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**DRAFT ANNEX TO ISPM 28: SULPHURYL FLUORIDE FUMIGATION TREATMENT FOR NEMATODES AND INSECTS IN DEBARKED WOOD (2007-101B)**

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<b>Status box</b>	
<i>This is not an official part of the annex to the standard and it will be modified by the IPPC Secretariat after adoption.</i>	
<b>Date of this document</b>	2016-11-28
<b>Document category</b>	Draft annex to ISPM 28
<b>Current document stage</b>	To CPM for adoption
<b>Major stages</b>	<p>2006-04 CPM-1 (2006) added topic <i>Revision of ISPM 15 (Regulation of wood packaging material in international trade)</i> (2006-011)</p> <p>2006-09 Treatment submitted in response to 2006-08 call for treatments</p> <p>2006-12 TPPT reviewed treatment</p> <p>2007-07 Revised draft considered by TPFQ</p> <p>2007-12 Further revised draft submitted to TPPT</p> <p>2008-12 TPFQ discussion</p> <p>2009-01 TPPT reviewed draft</p> <p>2009-07 Amended draft considered by TPFQ</p> <p>2010-07 Draft updated and recommended to SC</p> <p>2010-09 TPFQ discussion</p> <p>2011-04 SC e-decision</p> <p>2011-05 SC via e-discussion returned to TPPT</p> <p>2011-07 TPPT revised draft based on SC comments</p> <p>2011-10 TPPT reviewed draft</p> <p>2012-02 TPFQ discussion</p> <p>2012-12 TPPT reviewed draft</p> <p>2013-07 TPPT reviewed draft based on additional information from Submitter</p> <p>2014-01 TPPT deferred draft review pending information from specialists</p> <p>2014-06 TPPT reviewed draft based on information from specialists; TPPT recommended topic <i>Sulphuryl fluoride fumigation of wood packaging material</i> (2007-101) be split into two topics (one for insects and one for nematodes and insects); TPPT recommended draft to SC for member consultation</p> <p>2014-09 SC approved draft for member consultation via e-decision (2014_eSC_Nov_09)</p> <p>2014-11 SC agreed to split <i>Sulphuryl fluoride fumigation of wood packaging material</i> (2007-101) into two topics: <i>Sulphuryl fluoride fumigation of insects in debarked wood</i> (2007-101A) and <i>Sulphuryl fluoride fumigation of nematodes and insects in debarked wood</i> (2007-101B)</p> <p>2015-07 First consultation</p> <p>2016-09 TPPT recommended to SC for adoption</p> <p>2016-11 SC recommended to CPM-12 for adoption via e-decision (2016_eSC_Nov_16)</p>
<b>Treatment Lead</b>	Mr Mike ORMSBY (NZ)

<b>Notes</b>	2007-07 Letter to Submitter 2008-03 Letter to Submitter 2009-03 Letter to Submitter 2009-10 Additional information submitted to TPPT 2010-09 Letter to Submitter 2011-04 Formatted in template 2011-11 Letter to Submitter 2015-01 Edited 2016-04 Edited 2016-11 Edited <b><i>This treatment will be formatted after adoption, ensuring that footnotes are on the same page as where the footnote cue appears.</i></b>
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[3] **Scope of the treatment**

[4] This treatment describes the fumigation of debarked wood using sulphuryl fluoride to reduce the risk of introduction and spread of *Bursaphelenchus xylophilus* and insect pests<sup>1</sup>.

[5] **Treatment description**

[6] **Name of treatment** Sulphuryl fluoride fumigation treatment for nematodes and insects in debarked wood

[7] **Active ingredient** Sulphuryl fluoride (also known as sulfuryl fluoride, sulphur dioxide difluoride, sulphuryl difluoride)

[8] **Treatment type** Fumigation

[9] **Target pests** Wood-borne life stages of *Bursaphelenchus xylophilus* (Steiner & Buhner, 1934) Nickle, 1970 (Nematoda: Aphelenchoididae) and insects, including *Anoplophora glabripennis* (Motschulsky, 1853) (Coleoptera: Cerambycidae), *Anobium punctatum* (De Geer, 1774) (Coleoptera: Anobiidae) and *Arhopalus tristis* (Fabricius, 1787) (Coleoptera: Cerambycidae)

[10] **Target regulated articles** Debarked wood not exceeding 20 cm in cross-section at its smallest dimension and 75% moisture content (dry basis)

[11] **Treatment schedule**

[12] Fumigation of debarked wood not exceeding 20 cm in cross-section at its smallest dimension and 75% moisture content (dry basis) in accordance with a schedule that achieves the minimum concentration-time product (CT) within a single 24 or 48 hour period at the temperature and final residual concentration specified in Table 1.

[13] **Table 1.** Minimum concentration-time product (CT) within a single 24 or 48 hour period for debarked wood fumigated with sulphuryl fluoride

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Temperature	Duration (hours)	Minimum required CT (g-h/m <sup>3</sup> )	Minimum concentration (g/m <sup>3</sup> )
20 °C or above	48	3 000	29
30 °C or above	24	1 400	41

[15] This treatment schedule is effective against all wood-borne life stages of nematode and insect pests. There is 95% confidence that the treatment according to this schedule achieves the following levels of mortality for the wood-borne life stages of the following nematode and insect pests:

- [16]
- *Bursaphelenchus xylophilus* to not less than 99.99683%

[17] • *Anoplophora glabripennis* (larvae and pupae) to not less than 99.99683%<sup>2</sup>

[18] • *Anobium punctatum* (all life stages) to not less than 99.7462%

[19] • *Arhopalus tristis* (all life stages) to not less than 99%.

[20] The measured temperature of the product (including at the wood core) or the ambient air (whichever is lower) is used to calculate the sulphuryl fluoride dose and must be at least 20 °C throughout the duration of the treatment.

[21] **Other relevant information**

[22] One example of a schedule that achieves the minimum required CT for debarked wood treated with sulphuryl fluoride is shown in Table 2.

[23] **Table 2.** Example of a treatment schedule that achieves the minimum required concentration-time product (CT) for debarked wood treated with sulphuryl fluoride (SF)

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Minimum temperature during treatment	Minimum required CT (g·h/m <sup>3</sup> )	SF dose <sup>†</sup> (g/m <sup>3</sup> )	Minimum concentration (g/m <sup>3</sup> ) at hour:						
			0.5	2	4	12	24	36	48
20 °C or above	3 000	120	124	112	104	82	58	41	29
30 °C or above	1 400	82	87	78	73	58	41	N/A	N/A

[25] <sup>†</sup> Initial doses may need to be higher in conditions of high sorption or leakage.

N/A, not applicable.

[26] The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment for *B. xylophilus* and insects on the research reported by Barak *et al.* (2006), Bonifacio *et al.* (2013) and Sousa *et al.* (2010, 2011).

[27] The general effectiveness of this treatment has been supported by Barak *et al.* (2010), Binker *et al.* (1999), Bonifacio *et al.* (2013), Ducom *et al.* (2003), Dwinell *et al.* (2005), La Fage *et al.* (1982), Mizobuchi *et al.* (1996), Osbrink *et al.* (1987), Soma *et al.* (1996, 1997, 2001), Williams and Sprenkel (1990) and Zhang (2006).

[28] If the CT is not achieved within a single 24–48 hour period (even if the minimum concentration is achieved), corrective action will need to be taken. The treatment may be extended for a maximum of two hours without adding more sulphuryl fluoride, or it may be restarted.

[29] **References**

The present annex to the standard may refer to international standards for phytosanitary measures (ISPMs). ISPMs are available on the International Phytosanitary Portal (IPP) at <https://www.ippc.int/core-activities/standards-setting/ispms>.

[30] Barak, A., Messenger, M., Neese, P., Thoms, E. & Fraser, I. 2010. Sulfuryl fluoride treatment as a quarantine treatment for emerald ash borer (Coleoptera: Buprestidae) in ash logs. *Journal of Economic Entomology*, 103(3): 603–611.

[31] Barak, A., Wang, Y., Zhan, G., Wu, Y., Xu, L. & Huang, Q. 2006. Sulfuryl fluoride as a quarantine

- treatment for *Anoplophora glabripennis* (Coleoptera: Cerambycidae) in regulated wood packing material. *Journal of Economic Entomology*, 99(5): 1628–1635.
- [32] **Binker, G., Binker, J., Fröba, G., Graf, E. & Lanz, B.** 1999. Laboratory study on *Anobium punctatum*, number 130377/A and 403972 (bioassay 11–15), unpublished, Binker Materialschutz, Germany. In *Inclusion of active substances in Annex I to Directive 98/8/EC*: Assessment report: Sulphuryl fluoride, PT8, Appendix IV (List of studies), p. 29, September 2006.
- [33] **Bonifacio, L., Inácio, M.L., Sousa, E., Buckley, S. & Thoms, E.M.** 2013. *Complementary studies to validate the proposed fumigation schedules of sulphuryl fluoride for inclusion in ISPM No. 15 for the eradication of pine wood nematode (Bursaphelenchus xylophilus) from wood packaging material*. Report. Lisbon, Instituto Nacional de Investigação Agrária e Veterinária (ex-INRB). 60 pp.
- [34] **Ducom, P., Roussel, C. & Stefanini, V.** 2003. Efficacy of sulphuryl fluoride on European house borer eggs, *Hydrotrypes bajulus* (L.) (Coleoptera: Cerambycidae), contract research project. Laboratoire National de la Protection des Végétaux, Station d'Etude des Techniques de fumigation et de Protection des Denrées Stockées, Chemin d'Artigues - 33150 Cenon, France. In *Inclusion of active substances in Annex I to Directive 98/8/EC*: Assessment report: Sulphuryl fluoride, PT8, Appendix IV (List of studies), p. 31, September 2006.
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- [36] **La Fage, J.P., Jones, M. & Lawrence, T.** 1982. A laboratory evaluation of the fumigant, sulphuryl fluoride (Vikane), against the Formosan termite *Coptotermes formosanus* Shiraki. International Research Group on Wood Protection (IRGWP) Thirteenth Annual Meeting. Stockholm, May 1982. Stockholm, IRGWP Secretariat.
- [37] **Mizobuchi, M., Matsuoka, I., Soma, Y., Kishino, H., Yabuta, S., Imamura, M., Mizuno, T., Hirose, Y. & Kawakami, F.** 1996. Susceptibility of forest insect pests to sulphuryl fluoride. 2. Ambrosia beetles. *Research Bulletin of the Plant Protection Service Japan*, 32: 77–82.
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- [39] **Soma, Y., Mizobuchi, M., Oogita, T., Misumi, T., Kishono, H., Akagawa, T. & Kawakami, F.** 1997. Susceptibility of forest insect pests to sulphuryl fluoride. 3. Susceptibility to sulphuryl fluoride at 25 °C. *Research Bulletin of the Plant Protection Service Japan*, 33: 25–30.
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- [42] **Sousa, E., Bonifácio, L., Naves, P., Lurdes Silva Inácio, M., Henriques, J., Mota, M., Barbosa, P., Espada, M., Wontner-Smith, T., Cardew, S., Drinkall, M.J., Buckley, S. & Thoms, M.E.** 2010. *Studies to validate the proposed fumigation schedules of sulphuryl fluoride for inclusion in ISPM No. 15 for the eradication of pine wood nematode (Bursaphelenchus xylophilus) from wood packaging material*. Report. Lisbon, Instituto Nacional de Investigação Agrária e Veterinária (ex-INRB). 20 pp.
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- [45] **Zhang, Z.** 2006. Use of sulphuryl fluoride as an alternative fumigant to methyl bromide in export log

fumigation. *New Zealand Plant Protection*, 59: 223–227.

- [46] **Footnote 1:** The scope of phytosanitary treatments does not include issues related to pesticide registration or other domestic requirements for contracting parties' approval of treatments. Treatments adopted by the Commission on Phytosanitary Measures may not provide information on specific effects on human health or food safety, which should be addressed using domestic procedures before contracting parties approve a treatment. In addition, potential effects of treatments on product quality are considered for some host commodities before their international adoption. However, evaluation of any effects of a treatment on the quality of commodities may require additional consideration. There is no obligation for a contracting party to approve, register or adopt the treatments for use in its territory.
- [47] **Footnote 2:** The minimum level of mortality achieved by the treatment for this species has been estimated by extrapolation from a model fitted to the experimental data.