding atmosphere must not be less than 10 °C and the minimum exposure time must not be less than 24 hours. Monitoring of gas concentrations must be carried out at a minimum at 2, 4 and 24 hours from the beginning of the treatment. In the case of longer exposure times and weaker concentrations, additional measurement of the gas concentrations should be recorded at the end of fumigation.

[28] **Table 1:** Minimum CT over 24 hours for wood packaging material fumigated with methyl bromide

[29]

Temperature (°C)	CT (g·h/m^3) over 24 h	Minimum final concentration (g/m^3) after 24 h#
21.0 or above	650	24
16.0 – 20.9	800	28
10.0 – 15.9	900	32

[30] # In circumstances when the minimum final concentration is not achieved after 24 hours, a deviation in the concentration of ~5% is permitted provided additional treatment time is added to the end of the treatment to achieve the prescribed CT.

[31] One example of a schedule that may be used for achieving the specified requirements is shown in Table 2.

[32] Table 2: Example of a treatment schedule that achieves the minimum required CT for wood packaging material treated with methyl bromide (initial doses may need to be higher in conditions of high sorption or leakage)

[33]

Temperature (°C)	Dosage (g/m^3)	Minimum concentration (g/m^3) at:		
		2 h	4 h	24 h
21.0 or above	48	36	31	24
16.0 – 20.9	56	42	36	28
10.0 – 15.9	64	48	42	32

[34] NPPOs should ensure that the following factors are appropriately addressed by those involved in the application of methyl bromide treatment under this standard:

[35]

1. Fans are used as appropriate during the gas distribution phase of fumigation to ensure that equilibrium is reached and positioned to ensure that the fumigant is rapidly and effectively distributed throughout the fumigation enclosure (preferably within the first hour of application).
2. Fumigation enclosures are not loaded beyond 80% of their volume.
3. Fumigation enclosures are well sealed and as gas tight as possible. If fumigation is to be carried out under sheets, these are made of gas-proof material and sealed appropriately at seams and at floor level.
4. The fumigation site floor is either impermeable to the fumigant or gas-proof sheets are laid on the floor.
5. The use of a vaporizer to apply methyl bromide (“hot gassing”) in order to fully volatilize the fumigant prior to its entry into the fumigation enclosure is recommended.
6. Methyl bromide treatment is not carried out on stacked wood packaging material exceeding 20 cm in cross-section at its smallest dimension. Therefore, stacked wood packaging material may need separators to ensure adequate methyl bromide circulation and penetration.
7. The concentration of methyl bromide is always measured at a location furthest from the insertion point of the gas, as well as at other locations (e.g. at front bottom, centre middle and top back), to confirm that the uniform distribution of the gas (equilibrium) throughout the chamber is reached. Treatment time is not calculated until the equilibrium has been reached.
8. When calculating methyl bromide dosage, compensation is made for any gas mixtures (e.g. 2% chloropicrin) to ensure that the total amount of methyl bromide applied meets required dosage rates.
9. Initial dose rates and post-treatment product handling procedures take account of likely methyl bromide sorption by the treated wood packaging material or associated product (e.g. polystyrene boxes).
10. The measured temperature of the product or the ambient air (whichever is the lower) is used to calculate the methyl bromide dose.
11. Wood packaging material to be fumigated is not wrapped or coated in materials impervious to the fumigant.
12. Temperature and gas concentration sensors and data recording equipment are calibrated in accordance with the manufacturer’s instructions at a frequency specified by the NPPO.
13. For purposes of auditing, the treatment provider keeps records of methyl bromide treatments and

calibrations for a period of time specified by the NPPO.

[36]

Adoption of alternative treatments and revisions of approved treatment schedules

[37] As new technical information becomes available, existing treatments may be reviewed and modified, and alternative treatments or new treatment schedule(s) for wood packaging material may be adopted by the CPM. If a new treatment or a revised treatment schedule is adopted for wood packaging material and incorporated into this ISPM, material treated under the previous treatment or schedule does not need to be re-treated or re-marked.

[38] Footnote 1 This 20 cm limit is based on the efficacy data currently available.

[39] Footnote 2 Currently only microwave technology was proven to be capable of achieving the required temperature within the recommended time scale.

[40] Footnote 3 In addition, contracting parties to the IPPC may also have obligations under the Montreal Protocol on Substances that Deplete the Ozone Layer (UNEP, 2000).

[41] Footnote 4 The CT product utilized for methyl bromide treatment in this standard is the sum of the products of the concentration (g/m^3) and time (h) over the duration of the treatment.