PLANT PROTECTION

FUMIGATION INSTRUCTIONS FOR THE TREATMENT OF CUT WOOD IN BELGIUM FOR EXPORT TO CHINA

Procedures and administrative requirements for fumigation with sulfuryl fluoride-containing plant protection products from compressed gas cylinders

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DOCUMENT INFORMATION

Fumigation instructions for the treatment of cut wood in Belgium for export to China

Version 1.0
30/09/2026

https://fytoweb.be/en/guide/crop-protection/fumigation-instructions-treatment-cut-wood-belgium-export-china

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1. Introduction

The present instructions for action were drawn up in a collaboration of the Belgian fumigation companies and the competent authorities, namely the Directorate-General Animals, Plants and Food (DG APF) and the Directorate-General for Environment (DG EM), both within the FPS Public Health, Food Chain Safety and Environment, the FPS Employment, Labour and Social Dialogue, and the Federal Agency for the Safety of the Food Chain (FASFC).

The Department Plant protection products and fertilisers of DG APF is responsible for the authorisation of the placing on the market of plant protection products. The Inspection Service of DG EM is responsible for official supervision and post-checking of fumigations. The FASFC is responsible for phytosanitary export certification. The FPS Employment, Labour and Social Dialogue is responsible for the supervision of well-being of workers.

The instructions for action were drawn up against the background of the timber supply increase caused by bark beetles and thus the increased export of spruce cut wood to China. Due to the propagation of bark beetles, there is a high risk of spreading both bark-breeding (primarily bark beetles) and wood-breeding insects (primarily buck beetles) in the ranges intended for export. The infestation with wood-breeding insects also requires a recognised phytosanitary treatment.

In order to be able to respect both the specific conditions imposed by China and deliver pest-free timber, the Belgian fumigation companies will apply these instructions that go further than the general application conditions of the Belgian authorisation for the use of sulfurylfluoride. These instructions are an ultimate method to avoid the suspension of any export of timber to China.

2. Purpose

These instructions describe the minimum requirements for fumigation of cut wood with bark by means of the active substance sulfuryl fluoride (SO_2F_2) for export to China. The application of these instructions is the basis for the competent authorities to issue a Phytosanitary Certificate (PC) for fumigated logs (FR: https://favv-afsca.be/fr/themes/importation-et-exportation/exportation-vers-pays-tiers/vegetaux-et-produits-vegetaux-exportation, NL: https://favv-afsca.be/nl/themas/import-en-export/export-naar-derde-landen/planten-en-plantaardige-producten-export).

All applications for a PC from 01.12.2026 must confirm the correct application of these instructions and its accompanying documents. The competent authorities, the Directorate-General for

Environment (DG EM), the FPS Employment and Labour and Social Dialogue, shall verify compliance with the requirements on the basis of the present instructions for action and through regular checks. In case of non-compliance with the application of these instructions, DG EM will inform FASFC, which will not issue a PC for the products concerned. Certification may only resume after corrective measures that ensure full compliance withthese instructions have been implemented by the fumigation company.

These instructions relate exclusively to phytosanitary aspects.

3. Background

Since the end of the approval of methyl bromide in the EU, the fumigation of logs for export is based on China's phytosanitary import regulations (see 4 Import regulations of China) with products containing the active substance sulfuryl fluoride. The Chinese requirements include initial concentration, duration and temperatures. In 2023 and 2024, China intercepted 41 consignments of wood with a Belgian PC (primary spruce but also pine, oak and beech) due to the presence of live quarantine pests (bark and wood-breeding insects) during the import control in China. Number decreased sharply in 2024 and even more so in 2025, down to 5 consignments (on a total of approximately 1200 phytosanitary certificates in 2025) of which only 1 was situated in the winter period (January).

The regular complaints concerning cut wood exports not only endanger this trade but also affect the reputation of the plant health system and increase the risk that quarantine pests can spread.

A recent scientific study by the Julius Kühn Institute (JKI) in Germany could be interpreted as showing that SO_2F_2 cannot be sufficiently distributed in the container between 5 °C and 10 °C, supposedly because the gas accumulates at the bottom of the container due to its density. Even between 10 °C and 16 °C, SO_2F_2 might not be sufficiently distributed in the container (with or without active air circulation).

There is a possibility that the gas was not evenly distributed in this study and that it was based on an insufficient number of containers to provide scientific evidence of insufficient distribution.

In addition, there is regularly an insufficient gas-tightness of the containers, whereby the resulting reduction in gas concentration is further exacerbated, especially with high wind loads and containers with wooden floors. The presented aspects lead to insufficient gas concentration and distribution and consequently to insufficient efficacy in killing quarantine pests.

In accordance with existing agreements under the International Plant Protection Convention (IPPC), the competent authorities in the exporting country confirm the absence in infested consignments of quarantine pests regulated in the importing country and also the general absence of pests by issuing a PC (ISPM 12[1], Regulation (EU) 2016/2031). In the light of the situation presented and the ongoing complaints from China, the competent authorities first assumed that the current fumigation practice at temperatures below 10 °C could not provide the desired treatment success.

However, the Belgian competent authorities reconsidered this assumption based on the following arguments:

- The shortcomings of the study mentioned above.
- The sharp decrease in the number of notifications of interceptions by the Chinese authorities in the recent years, of which only 1 was situated in the winter period (January), after introduction of a solid winter procedure in past years, despite the current fumigation practice at temperatures that are sometimes below 10 °C.
- The fact that temperature is an important parameter for fumigation but that, for lower temperatures, higher dosages are prescribed, exactly to increase the efficacy at these temperatures.
- Furthermore, the majority of felling takes place during the cold season (outside the breeding season, when trees are 'dormant' and therefore have no sap flow; felling is more efficient as there are no leaves on the trees). As the fumigation takes 24 hours, the coldest temperature (at night) must always be taken into account. In Belgium, treatments would therefore be limited to a maximum of around five months per year (May–September). Nor can the trees be left lying in the forest for long periods after felling. Trade does not stop, so trees felled during the cold period will be treated elsewhere, meaning a shift in fumigation activities away from Belgium (to Eastern or Southern Europe or at the destination). Halting fumigation below 10 °C would cause a massive disruption to the logistics process.

The above elements seem to indicate that fumigation can be carried out with a sufficient degree of certainty at temperatures below 10 °C. Yet, improvements of other conditions for the fumigation, while staying proportionate and practically and economically workable, are expected to further increase this certainty.

In order to maintain the existing export of cut wood to China in the future and not to jeopardise the much-needed market, especially for wood infested with harmful organisms, the SO_2F_2

[1]This standard describes requirements and guidelines for the drafting and issuing of Phytosanitary Certificates (Phytosanitary Certificates for export and Phytosanitary Certificates for re-export).

treatment parameters must be adapted - regardless of the Chinese minimum requirements - so that the Belgian competent authorities can ensure with sufficient certainty that the cut wood is free of infestation after fumigation with SO_2F_2 and issue corresponding PCs in order to exclude further complaints from China and to prevent an import ban. These instructions accommodate this concern.

4. Import regulations of China

For the export of cut wood to China, the Chinese Plant Protection Service requires a PC in which the following elements must be confirmed:

- Effective treatment of cut wood against harmful organisms' infestation
- Absence of adherent soil
- Absence of listed quarantine and other harmful organisms

The phytosanitary import requirements of China for logs with bark are as follows:

- Sulfuryl fluoride fumigation by ambient pressure
- Temperature at 5 °C -10 °C, the initial dose of sulfuryl fluoride concentration of 104g/m^3, to fumigate the logs in a closed area for at least 24 hours.
- Temperature is above 10 °C, the initial dose of sulfuryl fluoride concentration reached 80g/m^3, to fumigate the logs in a closed area for at least 20 hours.

These requirements can also be found on https://favv-afsca.be/fr/themes/importation-et-exportation/exportation-vers-pays-tiers/vegetaux-et-produits-vegetaux-exportation#generale (FR, Information sur les exigences phytosanitaires des pays tiers et sources d'information > Annexe 3), https://favv-afsca.be/nl/themas/import-en-export/export-naar-derde-landen/planten-en-plantaardige-producten-export#algemene (NL, Informatie over de fytosanitaire eisen van derde landen en de informatiebronnen > Bijlage 3).

In the case of wood with bark, the harmful organisms listed in 8 Appendix: Harmful organisms of particular relevance for the export of bark-treated wood to China are particularly relevant for exports to China.

5. Administrative sequence: notification, fumigation plan and PC request

5.1. Notification before fumigation

Before the fumigation is carried out, notification to the Inspection Service of DG EM and FPS Employment, Labour and Social Dialogue in compliance with Art. 5. § 1st of the Royal Decree of 10/05/2023 on fumigation and defumigation is required. Notification needs to happen 24h prior to the fumigation in the case of cargo units like containers or quarantine treatments, via the website http://www.database-begassingen.be or http://www.database-fumigations.be. The notification includes, amongst others, indication of the intended fumigation time, place and container numbers. This notification should also contain a fumigation plan.

The above-mentioned fumigation plan includes the requirements set out in point 5.2 Fumigation monitoring and measurement records and the monitoring and record-keeping requirements set out in point 7.1 Inspection access and on-site verification.

5.2. Fumigation monitoring and measurement records

Data output for concentration and temperature measurements per container described hereunder should be made directly available on request or sent by e-mail to the Inspection services. The date and time stamp must be clearly visible. The data retention period in the company should be at least 2 years from the time of the treatment.

5.2.1. Concentration measurement

- Measurements of **initial and final concentrations**, in **all treated containers** using adequate equipment.
- Measurements should be taken **at the top of the container**, using a measuring probe or line on top of the logs, to account for a worst-case scenario (because the gas is heavier than air).

5.2.2. Temperature measurement

- Measurements of temperature **during the entire fumigation period**, per fumigation zone in **4 containers representative of the entire fumigation zone**: selection of corner containers to account for a worst-case scenario (most exposed to the cooling effect of draughts) using temperature data loggers (accuracy +/- 0.5 °C over the entire measuring chain). Temperature data loggers must be set to measure T° at an interval of 15 minutes or shorter.
- Measurements should be taken **under the bark of the wood**.

5.3. Systematic checks of fumigation companies

Every fumigation company is subject to systematic checks, according to a frequency pre-established by the Inspection service of DG EM.

6. Operational treatment conditions and treatment parameters

Note: From 01.12.2026, **in the event of non-compliance with the conditions described in the present document, no fumigation certificate** may be issued by fumigation companies. Without compliance demonstrated in fumigation certificates, FASFC will not issue any PC.

In principle, the applicable conditions must be taken into account, in particular the Royal Decree of 10/05/2023 on fumigation and defumigation, and the instructions for use of the plant protection product (authorisation certificate).

For the treatment of cut wood (softwood and hardwood) for shipping, one plant protection product is currently authorised in Belgium: PROFUME (9431P/B, active substance: sulfuryl fluoride i.e. SO_2F_2)

For the necessary quarantine treatments with plant protection products containing SO_2F_2, the following technical conditions shall apply:

6.1. Container gas-tightness and preliminary checks

The fumigation shall be carried out in sufficiently gas-tight containers.

A **visual check** is performed to evaluate the general condition of the container, in regard to the gas-tightness. Special attention is paid to the doors (door rubbers), presence of rust or holes... Ventilation holes are closed and **corrective measures** are taken if any defects are found.

On containers which are evaluated as 'reasonable suspicious of leakage', a **gas-tightness test** is performed by means of a smoke test, an ultrasonic test, etc. This is carried out by means of correct measuring equipment properly maintained and calibrated, and also on request of inspection services. Inspection services can require pictures or any other proof of the gas-tightness tests.

As target for the fumigation, the CxT product mentioned in the authorisation of PROFUME is taken. This **CxT-product** is calculated by taking two measurements: 1) initial measurement to control on the correct initial dosage; 2) end concentration after the exposure period.

6.2. Temperature conditions and required treatment parameters

The temperatures of the fumigating material in the container must have been reached before the fumigant is discharged and must be maintained throughout the fumigation period.

Compliance with the treatment parameters specified by China for fumigation with sulfuryl fluoride under normal pressure in accordance with (see 4 Import regulations of China) and the authorisation in Belgium:

6.2.1. 5-10 °C

At an ambient temperature of 5°C to 10°C, the initial concentration of sulfuryl fluoride shall be 104 g/m^3 and the closure time period shall be at least **24 hours**.

Note: Biological efficacy and uniform gas distribution in the container are difficult to guarantee for treatments at temperatures below 10 °C with regard to the requirements for quarantine treatments, **treatment is allowed only with guarantees that higher dosages have been applied** to increase the efficacy at these temperatures. In any case, the authorised application dose must be respected.

6.2.2. Above 10 °C

At an ambient temperature above 10 °C, the initial concentration of sulfuryl fluoride shall be 80 g/m³ and the closure time period shall be at least **24 hours.** This closure time period is foreseen in general by the Belgian authorisation.

6.3. Application rate and dosage calculation

To calculate the dosage, the load rate present must be taken into account. Experience shows that, with an average container fill rate, 3.5 kg of SO_2F_2 is sufficient to achieve the 80 g/m³ initial concentration and 4.5 kg to achieve 104 g/m³. Measurements of the initial concentrations must therefore be the guiding factor in verifying that, for each container, the intended concentration has indeed been achieved following the application of this dosage.

Application should happen by making use of the **Fumiguide tool**, provided by the authorisation holder of PROFUME.

6.4. Exposure period

Exposure period should be at least **24 hours** from the initial concentration measurement in the sufficiently gas-tight and sealed container.

7. Inspection access, post-treatment checks, records and calibration

7.1. Inspection access and on-site verification

a) The Inspection services reserve the right to carry out the evaluation of the temperature profile and the concentration measurement directly on the fumigation site immediately after the fumigation in the presence of the fumigator in charge. The same applies to the concentration measurement after discharge of the fumigant. Appropriate technology for reading the measured values (e.g. notebook) must be provided by the fumigation company.

b) The Inspection services must be granted access to all fumigated lots or units as well as to the gas pressure cylinder with PROFUME for weight control purposes, in compliance with the applicable occupational health and safety regulations.
c) The clearance measurement of the fumigated containers must ensure safe sampling (e.g. bark material).
d) During the inspection by the Inspection services, the presence of the fumigator in charge or an employee of the fumigation company shall be mandatory and shall have the authority to open, ventilate and release gaseous containers and other transport units in accordance with the Royal Decree of 10/05/2023 on fumigation and defumigation. During the follow-up inspection and sampling, measurements shall be made permanently by the fumigator in charge or his/her fumigation assistant in the respective fumigation units to be examined with an appropriate measuring instrument[2] for monitoring the occupational exposure limit value.

7.2. Post-treatment success check and corrective actions

After clearance, all fumigated containers must be checked for success of treatment. If survival of quarantine organisms is determined, the fumigation should be considered unsuccessful, and the container must be fumigated again. Afterwards, a thorough analysis of the situation needs to happen, with the necessary corrective actions and corrective measures. The relevant data is recorded and retained for 2 years. For reasons of occupational safety, the success check is not carried out inside the containers, but only in the door area. In the event of suspicion, the Inspection services reserve the right to have partial or complete unloading of containers carried out at the applicant's expense. Fumigators need to be able to demonstrate that they are sufficiently trained to identify living and dead organisms (in all stages).

7.3. Calibration requirements

Temperature sensors and gas measuring instruments must be calibrated in accordance with the manufacturer's specifications. For temperature sensors, this is usually a 2 or 3-point calibration (which also include the target temperature) every one or two years. Ice and boiling water are not allowed. When using wired probes, the entire measurement chain shall be calibrated.

[2] e.g. SF ExlporIR™ or M.A.C 2640 CLIRcheck

Factory calibration of the gas measuring instruments happens 1x/year or according to specifications of the manufacturer.

Calibration shall be demonstrated to the Inspection services upon request.

8. Appendix: Harmful organisms of particular relevance for the export of bark-treated wood to China[3]

Species of wood	Insect species or genus	Remarks
Softwood (Douglas fir, spruce, pine, larch, fir)	Bark beetle of the genus *Ips* (e.g. small spruce bark beetle - *Ips amitinus*, eight-spined engraver - *Ips typographus*, six-toothed bark beetle - *Ips sexdentatus*)	Quarantine status (except for Chinese species)
	Bark beetles of the genus *Dendroctonus* (great spruce bark beetle - *Dendroctonus micans*, occurs in China)	Quarantine status (except for Chinese species)
	Golden-haired bark beetle - *Hylurgus ligniperda* (bark beetle species - Curculionidae) only on pine wood	Quarantine status
	Common beetle of the genus *Monochamus* (sawyer beetles)	Quarantine status (except for Chinese species)
	Common beetle of the genus *Tetropium* (European spruce longhorn beetle - *Tetropium castaneum*, larch longicorn beetle - *T. gabrieli*, Brown spruce longhorn beetle - *Tetropium fuscum*)	Quarantine status (except for Chinese species)
	Weevils of the genus *Pissodes* (e.g. larger pine weevil - *Pissodes pini* or pine-top weevil - *P. piniphilus*, minor pine weevil - *Pissodes castaneus*)	Quarantine status
	Steel-blue wood wasp - *Sirex noctilio* (predominant on pine species)	Quarantine status
Beech	Jewel beetle of the genus *Agrilus* (except Chinese species), e.g. beech agrilus - *Agrilus viridis*	Quarantine status (except for Chinese species)
	Bark beetle of the genus *Xyleborus* (except Chinese species), e.g. European shothole borer - *Xyleborus dispar*, smaller alder bark beetle - *Xyleborus germanus*	Quarantine status (except for Chinese species)
	Aspen zebra beetle - *Xylotrechus rusticus* (also on poplars, willows, birches)	Quarantine status

[3] In accordance with existing agreements under the International Plant Protection Convention (IPPC), the competent authorities in the exporting country confirm the absence in infested consignments of quarantine pests regulated in the importing country and also the general absence of pests by issuing a PC (ISPM 12[3], Regulation (EU) 2016/2031).

Oak	Bark beetles of the genus *Xyleborus*, other than Chinese species (mediterranean oak borer - *Xyleborus monographus*, smaller alder bark beetle - *Xyleborus germanus*)	
	Red-headed ash borer - *Neoclytus acuminatus* (Longhorn beetle species - Cerambycidae)	Quarantine status (criticised by China)
	Ambrosia beetle of the genus *Platypus* (e.g. oak pinhole borer – *Platypus cylindrus*. Occurs in Europe and has already been objected to several times in 2018 on German oak logs in China)	Quarantine status (except for Chinese species)
Other hardwoods	Jewel beetle of the genus *Agrilus*	Quarantine status (except for Chinese species)
	Flat-faced longhorn beetles of the genus *Saperda*, (small poplar borer - *Saperda populnea*, large poplar longhorn - *S. carcharias*, ladder-marked longhorn beetle - *S. scalaris*. All species prefer poplars and willows)	Quarantine status (except for Chinese species)
	Aspen zebra beetle - *Xylotrechus rusticus* (on poplars, willows, beech trees, birch trees)	Quarantine status
	willow weevil - *Cryptorhynchus lapathi* (on young pastures and poplars, probably not relevant for export)	Quarantine status
	smaller European elm bark beetle and large European elm bark beetle - *Scolytus multistriatus* and *S. scolytus*, bark beetle family, relevant to elms, oaks, ash, poplars, willows, hornbeams, etc.)	Quarantine status

Other quarantine pests controlled by China on trees, but very likely not on cut wood:

- Italian pear scale - *Epidiaspis leperii*; on bark of rosaceae (e.g. apple, pear, cherry)
- Mussel scale - *Lepidosaphes ulmi* (polyphagic to e.g. Sapindaceae, Betulaceae, etc., but rather insignificant and to be suspected on stick woods)